Project contract no. 036851
ESONET European Seas Observatory Network

Instrument: Network of Excellence (NoE)
Thematic Priority: 1.1.6.3 – Climate Change and Ecosystems
Sub Priority: III – Global Change and Ecosystems

Project Deliverable D45b

3rd Demonstration Mission Periodic Reports

Due date of deliverable: August 2008
Actual submission date of report: July 2010

Start of project: 1st **March 2007** Duration: **48 months**

Work Packages 4
Organization name of lead contractor for this deliverable: INGV
Lead Author for this deliverable: Laura BERANZOLI

Revision [1.0]

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services)	X
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

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EXECUTIVE SUMMARY

Aim of this document is the reporting of the activities developing over the period June 2009 – December 2009 in the frame of WP4 the ESONET Demonstration Missions (DM, ref. ESONET NoE DoW). In addition, critical aspects for each DM are pointed out and suggestions are give in order to improve the mpact of the DMs work on ESONET and to help in the fully completion of the DM activities and achievements of the results.

In this period, the DMs approved in the 1st call (LIDO, LOOME, Marmara-DM, MOMAR-D, Fig.1)) are either at the completion of the first year or in the second year of activity. The DM implementation plans have in general a first work phase which include a significant effort of the partners for the integration/adaptation of the instrumentation and devices managed by each of them. This phase is completed for most of the DM and three of these DMs are presently in the phase of the development and follow-up of the sea experiments: LiDO in the Gulf of Cadiz, LOOME around the Hakon Mosby mud volcano (Norwegian margin) and MARMARA-DM in the Marmara Sea. The first results of this experiment phase are mainly represented by the technical achievement which are in turn related to the assessment/validation of the performance of the instrumentations/platforms.
The logistics involved in the sea operations (e.g., research vessels, ROVs, etc.) has been made available by the partners in the frame of a high level collaboration and coordination effort. The running sea experiments are progressing with the acquisition of long-term measurements in the sub-sea, seafloor and water column. In particular the DMs LIDO, LOOME and Marmara-DM have been testing multisensor-platforms, either new or improved, and have been producing a significant amount of long-term multidisciplinary time series acquired in three ESONET key-sites (Hakon Mosby, Gulf of Cadiz, Marmara Sea) and related to seismic activity, heat-flow and fluid emissions, water-column temperature, etc.
The work progress presents delays for some DMs depending from the lab work or from ship time availability.
The technical results obtained so far by LIDO, LOOME and Marmara-DM are the premise for successful experiments and for the collection of long-term multidisciplinary high-quality data.
The status of MOMAR-D is delayed with respect to the original implementation plan and the sea experiment is foreseen by 2010.
In the period June 2009 – December 2010 the DMs approved in the 2nd Call (MODOO, and AOEM) have started their activities of preparation of the instruments and platforms.
At the time of this report, The Grant Agreement (GA) signature process has been completed for MODOO while ESONET coordinator and AOEM coordinator are still negotiating some of the articles of the GA.

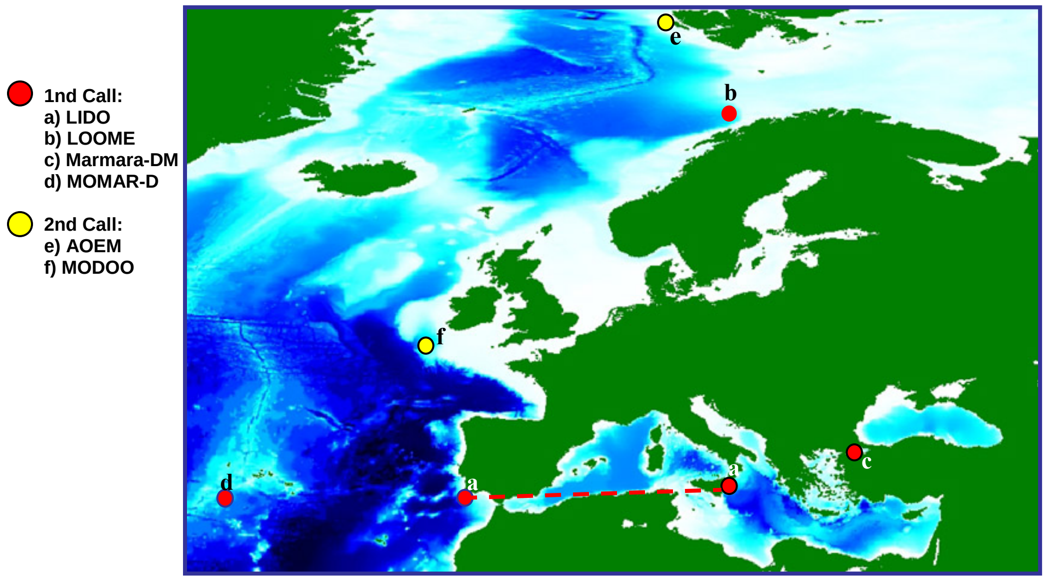

Fig. 1 – Sites of the ESONET Demo Missions (see legend)

1. MAJOR ACHIEVEMENTS OF THE ESONET DEMO MISSIONS

This section give a short description of the first results of the operative phase of the Demo Mission in order to highlight the achievements within the scientific objective of ESONET NoE.

demo missions LIDO, LOOME, Marmara, started in 2008, got into the pivotal moment of their operative phase. These Demo Missions have either started sea operation with the deployment of instrumented modules or collected the first data acquired on the seafloor.

1.1 LIDO

Coordinator: Universitat Politècnica de Catalunya (UPC) Michel Andrè	Start date 01.09.2008	End date 31.08.2010	Duration 24 months	Present Month 16

Participants: UPC, UB-Marum, FFCUL/ CGUL , INGV, ISMAR, INFN, CSIC-UTM, dBS, CIBRA Univ. of Pavia, TFH, TEC.

Scientific and Technological Objectives: extension of the present capabilities of the observatories working in the ESONET key-sites of Eastern Sicily (NEMO-SN1) and of the Gulf of Cadiz (GEOSTAR configured for NEAREST pilot experiment) by installing not-already-included sensor equipments related to Bioacoustics and Geohazards;

Major achievements in the reporting period

WP1- Recovery, Refurbishment and Deployment of Observatories (resp.: INGV)

The GEOSTAR observatory was tested and newly deployed in the Iberian Margin ESONET site for a new long-term mission in collaboration with NEAREST EC Project and with the support of MODUS deployment/recovery vehicle provided by TFH and Sarmiento de Gamboa R/V provided by CISIC.

GEOSTAR is operating from 10 November 2009 in acoustic transmission to a surface buoy and in satellite transmission to land. The observatory has been sending periodical messages containing part of the data acquired and the warning messages of seismic events and water pressure events. From the collaboration between ESONET and NEAREST, GEOSTAR provides to LIDO an original tsunami detection algorithm.

The refurbishment and upgrading of SN-1 observatory have advanced and the observatory is ready to undergo to a test phase before the deployment foreseen by summer 2010. The observatory now includes the same tsunami detection algorithm as GEOSTAR.

WP2 - Standardisation and spreading of acoustic sensors and tsunami detectors (resp.: dBs)

D2.4 will further develop the description of the SWE framework implementation concept meant to serve as an architectural guidance candidate to the LIDO Data Management and hardware interface development teams

With respect to D2.5 the first SensorML instance for hydrophone available today is being developed and inputs are being collected from ESONET and LIDO partners. This instance will be used as a guide for and implemented within the ESONET Sensor Registry (ESONET WP2 & WP9) hydrophone registration interface.

WP3 - Public Outreach (resp.: FFCUL)

The website for the public outreach is online (with simulated data for the Iberian Margin) at http://listentothedeep.com http://listentothedeep.org http://listentothedeep.net

The design the publication and display of the website in OCEANOPOLIS, Brest, France

Input for ESONET-WP7

WP4 - RT Software Development (resp.; UPC)

Modules for the automated detection, classification and localizations of biological and anthropogenic acoustic sources have been developed, tested and validated through simulations with acoustic data made available from previous experiments in deep sea (e.g. NEMO-OnDE) to reveal the presence of sperm whale clicks, ship impulses or ultrasonic cetacean clicks

The partners have been investigating the development of efficient and accurate techniques to be used as the basis of a localisation module for an automated real-time Passive Acoustic Monitoring system. Broadband space-time methods were implemented and allowed to map the sound radiated during the detected clicks and to consequently localise both sperm whales and vessels. Hybrid methods were also developed which improved the robustness of space-time methods to noise and reverberation and reduced computation time. The capacities of the approach were validated by consistent tracks of both sperm whales and vessels.

The Real-Time Acoustic Data Management architecture was tested and validated on previous recordings at SN-1 and is now ready to be implemented.

WP5 - Technical assessment (resp.: INFN)

Test and validation of low cost acoustic arrays and recording systems to be implemented in additional locations to extend the monitoring network. The data flow from sensors to public access (low resolution data) and to authorised users (high resolution data).

WP6 - Project management (resp.: UPC)

This WP is not documented in the report

Deliverables status at 31 Dec. 2009 (month 15)

Deliverable n.	**Deliverable name**	**Corresponding WP n.**	**Responsible Institution**	**Status at 31 Dec. 2009**
D1.1	Procedures for sea operations: recovery and deployment of SN-1 and Ovde stations (East Sicily)	WP1	INGV	**Delivered 29 feb 2009***
D1.2.	Status of the SN-1 and Ovde stations, new requirements and technical specifications of the enhancements	WP1	INGV	**Delivered 29 feb 2009***
D1.3.	Developments of the enhancements and tests	WP1	INGV	Delayed to June 2010
D1.4.	Sea operations procedures for recovery and deployment of GEOSTAR (Gulf of Cadiz) and refurbishment	WP1	INGV	**Delivered 29 feb 2009***
D1.5.	New requirements and technical specifications of the enhancements of the GEOSTAR surface buoy	WP1	INGV	**Delivered 29 feb 2009***
D1.6.	Demo mission planning, development and follow-up	WP1	INGV	Expected first draft DELIVERED
D 3.1	Website with real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions	WP3	FFCUL-UPC	Expected In dealy
D 4.1	Report on functioning/misfunctioning Parts and subsystems of the recovered instrumentation	WP5	TEC	**Delivered to 29 Feb. 2009 (predated)***
D 4.2	TDR of new hydrophone arrays; TDR of data acquisition, Power and data transmission systems, sea operations	WP5	INFN	**Delivered to 29 Feb. 2009 (predated)***
D 4.3	Reports on testing activity	WP5	INFN	Delayed to June 2010*

D 4.4	Reports on integration activity	WP5	INFN	Delayed to June 2010*
D4.6.	Periodic reports of underwater stations, on-shore and offshore systems under activity (up-dating)	WP5	INFN	Delayed to June 2010*
D5.1.a	Six month based reports	WP6	UPC	Delivered 29 feb 2009*
D5.1.b	Six month based reports (up-dating)	WP6	UPC	Expected Delivered

* for previously delivered documents and for all DMS see ANNEX D12 DM – http://wwz.ifremer.fr/esonet_emso/partners_only/official_documents/reporting_documents

* integration and tests are already on-going and the ship-time is not defined yet.

Critical points, comments and suggestions for the next DM development period

The coordination (WP6) in this report was not documented. The coordination has to be more visible and effective toward the partners to improve the integration of some activities which otherwise could appear as independent. Attention to the Deliverables issue has to be paid as some of them are in delay.

The WP leaders should give more visibility to the contribution of the partners involved in the WP.
A general impression on the report relates to the not sufficiently clear separation between 'work done' and 'work to be done'. This ambiguity has to be removed.

The status of the bio-acoustic system for the Iberian Site is not reported.
Some Deliverables will be delayed to the IV period because of the on-going development of tests for the platforms to be deployed off-shore Sicily.

According to the Implementation Plan WP2 is aimed at implementing international accepted standard methods in data acquisition and management and at establishing of a sensor inventory. It is not sufficiently clear what are practically the progresses of this WP.

2.2 LOOME

Coordinator: Max Plank Institute - MPI D. de Beer	Start date	End date	Duration	Present Month
	01.02.2008	31.12.2011	35 months	23

Participants
KDM-Marum, AWI, IFM-GEOMAR, IFR, UiT,

Scientific and technical objectives:
Follow events of eruption with sensor package aimed downwards (acoustics), at the sediments surface (t-strings, chemo-sensor-strings, camera), and in the water column (CTD, scanning sonar). Test integration of these sensors, and endurance.

Major achievements in the reporting period
LOOME is presently in the monitoring of seabed processes. Wood pieces that were deployed in 2008 were recovered and analysed for colonization by wood eating fauna. A detailed temperature study across the hot spot with the 13 m T-lance was performed. The highest temperature gradients were recorded, indicating high seepage activity. Measurement of the primary productivity of the sulphur oxidising community. An

experiment with a photon counter was done, to test the hypothesis that bioluminescence is particularly high near the cold seep. The hypothesis had to be rejected. The recovery cruise is planned for September 2010.

WP1 – Seismic detection of eruptive events
After the recovery of Aug. 2009 the module was again deployed near an hot sport in opposite position respect to the LOOME frame in September 2009.

WP2 - Monitoring of fluid chemistry
The sensors were deployed

WP3 – Monitoring of physical sediment properties
Temperature and pore pressure in the sub-surface and sea bed (resp.: IFM-GEOMAR).
The T-lance was redeployed near the hot spot.
The temperature lance and the pore-pressure lance were recovered. The temperature lance was re-deployed. Temperature and bottom water pressure sensing systems were integrated into the LOOME frame and deployed as a part of the main observatory module. All sensors were installed at the planned positions at the seafloor. First data was obtained via the ROV using the CLSI.

WP4 - Detection and quantification of gas flares.
Due to the electronic failure, the sonar is now operating autonomously. The sonar is deployed together with the frame.

WP5 - Construction of the central frame/platform
Platform is presently operating at seabed

WP6 - Underwater communication
Not clear status

WP7 - Deployment frame
COSTOFF is presently operating to acquire T-signals.

WP8 - Standardization and interoperability
Not documented

WP9 - LOOME management
Not clear status

Deliverables status at 31 Dec. 2009 (month 15)

Deliverable n.	Deliverable name	Corresponding WP n.	Responsible Institution	Status at 31 Dec. 2009
1	Long-term seismometer	1, 10, 13	UiT	**Delivered 29 Feb. 2009 ***
2	Long-term chemical sensors (pH, O2, sulfide, redoX)	2	MPI-MM	**Delivered 29 Feb. 2009 ***
3	Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed	2	IFREMER/IFM-GEOMAR	**Delivered 29 Feb. 2009 ***
4	Scanning sonar for gas flares detection	4	MARUM	**Delivered 29 Feb. 2009 ***
5	Design of sensor network and	7	MPI	Expected

	operation platform			DELIVERED
6	Deployment and recovery procedures for instruments and data	8	Marum	Expected DELIVERED
7	Design of underwater communication	9	MARUM /Ifremer/UiT	Expected DELIVERED
8	Documentation of inter-operability and standardization	14	MARUM	Expected DELIVERED
9	Cruise report Jan Mayen 2008, Polarstern 2009	10	MPI/UiT/Ifremer	**Delivered 21 Nov. 2008 * Delivered 5 Feb 2010 ***

Critical points, comments and suggestions for the next DM development period

End date is over the end of ESONET; it should be reported to 31.10.2010.

WP titles are different from the implementation plan and this could cause misunderstanding in the assessment of the work status. It would be advisable to stick to the original titles.

The WP description of the status of activities is too synthetic and some time not comprehensible. The reports should be understandable to external readers.

WP6 and WP8 (both Responsibility of MARUM) are not documented.

According to the implementation plan, WP9 is 'Management' while it is referred to as 'Scientific Report'. Nothing is give about the management status.

The deliverable reports should bring on the cover page the title of the deliverables according to the implementation plan to avoid misunderstanding.

2.3 MARMARA-DM

Coordinator: IFR – Ifremer L. Geli	Start date 01.04.2008	End date 30.09.2010	Duration 30 months	Present Month 22

Participants
ITU, ISMAR-CNR, INGV, CNRS, DEU/IMAST

Scientific and technical objectives:
The goal of MARMARA-DM is to contribute to the establishment of optimized permanent seafloor observatory stations for earthquake monitoring in the Marmara Sea (MS) and investigate the submarine segment of the North Anatolia Fault with respect to fluids and seismicity possible relation.

Major achievements in the reporting period
MARMARA-DM has been performing seafloor and ship-based data acquisition of multiple masurements in time (time-series) and space (bathymetry).

WP 1 : Analysis of the available time series data and in-situ samples from the Marnaut cruise.
This workpackage is almost done. All deliverables have been produced, except D1.2 (paper of fluid flow measurements).

WP 2 : Marine operations. During the reporting period, the most important activities have been conducted under this WP :

1. "Marmesonet" Cruise was conducted by IFREMER with R/V Le Suroit, from November 4th to december 14th, 2009. The cruise was divided in two parts :
   - part 1 for acoustic detection of gas emissions, AUV micro-bathymetry and seabottom deployment of BOB (acoustic gas bubble detector) ;
   - part 2 for high resolution, 3D seismic survey on the western high.
2. Marmara-2009 cruise of R/V Urania was conducted from september 22 (start in Brindisi) to october 12 (return to Brindisi), under the supervision of Luca Gasperini, ISMAR (partner 4). R/V Urania has deployed SN-4 in the east Ç?narc?k Basin, and performed en-route surveys to map and sample dissoved gas in the water column. All Ifremer instruments (10 OBSs and 5 piezometers) were deployed during the Urania cruise. These instruments will be recovered in march 2010.

WP 3 : Integration of land and seafloor seismological data. The tentative work performed using OBS data from the MarNaut cruise and land data from Turkish institutions (KOERI and TUBITAK) has shown that it is impossible to merge land and seabottom datasets in absence of a detailed 3D velocity model. Hence, this WP can be considered as done at this stage.

WP 4 : Data integration and modeling. In progress.

WP 5 : Comparative study and project feasibility. In progress,

WP 6 : Public and education outreach, coordination at national (Turkish) level and fund raising. An important activity has been undertaken under this Workpackage (see specific report on WP6).

Deliverables status at 31 Dec. 2009 (month 15)

Deliverable n.	Deliverable name	Corresponding WP n.	Responsible Institution	Status at 31 Dec. 2009
	Paper on piezometer and OBS results	1	CNRS	Delivered
D1.2	Paper on flowmeters/osmo-samplers	1	CNRS	Delivered
D1.3	Paper on fluid analysis	1	CNRS	Delivered
D1.4	D1.1	1	CNRS	Delivered
D2.1	Reports on DEU cruise	2	DEU/IMST	Expected Delivered
D2.3	Urania operations and 6 months time series at 3 sites	2	ISMAR/INGV	Expected In delay
D3.3	High Res Seismic Images at the 3 sites	3	ITU	Delayed Month 30
D6.3	Training course	6	DEU/IMST	Expected Delivered

Critical points, comments and suggestions for the next DM development period

The report is detailed and the activities are very well documented as well as the resources (man-power and funds).

The deliverables have to be identified according to the implementation plan while they are often submitted without the correct title or identification number. This can cause misunderstandings.

The DM is expected to give very interesting results.

2.4 MOMAR-D

Coordinator: IFR – Ifremer P.-M. Sarradin	Start date 01.09.2008	End date 30.09.2010	Duration 24 months	Present Month 16

Participants
DOP/UAÇ, FFCUL/CGUL, IPGP, NOC, CNRS – F, CNRS – C, Univ. Bremen, Ifremer, SOPAB

Scientific and technical objectives:
To study the temporal variability of active processes such as hydro-thermalism, ecosystem dynamics, volcanism, seismicity and ground deformation, in order to constrain the dynamics of mid-ocean ridge hydrothermal ecosystems.To deploy a multidisciplinary acoustically linked observing system, with satellite connection to shore. To demonstrate the overall management of this system during 1 month even if its operation will actually continue during 12 months.

Major achievements in the reporting period
Wp1, WP2, Wp7 seem to be the presently active WPs.

The cruise is now scheduled in September 2010, on the Pourquoi pas ? with the ROV Victor 6000. Due to logistic constraints of the fleet, the duration of the first cruise was reduced from 19 to 13 days to implement the observatory infrastructure on Lucky Strike.
After the meeting in Brest in March 2009 and the final definition of the observatory, this period was used to start the technological work. The design and building of the sensors and nodes is in progress as well as the software adaptation of the sensors to the SEAMON technology. The objective is to start the trial step in Brest in Spring 2010. Shipping is planned during Summer 2010.

In parallel, a draft of the data management policy is circulating among the partners (see draft of D3).

The MoMAR-D project was presented during the 4th International symposium on Chemosynthetic Based Ecosystems in Okinawa (Jpn), the ESONET All region workshop in Paris, the ESONET Best practices workshop in Brest and the Ocean Biology Observatory Workshop in Mestre (It).
The next 6 month period will be devoted to the on shore integration and trial of the system in Ifremer in Spring 2010.
D3 and D4 will be finalized before the cruise.
The cruise preparation reports (Agreement to work in the Portuguese waters and Technological description of the cruise) will be delivered to the French Fleet in March 2010.

Deliverables status at 31 Dec. 2009 (month 15)

	Deliverable Name	WP	Lead contractor	STATUS
D1	Cruise proposal submission	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	**DELIVERED**
D2	Report Description of the operational system : interface specifications, sensors, localisation	WP2	J. Blandin (P#7)	**Delivered**
D3	Signed agreement Data management policy	WP3	T. Carval (P#7)	Delayed 07/2010
D4	Communication plan	WP5	J. Sarrazin (P#7)	Delayed 07/2010
D5	On shore integration and test report	WP2	J. Blandin (P#7)	Delayed 06/2010

Critical points, comments and suggestions for the next DM development period

Some parts of the periodic report do not follow the requested template and this cause lack of clarity with respect to the work done. The description of the activity is not clear when compared to the original implementation plan and some parts are too generic. The WP leaders has to make a larger effort of synthesis instead of reporting the individual contribution of each partner. The coordination has to be stronger in order to favour an actual integration of the partners.

The DM is affected by a significant delayed that according to the report should be recovered in 2010. A check is necessary on the next six-month report.

2.5 MODOO

Coordinator: IFM-GEOMAR J. Karstensen	Start date 01.05.2009	End date 30.09.2010	Duration 17 months	Present Month 8

Participants: NERC-NOCS, IM, NIOZ, UniAbdn, AWI

Scientific and technical Objectives:
This DM will demonstrate the functioning of a Modular and mObile Deep Ocean Observatory (MODOO) with real-time data access. The MODOO concept is that of linking and operating stand-alone observatory modules (lander, mooring) in such a way that they merge into a single observatory. The MODOO concept shall be applicable to any non-cabled environment as well as to link non-cabled with a cables site.

Major achievements in the reporting period
The first 8 month of the DM have been concentrated on outlying and building the hardware, in particular the Data Collection and Dissemination (DCD) node that connect lander and mooring. This activity is still

ongoing. In addition, procedures (e.g. data flow, testing of equipment) have to be defined. A website has been established (www.modoo.info) and linked to the ESONET NoE website (deliverable D4.1). The website will be extended to link to the real time data. Preparation for the data collection and dissemination have been taken (type of sensors, data streams expected, responsible contact). The data processing (near real time, delayed mode) has been outlined in accordance with international standards (e.g. GTS, OceanSITES).

WP1 - Lander component
In order to advance the capabilities of the BOBO lander to get it interfaced with the EuroSITES mooring via the DCD nodes and to host additional sensors, the lander configuration was outlined and information about the expected payload was collected. The passive acoustic sensor in preparation will be delivered during February 2010 for implementation into the lander.

WP2 - Mooring component
The objective of this WP is to design the EuroSITES water column observatory to incorporate the needs to the MODOO mission. In particular the inductive link based communication between the CDC node and the surface control unit must be defined and programmed. The design required for the new mooring has been almost completed and some of the hardware required has been purchased. This work is shared with EuroSITES preparation for the PAP deployment. The major enhancement is the installation of a new type of surface buoy (shared with the Met Office) which host a variety of air/sea exchange sensors, telemetry system and energy supply.

WP3 - Scientific and technological integration
The major step for the scientific integration of the observatory components is: standardization, interoperability and access to data (see also WP4). The technological integration includes the linking between the observatories (see also WP1 & WP2) and the linking of their components/sensors. The integrating devices are the “data collection and dissemination” (DCD) nodes. The DCD nodes are central to the MODOO Demomission as they fulfil the scientific and technological integration of the observatory modules. The process started with the definition of the needs (scientific and technological) followed by integration requirements. This process is still ongoing

WP4 - Data management and outreach
The MODOO project data management will be an extension of the systems already being undertaken under the auspices of EuroSITES. This will enhance links between EuroSITES and ESONET NoE data management principles. A large range of data types will be handled in real-time, including meterological air/sea exchange instrumentation, water column and sea floor lander. During this pre-deployment phase of MODOO meta-data such as the number and types of sensors to be used on the mooring and lander have been gathered.

WP2 - Coordination
Shortly after the official project start (01. May 2009) a kick-off meeting was organized and held (early May 2009). Other meetings also in collaboration with the “exchange of personal” MODOO connect have been held in December 2009. Preparatory work for the first report to ESONET NoE WP4 have been made. Project updates and request have been posted to the partners.

Deliverables status at 31 Dec. 2009 (month 8)

	Deliverable Name	WP	Lead contractor	STATUS
D2.1	Document describing NERC-NOCS Iridium	WP2	NERC-NOCS	Expected Delivered
D 4.1	MODOO web presence established	WP 4	NERC-NOCS	Expected Delivered
D 5.1	Progress reports	WP 5	IFM-GEOMAR	Expected Delivered

<u>Critical points, comments and suggestions for the next DM development period</u>

The report, despite of an error of paging, is very clear and accurate and account for the major activities and achievements of the DM. In particular the achievements are given in a very assessable way through time-line and tables clear updating.

Some delay have been reported, justified and corrective action have been identified.

2.6 AOEM

Coordinator: NERC-NOCS I. Wright	Start date 01.07.2009	End date 31.10.2010	Duration 16 months	Present Month 8

<u>Participants</u>: AWI, FoRTH, Leibniz Institute of Marine Sciences, Nansen Environmental and Remote Sensing Center, UiT

<u>Scientific and technical Objectives</u>:
Demonstrate and deploy observatory lander technology for dissociating hydrate studies in high-latitude, but warming Arctic Ocean shelf sites. Design and evaluate data acquisition and real-time transmission methodologies for Fram Strait oceanography, including an acoustic network for future ocean tomography and glider navigation and docking.
Develop the scientific and policy case for the Arctic ESONET site to become a sustained cabled observatory network within ESONET / EMSO initiatives, and Norwegian SIAOS and EU ESFRI programmes.

<u>Major achievements in the reporting period</u>
Although some activities have been started by the partners of this DM, the workplan reports the starting of the activity by January 2010 when the problems related to the agreement on the arrangement of some parts of the Grant Agreement between the DM partnership and the ESONET Coordiator are expected to be completed.

<u>Deliverables status at 31 Dec. 2009 (month 15)</u>
The deliverables issue is foreseen starting from May2010.

<u>Critical points, cComments and suggestions for the next DM development period</u>

Because of the early stage of the DM, comments and suggestion are not applicable. The recommendation is however that the formalities within ESONET NoE be completed soon to allow the DM to have its course and be completed in due time.

Conclusions

Three sea experiment are running within LIDO, LOOME and MARMARA Demo Missions. Three experiments are in preparation for the 2010 within MOMAR, MODOO and AOEM.

The next 6 months will be important to check the tipology and quality of the data acquired and the data management by the running experiments and to verify the work of preparation and the actual cruise plan for the foreseen experiments.

While some of the DMs (Marmara and MODOO) are well documented and the work is easily assessable, for other DMs, such as LIDO LOOME and MOMAR, a major effort has to be in this sense. Deliverables have to issue in agreement to the implementation plan and eventual delay have to be explained and the new delivery dates indicated. In addition, the deliverables have to be clearly indicated with the title and identification number reported in the original implementation plan to avoid misunderstanding.

For MOMAR and AOEM the next months will be crucial to check the achievement of the implementation plan within October 2010.

ANNEX – DM Periodic Reports

Project contract no. 036851

ESONET

European Seas Observatory Network

Instrument: **Network of Excellence (NoE)**
Thematic Priority: **1.1.6.3 – Climate Change and Ecosystems**
Sub Priority: **III – Global Change and Ecosystems**

LIDO Demonstration Mission
Periodic Reports

Start date of project: **March 2007** Duration: **48 months**

Start date of the Demonstration Mission: **September 2008** Duration: **24 months**

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
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ESONET Demonstration Missions

1st Periodic Activity Report

The Periodic Activity Report contains an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken.

This document has to be filled in with reference to the DM Implementation plan. *This means that Deliverables, Milestones and WPs have to be the same as in the DM Implementation plan.*

The Periodic Report contains 2 parts:
- Part I: it is addressed to the coordinator with minimum input from the partners
- Part II: it is addressed to each WP Leader and reports a detailed update of each WP activity at task level.

The report includes a rough justification of the costs incurred and of the resources deployed by each contractor linking them to activities implemented and justifying their necessity.

Finally the report contains information on use and dissemination activities.

Reporting period:

B.1. **September 2008**

Part I

DM acronym:	***LIDO***
DM title:	*LISTENING TO THE DEEP-OCEAN ENVIRONMENT*
ESONET Site:	*EAST-SICILY & GULF OF CADIZ*
Scientific Area(s):	*GEOPHYSICS & BIOACOUSTICS*
Technological Area(s):	*GEOPHYSICS & BIOACOUSTICS*
DM Start date:	*1 SEPTEMBER 2008*
DM duration:	*24 MONTHS*
Period of the reporting	from 1 to 30 September 2008

Partner Num.	Partner Institution Name	Principal Investigator (PI) for the Demo Mission	PI coordinates (Address, Email, Telephone, fax..)
1.	UPC Universitat Politècnica de Catalunya	Michel André	michel.andre@upc.edu
2.	UB* University of Bremen (Marum)	Christoph Waldmann	waldmann@marum.de
3.	FFCUL/ CGUL* Fundação da Faculdade de Ciências da Universidade de Lisboa Centro de Geofísica da Universidade de Lisboa	Jorge Miguel Miranda	jmiranda@fc.ul.pt
4.	INGV Istituto Nazionale di Geofisica e Vulcanologia	Paolo Favali	paolofa@ingv.it
5.	ISMAR Consiglio Nazionale delle Ricerche Istituto Scienze Marine, Dipartimento di Bologna	Nevio Zitellini	nevio.zitellini@bo.ismar.cnr.it
6.	Istituto Nazionale di Fisica Nucleare INFN*	Giorgio Riccobene	riccobene@lns.infn.it
7.	Consejo Superior de Investigaciones CSIC* Cientificas – Unitat de Tecnologia Marina - Centre Mediterrani d'Investigacions Marines i Ambientals	Juan Josè Danobeitia	jjdanobeitia@cmima.csic.es
8.	dBScale dBS*	Eric Delory	eric@dbscale.com
9.	Centro Interdisciplinare di Bioacustica e CIBRA Ricerche Ambientali, Università degli Studi di Pavia	Gianni Pavan	gpavan@cibra.unipv.it
10.	Technische Fachhochschule Berlin -FB VIII TFH* - Maschinenbau, Verfahrens- und Umwelttechnik - AG Tiefseesysteme	Hans W. Gerber	hwgerber@ism.tu-berlin.de hwgerber@tfh-berlin.de

11.	Tecnomare-ENI S.p.A. TEC*	Francesco Gasparoni	francesco.gasparoni@tecnomare.it

Executive summary *(max one page)*

LIDO (Listening to the Deep Ocean environment) proposes to establish a first nucleus of a regional network of multidisciplinary seafloor observatorios contributing to the coordination of high quality research in the ESONET NoE by allowing the long-term monitoring of Geohazards and Marine Ambient Noise in the Mediterranean Sea and the adjacent Atlantic waters. Specific activities are addressed to a long-term monitoring of earthquakes and tsunamis and the characterisation of ambient noise induced by marine mammals (Bioacoustics) and anthropogenic noise.

The objective of the proposal will be achieved through the extension of the present capabilities of the observatories working in the ESONET key-sites of Eastern Sicily (NEMO-SN1) and of the Gulf of Cadiz (GEOSTAR configured for NEAREST pilot experiment) by installing not-already-included sensor equipments related to Bioacoustics and Geohazards;

Scientific Objectives

Geo-Hazards: LIDO aims at improving the real-time and near-real-time detection of signals by a multiparameter seafloor observatory network at regional scale for the characterisation of potential tsunamigenic sources. Its methodological approach is based on the cross-checking of geophysical, oceanographic and environmental time series acquired on the seafloor and in the water column. LIDO will provide real-time and nearto-real-time seismological and water-pressure comparative time series from near-shore sources and operational tools (e.g., prototype of tsunameters) integrated in seafloor observation systems, and in the terrestrial Networks LIDO follows the recommendation of the Intergovernmental Coordination Group of the Intergovernmental Oceanographic Commission (UNESCO) for the North-Eastern Atlantic and Mediterranean Tsunami Warning System (ICG/NEAMTWS) for the urgent deployment of a tsunami warning system in the related areas with special regard to the definition of trans-national seismic and sea level monitoring networks.

Bioacoustics: LIDO will evaluate the human and natural contributions to marine ambient noise and for the first time describe the long-term trends in ambient Boise levels, especially from human activities (influenced for example by increasing shipping) and in marine mammals populations (migration patterns, presence, and habitat use of key species, like sperm -, fin - and beaked whales). LIDO will allow real-time and near real-time long-term acoustic monitoring of marine mammals at regional level, as well as noise propagation that could be in the next years correlated with the effects of anthropogenic impacts and climate changes, using the same infrastructure defined above.

Technological objectives

The technological objective of LIDO is the development of the first nucleus of a regional multiparameter seafloor network of homogeneous observatories (same sensors) and its long-term operability beyond the duration of LIDO demo mission in two ESONET key-sites, East Sicily (cabled) and Gulf of Cadiz (acoustically linked with a surface buoy).

Table 1: Deliverables List

Give the deliverable list and status

Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months*	Used indicative person months*	Lead contractor
D1.1	Procedures for sea operations: recovery and deployment of SN-1 and Ovde stations (East Sicily)	WP1	MONTH 1	ON TIME			INGV
D1.2.	Status of the SN-1 and Ovde stations, new requirements and technical specifications of the enhancements	WP1	MONTH3	ON TIME			INGV
D1.3.	Developments of the enhancements and tests	WP1	MONTH7	ON TIME			INGV
D1.4.	Sea operations procedures for recovery and deployment of GEOSTAR (Gulf of Cadiz) and refurbishment	WP1	MONTH5	ON TIME			INGV
D1.5.	New requirements and technical specifications of the enhancements of the GEOSTAR surface buoy	WP1	MONTH3	ON TIME			INGV
D1.6.	Demo mission planning, development and follow-up	WP1	MONTH5	ON TIME			INGV
D2.1.	Software of real-time detection of biological sounds (whales and dolphins) and anthropogenic noise	WP4	MONTH22				UPC
D2.2.	Software of automatic classification of biological sounds (whales and dolphins) and anthropogenic noise	WP4	MONTH22				UPC
D2.3.	Software of marine mammal localisation and tracking	WP4	MONTH22				UPC
D2.4.	Report on the implementation of prototype SWE concepts	WP2	MONTH22				UB
D2.5.	Report on the sensor registry	WP2	MONTH22				UB
D3.1.	Website with real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions	WP3	MONTH12	ON TIME			FFCUL UPC
D4.1.	Report on functioning/mis-functioning parts and subsystems of the recovered instrumentation	WP5	MONTH3	ON TIME			INFN
D4.2.	TDR of new hydrophone arrays; TDR of data acquisition, power and data transmission systems, sea operations	WP5	MONTH5	ON TIME			INFN
D4.3.	Reports on testing activity	WP5	MONTH12	ON TIME			INFN
D4.4.	Reports on integration activity	WP5	MONTH15				INFN

D4.5.	Final report on station tests after integration.	WP5	MONTH18				INFN
D4.6.	Periodic reports of underwater stations, on-shore and offshore systems under activity.	WP5	MONTH9, 12, 15, 18, 21	ON TIME			INFN
D4.7.	Report on technological conclusions from test activities.	WP5	MONTH22				INFN
D4.8.	Report on possible standardisation and spreading of acoustic sensors and tsunami detectors	WP2	MONTH22				UB
D5.1.	Six month based reports	WP6	MONTH6, 12, 18, 24	ON TIME			UPC
D5.2.	Final report	WP6	MONTH24				UPC

**the person month must be the same as indicated in Part II- WP progress report (see pag. 10)*

Table 2: Milestones List

Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
M1	Infrastructures ready and Observatories deployed for the pilot experiment start	WP1	MONTH7,8	MONTH 13,14	INGV
M2	Museum involved in the DM Outreach	WP3	MONTH11,12	ON TIME	FFCUL
M3	End of the Pilot Experiment	WP1	MONTH18,19	MONTH22	INGV

WP bar chart (planned/actual):

insert the time extention of each workpackage (yellow for planned and green for actual) according to the individual WP reports (see example))

	Months																							
WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1 planned																								
1 actual																								
2 planned																								
2 actual																								
3 planned																								
3 actual																								
4 planned																								
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5 planned																								
5 Actual																								
6 planned																								
6 actual																								
Milestones Planned								M1				M2						M3						
Actual												M2		M1								M3		

Link with ESONET main activities: *please update the dates and contents of the foreseen activities*

Inputs to the DM from ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments
WP1	01/06/2009	31/12/2009	Activity 1a4 Activity 1b4, 1b5 Task d: LIDO is currently collaborating with NEPTUNE and VENUS to implement in Canada the LIDO RT analysis softwares.
WP2	01/10/2008	31/03/2010	Activities 2b2, 2a2, 2b3, 2c2
WP3			Activities 3a1, 3a2, 3a3
WP4	01/09/2008	31/05/2010	Activities LIDO 1-5
WP5			Task b: LIDO is particularly sensitive on the effects of noise on marine organisms and will participate in the development and approval of ethical guidelines and procedures. This latter point constitutes a major criteria to award the ESONET LABEL to the observatories.
WP6			Activity 6a2 Activity 6b1, 6b2
WP7			Task a, b & c

Outputs to ESONET WPs :	Starting date: dd/mm/yy	Ending date: dd/mm/yy	Comments
WP4 - Deliverable D12	01/09/2008	31/01/2009	18 month
WP3 - Deliverable D13	01/09/2008	31/01/2009	18 month
WP6 - Deliverable D15	01/09/2008	31/01/2009	18month
WP7 - Deliverable D18	01/09/2008	31/01/2009	18 month
WP1 - Deliverable D19	01/09/2008	31/01/2009	18 month
WP8 - Deliverable D29	01/09/2008	-	12,24,36,48 months

B.1.1.1. *Sensors & data management plan:* please update the following table: follow the guidelines issued from the ESONET Best Practice workshop

Measured parameters	Depth	Sampling/storage/ acquisition frequency	Access restriction / unrestriction (esonet partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	comments
three-component ground velocity	Up to 4000	20 ÷ 100 Hz	Raw data: immediate public access Processed data: delayed public access	
Pressure perturbations in water	Up to 4000	80 ÷ 100 Hz	Raw data: immediate public access Processed data: delayed public access	
gravity acceleration	Up to 4000	0.01 ÷ 1 Hz	Raw data: immediate public access Processed data: delayed public access	
magnetic field (scalar and three components)	Up to 4000	1 sample/min 1 sample/s	Raw data: immediate public access Processed data: delayed public access	
Seafloor water current (three components)	Up to 4000	2 Hz	Raw data: immediate public access Processed data: delayed public access	
ADCP	Up to 4000		Raw data: immediate public access Processed data: delayed public access	
Light transmission	Up to 4000	1 sample/hour	Raw data: immediate public access Processed data: delayed public access	
Conductivity	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	
Temperature	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	
Static Pressure	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	

Methane concentration	Up to 4000	1 Hz	Raw data: immediate public access Processed data: delayed public access	
H_2S concentration	Up to 4000	1 sample/10 min (averaged on 30 samples/s)	Public, delayed	
pH	Up to 4000	1 sample/6 hours*	Public, delayed	
water sampler	Up to 4000	Off-line analysis	Public, delayed	
Biological noise (cetacean: sperm whales, beaked whales, pilot whales, baleen whales) Anthropoge-nic noise (shipping and other activities) Natural noise	Up to 2500	4 Hydrophones: (sensitivity -195 de re 1V/mPa from 20Hz to 50kHz) preamplification (+20dB) and digitization underwater (at 96 kHz, 24 bit) All 4 hydrophones synchronized and phased All data are continuously sent to shore. Data acquisition and recording on-shore. Data distribution through internet.	ESONET partners, Scientific Community (RT optimised data and delayed if registered to download good quality raw data), Public Real-Time access of optimised data and access to previous recordings	

Dissemination and outreach : please update the table

School material that would be available at the issue of the mission: -photos, video, courses, … -others	Website, tutorials, Photos, videos, training, press events. Direct connection to the sites will allow the general public to access acoustic data stream as well as previous recording and information (historical statistics) Specific materials will be produce with a focus on the acoustic monitoring of the ocean, grouping anthropogenic, seismic and bio acoustic sources
Dissemination through collaborations with aquaria, museum, sciences centres, …?	Near-real time images via internet from seafloor observatory in museums and aquaria. Direct connection to the sites will allow the general public to access acoustic data stream as well as previous recording and information (historical statistics). In the Lisbon Natural History Museum a panel will be installed where information concerning ESONET will be displayed, with a focus on real-time data.

Part II

DM acronym:	***LIDO***
Scientific Area(s):	*GEOPHYSISCS & BIOACOUSTICS*
Technological Area(s):	*GEOPHYSISCS & BIOACOUSTICS*
DM Start date:	*01/09/2008*
DM duration:	*24 MONTHS*

WP management report

(from 1 to 30 September 2008)

WORKPACKAGE	*WP1*
Full WP title	Recovery, Refurbishment and Deployment of Observatories
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*INGV*
Person in charge for the report (WP Leader)	*PAOLO FAVALI*
Partners involved in the Work	*INGV, INFN, TEC, CSIC, TFH, UPC*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

Tasks/activities: Developments and enhancements of NEMO-SN1 and GEOSTAR observatories and infrastructures to open the nodes of a first nucleus of regional network to other disciplines (bioacoustics) and homogenization of geophysical equipments by integration of additional sensor, devices, and software.
GEOSTAR and NEMO-SN1 need to be homogenised and upgraded with respect to:
- Geophysical sensor equipments
- Software for data automatic pre-processing for tsunami detection
- Bioacoustics monitoring

Recovery successfully performed on April 2008, in the same campaign for the SN1 recovery.
Test onshore after recovery: all the "acoustic" components were perfectly working. An auxiliary instrument, the compass, was not working due to bad fibre connection inside the internal Wessel.

As for the improvements foreseen in LIDO at the East Sicily ESONET Site, they will consist in:
Additional sensors:

→Absolute Pressure Gauge (APG)
→ Differential Pressure Gauge (DPG)

→ Acoustics Doppler Current Profiler (ADCP)
→ Fluxgate magnetometer
→ High sampling hydrophones for Bioacoustics

- Data acquisition and automatic processing
→at seafloor: data digitalisation for seismological sensor package (seismometers + hydrophones)
→on land: time series synchronisation + overall data acquisition + Tsunami detection algorithm + RT acoustic data management

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	
Personnel costs	
Subcontracting	
Travels	
Consumables	
Other costs	
Total Costs	

WORKPACKAGE	*WP2*
Full WP title	Standardisation and spreading of acoustic sensors and tsunami detectors
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*UB*
Person in charge for the report (WP Leader)	*CHRISTOPH WALDMANN*
Partners involved in the Work	*UB, DBSCALE*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed -*

"Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".

In LIDO observatories, as well as for ESONET observatories at large, the Data Management workpackage partners have focused on identifying primary hotspots for interoperability, at the physical interfacing layer and at the data access and presentation layer. So, here we will also give a primary set of possible standard solutions.

It is thought prioritary to focus the effort for the implementation of interoperability concepts: at the physical layer sensor interface, at the main station's data servers, and in the encoding of hydrophones in standard format. The latter will imply agreement on a common vocabulary for ocean acoustic sensors and the contribution to and collaboration with ocean-related ontology initiatives

One approach consists in opening a local directory to the public with a catalog service available and standard data and metadata formats. It is rather proven approach for data servers, and as a generic approach it lacks the specificities that ocean observatories may call for. For example there is no protocol companion for sensor control (it is about data and data only). Approach B, which is currently evolving (these standards have been recently fully-approved), answers a broader set of needs although due to its rather recent release it is more complex and risky to implement. One neat advantage as regards the sensor web approach is that it will evolve in close collaboration with the ocean community and ESONET is already contributing actively to its development.

WORKPACKAGE	*WP3*
Full WP title	Public Outreach
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*FFCUL*
Person in charge for the report (WP Leader)	*JORGE MIGUEL MIRANDA*
Partners involved in the Work	*UPC*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

WORKPACKAGE	*WP4*
Full WP title	RT Software Development

Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*UPC*
Person in charge for the report (WP Leader)	*MICHEL ANDRE'*
Partners involved in the Work	*UPC, CIBRA*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

Development of RT and automatic analysis softwares for the Long-term recording and analysis of natural, artificial and biological sound sources; Identification and tracking of cetaceans; Long-term noise interactions and masking.

At the CTSL location, the 4 channels data will be streamed to the preprocessing server as we have just seen, that will be responsible for the analysis of the segments and the tagging of data. One channel will also be encoding the output of the analysis into mp3 format for public access. At that stage no storage is performed (available at the end of next month). The analysis server in turn will identify the acoustic sources and track them as much as possible (sperm, beaked whales, ships, etc.). These codes will be ready next spring.

At the LNS, besides the storage of the data at the MADS server, the web server will store the analysis results in xml format;
Make available mp3 data and analysis results to the flash client; stream analysis results to the LAB-UPC; and provide access to selected data stored for third parties (research collaborators, etc.)

Finally, at the UPC, the server will be responsible of the configuration for the: General public access to Real-Time flash client; General public access to sound library; General public access to (statistical) analysis of the acoustic environment near the platform; Registration for third party collaboration and access control to high quality data

The objectives of LIDO in terms of acoustic and bioacoustics data management is the long term monitoring and assessment of the anthropogenic sources on marine organisms, specially cetaceans, implying the detection, classification and tracking of the sources. This is illustrated here by Phase 3. To achieve this objective, it is necessary to develop a rigorous and versatile protocol that we have separated in two previous steps: Phase 1 and 2. Here, one has to keep in mind that the overall process will be conducted in RT or close to RT.

Detector 1 is an unspecific detector that triggers to the presence of tonal bands, of impulses (clicks), of whistles, calls or sonar.

Detector 2 detects the presence of broadband bulk at lower frequencies that is typical for shipping. It also detects underwater explosions and sperm whale clicks (if there are many), therefore it is also rather unspecific.

Detector 3 is specific for short, possibly FM tonals, such as dolphin whistles or sonar.

Detector 4 is specific for the tonal ship lines sometimes produced by ships.

Detector 5-8 are specific for impulses. They can be tuned to detect impulses that have energy in a given frequency band and the duration of the impulses that are detected can be approximately specified. Depending on how they are tuned, they will detect for example: Airgun, sperm whale clicks, clicks produced by ship propellers, beaked whale and dolphin clicks.

Status of Activities
- Tonals, impulses and broadband signals are detected. This allows to detect most cetacean species of interest, ships, underwater explosions (e.g. seismic surveys), sonar.
- The detectors allow a primary classification of the data into broad classes, which will reduce the data volume supplied to more specific (and greedy) recognition algorithms.
-Because of lack of data: Low frequency tonals of large whales; Natural seismic activity; Pile driving; Dredging; Drilling have not been tested yet on the detectors.
- Phase 2 is foreseen to be due by April 2009 and Phase 3 statistical analysis will start a soon as the antennas are deployed.

WORKPACKAGE	*WP5*
Full WP title	Technical assessment
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*INFN*
Person in charge for the report (WP Leader)	*GIORGIO RICCOBENE*
Partners involved in the Work	*UPC*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - “Contributing to workpackage X” or “Contributing YY% to workpackage X” is too unspecific. Rather e.g. “Developed the ...module for…in workpackage X”.*

Test and validation of low cost acoustic arrays and recording systems to be implemented in additional locations to extend the monitoring network and possibly evaluate new European sites for long term monitoring.

The stream of data coming from the observatory will be directed to a server (ADS) that will distribute it to preprocessing servers where the first filters will be applied as well as where the following specific analysis of the data will be performed. A dedicated server (RADS) will compress and store the roar data. Through a WI-FI connection the processed data will then be sent tot he LNS station where one server will allow the safe public access to the low resolution data and another one will offer the access to high resolution data to registered users. Both servers will be separatedfor safety reasons and spam/virus protection.

- A **tabular overview of budgeted person-months and actual person-months** by workpackage (budgeted person –months to be taken from “Effort breakdown” Excel file)

WP number and name		**First period**	B.2. **Permanent staff**(1) B.3. **first period**
WP1	Actual person months		
	Planned total person months		
WP2	Actual person months		
	Planned total person months		
WP3	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
WPn	Actual person months		
	Planned total person months		
TOTAL	**Actual tot person months**		
	Planned total person months		

(1)*not charged to the DM*

Workpackage progress

(from 1 to 30 September 2008)

Workpackage objectives and starting point *(max 500 characters)*

Progress towards objectives – *(short description about Tasks status; each task has to be referred as Task n.m where n is the WP number and m is a progressive number)*

Task 1.1: Developments of enhancements of NEMO-SN1 and GEOSTAR observatories and infrastructures to open the nodes of a first nucleus of regional network to other disciplines (bioacoustics) and homogenization of geophysical equipments by integration of additional sensor, devices, and software.

contractors involved : INGV, INFN, TEC, ISMAR, CSIC, TFH, UPC

Task 2.1: Standardisation of ocean observatory measurements by implementing international accepted standard methods in data acquisition and management; Establishment of a sensor inventory; Long-term seismometric measurements and analysis.

contractors involved : UB, dBSCALE

Task 3.1: Real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions (e.g., Scientific Museums, Aquaria) where the whole ESONET network will be presented together with the "sonic imagery" of the LIDO stations.

contractors involved : FFCUL, UPC

Task 4.1: Development of RT and automatic analysis softwares: Long-term recording and analysis of natural, artificial and biological sound sources; Identification and tracking of cetaceans; Long-term noise interactions and masking.

contractors involved : UPC, CIBRA

Task 5.1: Test and validation of low cost acoustic arrays and recording systems to be implemented in additional locations to extend the monitoring network and possibly evaluate new European sites for long term monitoring.

contractors involved : INFN, UPC

Task 6.1: Implementation of the administrative and financial decisions of the SC, within the framework set by the European Commission and under the authority of the ESONET NoE. The Activity Leaders are advised by the Advisory Council.

contractors involved : UPC

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

A) *insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters*

Corrective actions: *insert description of the corrective actions max 500 characters*

B) *insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters*

Corrective action: *insert description of the corrective actions max 500 characters*

TABLE 1: WP DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Deliverable Num.	Deliverable Name	Responsible Institution	Delivery Month	Actual or Forecast delivery date *(month)*	Estimated indicative person months *(insert month according to the DM implementation plan)*	Used indicative person months
D1.1	Procedures for sea operations: recovery and deployment of SN-1 and Ovde stations (East Sicily)	INFN	1			
D1.2	Status of the SN-1 and Ovde stations, new requirements and technical specifications of the enhancements	INGV	3			
D1.3	Developments of the enhancements and tests	INFN	7			
D1.4	Sea operations procedures for recovery and deployment of GEOSTAR (Gulf of Cadiz) and refurbishment	TEC	5			
D1.5	New requirements and technical specifications of the enhancements of the GEOSTAR surface buoy	UPC	3			
D1.6	Demo mission planning, development and follow-up	INGV	5			
D2.1	Software of real-time detection of biological sounds (whales and dolphins) and anthropogenic noise	UPC	22			
D2.2	Software of automatic classification of biological sounds (whales and dolphins) and anthropogenic noise	UPC	22			
D2.3	Software of marine mammal localisation and tracking	UPC	22			
D2.4	Report on the implementation of prototype SWE concepts	UB	22			
D2.5	Report on the sensor registry	UB	22			

D3.1	Website with real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions	FFCUL/UPC	12			
D4.1.	Report on functioning/mis-functioning parts and subsystems of the recovered instrumentation	TEC	3			
D4.2.	TDR of new hydrophone arrays; TDR of data acquisition, power and data transmission systems, sea operations	INFN	5			
D4.3.	Reports on testing activity	TEC	12			
D4.4.	Reports on integration activity	INFN	15			
D4.5.	Final report on station tests after integration.	INGV	18			
D4.6.	Periodic reports of underwater stations, on-shore and offshore systems under activity.	INGV	9,12,15,18, 21			
D4.7.	Report on technological conclusions from test activities.	INFN	22			
D4.8.	Report on possible standardisation and spreading of acoustic sensors and tsunami detectors	UB	22			
D5.1.	Six month based reports	UPC	6,12,18,24			
D5.2.	Final report		24			

TABLE 2: WP MILESTONES LIST *(list and status of the Milestones linked to the WP)*

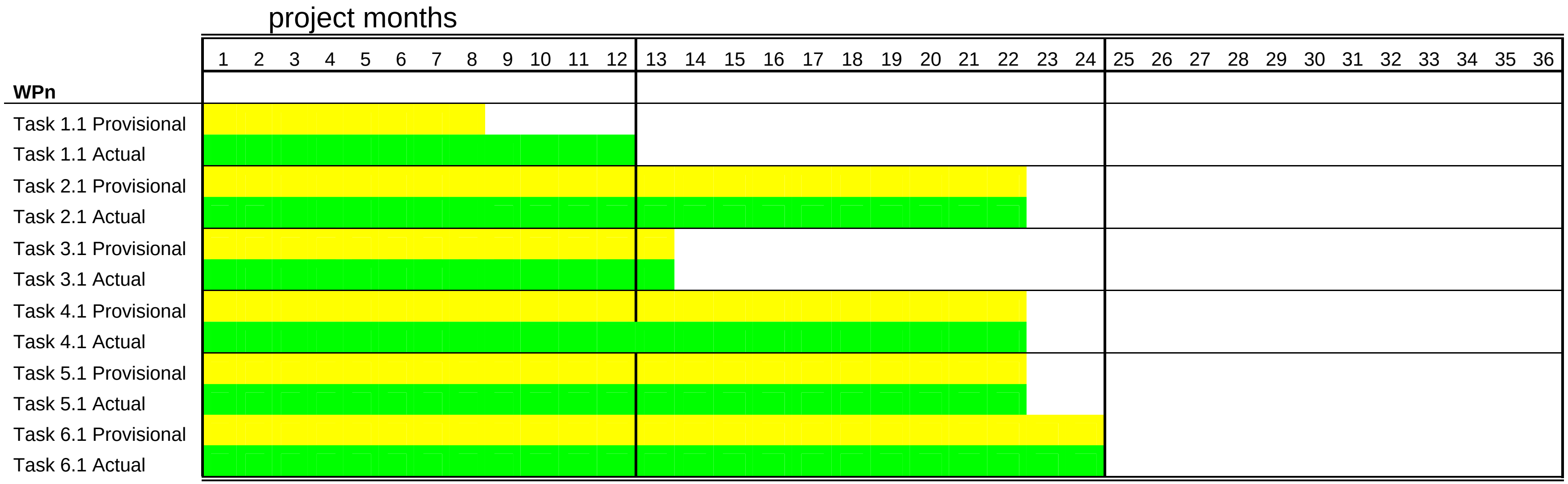
Miliestone Num.	Milestone Description	Month	Actual or Forecast delivery date
M1	Kick-off meeting	2	
M2 M3 M4	Infrastructures ready and Observatories deployed for the pilot experiment start. Museum involved in the DM outreach End of the pilot experiment	7-8 11-12 18-19	

UPDATED GANTT

<u>for all the WP tasks</u>: fill in the 'Provisional' cells of the following table in yellow according to the time duration of the tasks as described in the implementation

<u>for the tasks to be developed in the period of this report</u>: fill in the 'Actual' cells of the following table in green according to the actual or forecast duration of the tasks.

(Example is reported below)



LIDO (Listening to the Deep-Ocean environment)

ESONET Demonstration Missions

2nd Periodic Activity Report

The Periodic Activity Report contains an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken. *This document has to be filled in with reference to the DM Implementation plan. This means that Deliverables, Milestones and WPs have to be the same as in the DM Implementation plan.* *The Periodic Report contains 2 parts:* *- Part I: it is addressed to the coordinator with minimum input from the partners* *- Part II: it is addressed to each WP Leader and reports a detailed update of each WP activity at task level.* *The report includes a rough justification of the costs incurred and of the resources deployed by each contractor linking them to activities implemented and justifying their necessity.* *Finally the report contains information on use and dissemination activities.*

Reporting period:

30 September 2008 30 May 2009

Part I

DM acronym: *LIDO*

DM title: *LISTENING TO THE DEEP-OCEAN ENVIRONMENT*

ESONET Site: *EAST-SICILY & GULF OF CADIZ*

Scientific Area(s): *GEOPHYSICS & BIOACOUSTICS*

Technological Area(s): *GEOPHYSICS & BIOACOUSTICS*

DM Start date: *1 SEPTEMBER 2008*

DM duration: *24 MONTHS*

Period of the reporting from 1 October 2008 to 30 May 2009

Partner Num.	Partner Institution Name	Principal Investigator (PI) for the Demo Mission	PI coordinates (Address, Email, Telephone, fax..)
1.	UPC Universitat Politècnica de Catalunya	Michel André	michel.andre@upc.edu
2.	UB* University of Bremen (Marum)	Christoph Waldmann	waldmann@marum.de
3.	FFCUL/ CGUL* Fundação da Faculdade de Ciências da Universidade de Lisboa Centro de Geofísica da Universidade de Lisboa	Jorge Miguel Miranda	jmiranda@fc.ul.pt
4.	INGV Istituto Nazionale di Geofisica e Vulcanologia	Paolo Favali	paolofa@ingv.it
5.	ISMAR Consiglio Nazionale delle Ricerche Istituto Scienze Marine, Dipartimento di Bologna	Nevio Zitellini	nevio.zitellini@bo.ismar.cnr.it
6.	Istituto Nazionale di Fisica Nucleare INFN*	Giorgio Riccobene	riccobene@lns.infn.it
7.	Consejo Superior de Investigaciones CSIC* Cientificas – Unitat de Tecnologia Marina - Centre Mediterrani d'Investigacions Marines i Ambientals	Juan Josè Danobeitia	jjdanobeitia@cmima.csic.es
8.	dBScale dBS*	Eric Delory	eric@dbscale.com
9.	Centro Interdisciplinare di Bioacustica e CIBRA Ricerche Ambientali, Università degli Studi di Pavia	Gianni Pavan	gpavan@cibra.unipv.it
10.	Technische Fachhochschule Berlin -FB VIII TFH* - Maschinenbau, Verfahrens- und Umwelttechnik - AG Tiefseesysteme	Hans W. Gerber	hwgerber@ism.tu-berlin.de hwgerber@tfh-berlin.de
11.	Tecnomare-ENI S.p.A. TEC*	Francesco Gasparoni	francesco.gasparoni@tecnomare.it

Executive summary *(max one page)*

LIDO (Listening to the Deep Ocean environment) proposes to establish a first nucleus of a regional network of multidisciplinary seafloor observatories contributing to the coordination of high quality research in the ESONET NoE by allowing the long-term monitoring of Geohazards and Marine Ambient Noise in the Mediterranean Sea and the adjacent Atlantic waters. Specific activities are addressed to a long-term monitoring of earthquakes and tsunamis and the characterisation of ambient noise induced by marine mammals (Bioacoustics) and anthropogenic noise.

The objective of the proposal will be achieved through the extension of the present capabilities of the observatories working in the ESONET key-sites of Eastern Sicily (NEMO-SN1) and of the Gulf of Cadiz (GEOSTAR configured for NEAREST pilot experiment) by installing not-already-included sensor equipments related to Bioacoustics and Geohazards;

Scientific Objectives
Geo-Hazards: LIDO aims at improving the real-time and near-real-time detection of signals by a multiparameter seafloor observatory network at regional scale for the characterisation of potential tsunamigenic sources. Its methodological approach is based on the cross-checking of geophysical, oceanographic and environmental time series acquired on the seafloor and in the water column. LIDO will provide real-time and nearto-real-time seismological and water-pressure comparative time series from near-shore sources and operational tools (e.g., prototype of tsunameters) integrated in seafloor observation systems, and in the terrestrial Networks LIDO follows the recommendation of the Intergovernmental Coordination Group of the Intergovernmental Oceanographic Commission (UNESCO) for the North-Eastern Atlantic and Mediterranean Tsunami Warning System (ICG/NEAMTWS) for the urgent deployment of a tsunami warning system in the related areas with special regard to the definition of trans-national seismic and sea level monitoring networks.

Bioacoustics: LIDO will evaluate the human and natural contributions to marine ambient noise and for the first time describe the long-term trends in ambient Boise levels, especially from human activities (influenced for example by increasing shipping) and in marine mammals populations (migration patterns, presence, and habitat use of key species, like sperm -, fin - and beaked whales). LIDO will allow real-time and near real-time long-term acoustic monitoring of marine mammals at regional level, as well as noise propagation that could be in the next years correlated with the effects of anthropogenic impacts and climate changes, using the same infrastructure defined above.

Technological objectives
The technological objective of LIDO is the development of the first nucleus of a regional multiparameter seafloor network of homogeneous observatories (same sensors) and its long-term operability beyond the duration of LIDO demo mission in two ESONET key-sites, East Sicily (cabled) and Gulf of Cadiz (acoustically linked with a surface buoy).

Table 1: Deliverables List of the LIDO Demonstration Mission

LIDO Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months*	Used indicative person months*	Lead contractor
D1.1	Procedures for sea operations: recovery and deployment of SN-1 and Ovde stations (East Sicily)	WP1	MONTH 1	ON TIME			INGV
D1.2.	Status of the SN-1 and Ovde stations, new requirements and technical specifications of the enhancements	WP1	MONTH3	ON TIME			INGV
D1.3.	Developments of the enhancements and tests	WP1	MONTH7	ON TIME Not received			INGV
D1.4.	Sea operations procedures for recovery and deployment of GEOSTAR (Gulf of Cadiz) and refurbishment	WP1	MONTH5	ON TIME			INGV
D1.5.	New requirements and technical specifications of the enhancements of the GEOSTAR surface buoy	WP1	MONTH3	ON TIME			INGV
D1.6.	Demo mission planning, development and follow-up	WP1	MONTH5	ON TIME Not received, oneyear of delay!!!			INGV
D2.1.	Software of real-time detection of biological sounds (whales and dolphins) and anthropogenic noise	WP4	MONTH22				UPC
D2.2.	Software of automatic classification of biological sounds (whales and dolphins) and anthropogenic noise	WP4	MONTH22				UPC
D2.3.	Software of marine mammal localisation and tracking	WP4	MONTH22				UPC
D2.4.	Report on the implementation of prototype SWE concepts	WP2	MONTH22				UB
D2.5.	Report on the sensor registry	WP2	MONTH22				UB
D3.1.	Website with real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions	WP3	MONTH12	ON TIME Not received			FFCUL UPC
D4.1.	Report on functioning/mis-functioning parts and subsystems of the recovered instrumentation	WP5	MONTH3	ON TIME			INFN
D4.2.	TDR of new hydrophone arrays; TDR of data	WP5	MONTH5	ON TIME			INFN

LIDO Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months*	Used indicative person months*	Lead contractor
	acquisition, power and data transmission systems, sea operations						
D4.3.	Reports on testing activity	WP5	MONTH12	ON TIME			INFN
D4.4.	Reports on integration activity	WP5	MONTH15				INFN
D4.5.	Final report on station tests after integration.	WP5	MONTH18				INFN
D4.6.	Periodic reports of underwater stations, on-shore and offshore systems under activity.	WP5	MONTH9, 12, 15, 18, 21	ON TIME			INFN
D4.7.	Report on technological conclusions from test activities.	WP5	MONTH22				INFN
D4.8.	Report on possible standardisation and spreading of acoustic sensors and tsunami detectors	WP2	MONTH22				UB
D5.1.	Six month based reports	WP6	MONTH6, 12, 18, 24	ON TIME			UPC
D5.2.	Final report	WP6	MONTH24				UPC

**the person month must be the same as indicated in Part II- WP progress report (see pag. 10)*

Table 2: Milestones List of the LIDO Demonstration Mission

LIDO Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
M1	Infrastructures ready and Observatories deployed for the pilot experiment start	WP1	MONTH7,8	MONTH 13,14	INGV
M2	Museum involved in the DM Outreach	WP3	MONTH11,12	ON TIME	FFCUL
M3	End of the Pilot Experiment	WP1	MONTH18,19	MONTH22	INGV

WP bar chart (planned/actual):

insert the time extention of each workpackage (yellow for planned and green for actual) according to the individual WP reports (see example))

	Months																							
WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1 planned																								
1 actual																								
2 planned																								
2 actual																								
3 planned																								
3 actual																								
4 planned																								
4 actual																								
5 planned																								
5 Actual																								
6 planned																								
6 actual																								
Milestones planned								M1				M2						M3						
actual												M2		M1								M3		

Link with ESONET main activities:

Inputs to the DM from ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments
WP1	01/06/2009	31/12/2009	Activity 1a4 Activity 1b4, 1b5 Task d: LIDO is currently collaborating with NEPTUNE and VENUS to implement in Canada the LIDO RT analysis softwares.
WP2	01/10/2008	31/03/2010	Activities 2b2, 2a2, 2b3, 2c2
WP3			Activities 3a1, 3a2, 3a3
WP4	01/09/2008	31/05/2010	Activities LIDO 1-5
WP5			Task b: LIDO is particularly sensitive on the effects of noise on marine organisms and will participate in the development and approval of ethical guidelines and procedures. This latter point constitutes a major criteria to award the ESONET LABEL to the observatories.
WP6			Activity 6a2 Activity 6b1, 6b2
WP7			Task a, b & c

Outputs to ESONET WPs :	Starting date: dd/mm/yy	Ending date: dd/mm/yy	Comments
WP4 - Deliverable D12	01/09/2008	31/01/2009	18 month
WP3 - Deliverable D13	01/09/2008	31/01/2009	18 month
WP6 - Deliverable D15	01/09/2008	31/01/2009	18month
WP7 - Deliverable D18	01/09/2008	31/01/2009	18 month
WP1 - Deliverable D19	01/09/2008	31/01/2009	18 month
WP8 - Deliverable D29	01/09/2008	-	12,24,36,48 months

Sensors & data management plan:

Measured parameters	**Depth**	**Sampling/storage/acquisition frequency**	**Access restriction / unrestriction (esonet partners, public, immediately or delayed, to raw data, processed data …)** ***please note that EC ask Esonet community to provide data in easy and free access***	**comments**
three-component ground velocity	Up to 4000	20 ÷ 100 Hz	Raw data: immediate public access Processed data: delayed public access	
Pressure perturbations in water	Up to 4000	80 ÷ 100 Hz	Raw data: immediate public access Processed data: delayed public access	
gravity acceleration	Up to 4000	0.01 ÷ 1 Hz	Raw data: immediate public access Processed data: delayed public access	
magnetic field (scalar and three components)	Up to 4000	1 sample/min 1 sample/s	Raw data: immediate public access Processed data: delayed public access	
Seafloor water current (three components)	Up to 4000	2 Hz	Raw data: immediate public access Processed data: delayed public access	
ADCP	Up to 4000		Raw data: immediate public access Processed data: delayed public access	
Light transmission	Up to 4000	1 sample/hour	Raw data: immediate public access Processed data: delayed public access	
Conductivity	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	
Temperature	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	
Static Pressure	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	
Methane concentration	Up to 4000	1 Hz	Raw data: immediate public access Processed data: delayed public access	

Measured parameters	**Depth**	**Sampling/storage/acquisition frequency**	**Access restriction / unrestriction (esonet partners, public, immediately or delayed, to raw data, processed data …)** ***please note that EC ask Esonet community to provide data in easy and free access***	**comments**
H_2S concentration	Up to 4000	1 sample/10 min (averaged on 30 samples/s)	Public, delayed	
pH	Up to 4000	1 sample/6 hours*	Public, delayed	
water sampler	Up to 4000	Off-line analysis	Public, delayed	
Biological noise (cetacean: sperm whales, beaked whales, pilot whales, baleen whales) Anthropogenic noise (shipping and other activities) Natural noise	Up to 2500	4 Hydrophones: (sensitivity -195 de re 1V/mPa from 20Hz to 50kHz) preamplification (+20dB) and digitization underwater (at 96 kHz, 24 bit) All 4 hydrophones synchronized and phased All data are continuously sent to shore. Data acquisition and recording on-shore. Data distribution through internet.	ESONET partners, Scientific Community (RT optimised data and delayed if registered to download good quality raw data), Public Real-Time access of optimised data and access to previous recordings	

Dissemination and outreach :

School material that would be available at the issue of the mission: -photos, video, courses, … -others	Website, tutorials, Photos, videos, training, press events. Direct connection to the sites will allow the general public to access acoustic data stream as well as previous recording and information (historical statistics) Specific materials will be produce with a focus on the acoustic monitoring of the ocean, grouping anthropogenic, seismic and bio acoustic sources
Dissemination through collaborations with aquaria, museum, sciences centres, …?	Near-real time images via internet from seafloor observatory in museums and aquaria. Direct connection to the sites will allow the general public to access acoustic data stream as well as previous recording and information (historical statistics). In the Lisbon Natural History Museum a panel will be installed where information concerning ESONET will be displayed, with a focus on real-time data.

Part II

ESONET Noe – Demonstration Mission	DM acronym: *LIDO*
Scientific Area(s):	*GEOPHYSISCS & BIOACOUSTICS*
Technological Area(s):	*GEOPHYSISCS & BIOACOUSTICS*
DM Start date:	*01/09/2008*
DM duration:	*24 MONTHS*

WP management reports

(from 1 to 30 September 2008)

WORKPACKAGE	***WP1***
Full WP title	Recovery, Refurbishment and Deployment of Observatories
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*INGV*
Person in charge for the report (WP Leader)	*PAOLO FAVALI*
Partners involved in the Work	*INGV, INFN, TEC, CSIC, TFH, UPC*

Period of the reporting: from 1 to 30 September 2008

-
- **Work performed:**

Tasks/activities: Developments and enhancements of NEMO-SN1 and GEOSTAR observatories and infrastructures to open the nodes of a first nucleus of regional network to other disciplines (bioacoustics) and homogenization of geophysical equipments by integration of additional sensor, devices, and software.
GEOSTAR and NEMO-SN1 need to be homogenised and upgraded with respect to:

- Geophysical sensor equipments
- Software for data automatic pre-processing for tsunami detection
- Bioacoustics monitoring

Recovery successfully performed on April 2008, in the same campaign for the SN1 recovery.
Test onshore after recovery: all the “acoustic” components were perfectly working. An auxiliary instrument, the compass, was not working due to bad fibre connection inside the internal Wessel.

As for the improvements foreseen in LIDO at the East Sicily ESONET Site, they will consist in:
Additional sensors:

→Absolute Pressure Gauge (APG)
→ Differential Pressure Gauge (DPG)
→ Acoustics Doppler Current Profiler (ADCP)

→ Fluxgate magnetometer
→ High sampling hydrophones for Bioacoustics

Data acquisition and automatic processing
→at seafloor: data digitalisation for seismological sensor package (seismometers + hydrophones)
→on land: time series synchronisation + overall data acquisition + Tsunami detection algorithm + RT acoustic data management

•

• **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	
Personnel costs	
Subcontracting	
Travels	
Consumables	
Other costs	
Total Costs	

Table to be completed!

WORKPACKAGE	***WP2***
Full WP title	Standardisation and spreading of acoustic sensors and tsunami detectors
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*UniHB*
Person in charge for the report (WP Leader)	*CHRISTOPH WALDMANN*
Partners involved in the Work	*UniHB, DBSCALE*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

•

• **Work performed:**

In LIDO observatories, as well as for ESONET observatories at large, the Data Management workpackage partners have focused on identifying primary hotspots for interoperability, at the physical interfacing layer and at the data access and presentation layer. So, here we will also give a primary set of possible standard solutions.

It is thought prioritary to focus the effort for the implementation of interoperability concepts: at the physical layer sensor interface, at the main station's data servers, and in the encoding of hydrophones in standard format. The latter will imply agreement on a common vocabulary for ocean acoustic sensors and the contribution to and collaboration with ocean-related ontology initiatives

One approach consists in opening a local directory to the public with a catalogue service available and standard data and metadata formats. It is rather proven approach for data servers, and as a generic approach it lacks the specificities that ocean observatories may call for. For example there is no protocol companion for sensor control (it is about data and data only). Approach B, which is currently evolving (these standards have been recently fully-approved), answers a broader set of needs although due to its rather recent release it is more complex and risky to implement. One neat advantage as regards the sensor web approach is that it will evolve in close collaboration with the ocean community and ESONET is already contributing actively to its development.

WORKPACKAGE	***WP3***
Full WP title	Public Outreach
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*FFCUL*
Person in charge for the report (WP Leader)	*JORGE MIGUEL MIRANDA*
Partners involved in the Work	*UPC*

Period of the reporting: from 1 to 30 September 2008

•

There is no WP3 description, please, explain!

WORKPACKAGE	***WP4***
Full WP title	RT Software Development
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*UPC*
Person in charge for the report (WP Leader)	*MICHEL ANDRÉ*
Partners involved in the Work	*UPC, CIBRA*

Period of the reporting: from 1 to 30 September 2008

-
- **Work performed:**

Development of RT and automatic analysis softwares for the Long-term recording and analysis of natural, artificial and biological sound sources; Identification and tracking of cetaceans; Long-term noise interactions and masking.

At the CTSL location, the 4 channels data will be streamed to the preprocessing server as we have just seen, that will be responsible for the analysis of the segments and the tagging of data. One channel will also be encoding the output of the analysis into mp3 format for public access. At that stage no storage is performed (available at the end of next month). The analysis server in turn will identify the acoustic sources and track them as much as possible (sperm, beaked whales, ships, etc.). These codes will be ready next spring.

At the LNS, besides the storage of the data at the MADS server, the web server will store the analysis results in xml format;
Make available mp3 data and analysis results to the flash client; stream analysis results to the LAB-UPC; and provide access to selected data stored for third parties (research collaborators, etc.)

Finally, at the UPC, the server will be responsible of the configuration for the: General public access to Real-Time flash client; General public access to sound library; General public access to (statistical) analysis of the acoustic environment near the platform; Registration for third party collaboration and access control to high quality data

The objectives of LIDO in terms of acoustic and bioacoustics data management is the long term monitoring and assessment of the anthropogenic sources on marine organisms, specially cetaceans, implying the detection, classification and tracking of the sources. This is illustrated here by Phase 3. To achieve this objective, it is necessary to develop a rigorous and versatile protocol that we have separated in two previous steps: Phase 1 and 2. Here, one has to keep in mind that the overall process will be conducted in RT or close to RT.

Detector 1 is an unspecific detector that triggers to the presence of tonal bands, of impulses (clicks), of whistles, calls or sonar.

Detector 2 detects the presence of broadband bulk at lower frequencies that is typical for shipping. It also detects underwater explosions and sperm whale clicks (if there are many), therefore it is also rather unspecific.

Detector 3 is specific for short, possibly FM tonals, such as dolphin whistles or sonar.

Detector 4 is specific for the tonal ship lines sometimes produced by ships.

Detector 5-8 are specific for impulses. They can be tuned to detect impulses that have energy in a given frequency band and the duration of the impulses that are detected can be approximately specified. Depending on how they are tuned, they will detect for example: Airgun, sperm whale clicks, clicks produced by ship propellers, beaked whale and dolphin clicks.

Status of Activities

- Tonals, impulses and broadband signals are detected. This allows to detect most cetacean species of interest, ships, underwater explosions (e.g. seismic surveys), sonar.
- The detectors allow a primary classification of the data into broad classes, which will reduce the data volume supplied to more specific (and greedy) recognition algorithms.
- Because of lack of data: Low frequency tonals of large whales; Natural seismic activity; Pile driving; Dredging; Drilling have not been tested yet on the detectors.
- Phase 2 is foreseen to be due by September 2009 and Phase 3 statistical analysis will start a soon as the antennas are deployed.

WORKPACKAGE	***WP5***
Full WP title	Technical assessment
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*INFN*
Person in charge for the report (WP Leader)	*GIORGIO RICCOBENE*
Partners involved in the Work	*UPC*

Period of the reporting: from 1 to 30 September 2008

- .
- Work performed:

Test and validation of low cost acoustic arrays and recording systems to be implemented in additional locations to extend the monitoring network and possibly evaluate new European sites for long term monitoring.

The stream of data coming from the observatory will be directed to a server (ADS) that will distribute it to preprocessing servers where the first filters will be applied as well as where the following specific analysis of the data will be performed. A dedicated server (RADS) will compress and store the roar data. Through a WI-FI connection the processed data will then be sent tot he LNS station where one server will allow the safe public access to the low resolution data and another one will offer the access to high resolution data to registered users. Both servers will be separatedfor safety reasons and spam/virus protection.

- A **tabular overview of budgeted person-months and actual person-months** by workpackage (budgeted person –months to be taken from “Effort breakdown” Excel file)

  Too much complicated for partner to complete every 6 months

WP number and name		**First period**	**Permanent staff[(1)] first period**
WP1	Actual person months		
	Planned total person months		
WP2	Actual person months		
	Planned total person months		
WP3	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
WPn	Actual person months		
	Planned total person months		
TOTAL	**Actual tot person months**		
	Planned total person months		

[(1)]*not charged to the DM*

Table to be completed

Workpackage progress

(from 1 to 30 September 2008)

Progress towards objectives:

Task 1.1: Developments of enhancements of NEMO-SN1 and GEOSTAR observatories and infrastructures to open the nodes of a first nucleus of regional network to other disciplines (bioacoustics) and homogenization of geophysical equipments by integration of additional sensor, devices, and software.

Contractors involved : INGV, INFN, TEC, ISMAR, CSIC, TFH, UPC

Task 2.1: Standardisation of ocean observatory measurements by implementing international accepted standard methods in data acquisition and management; Establishment of a sensor inventory; Long- term seismometric measurements and analysis.

contractors involved : ULB, dBSCALE

Task 3.1: Real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions (e.g., Scientific Museums, Aquaria) where the whole ESONET network will be presented together with the “sonic imagery” of the LIDO stations.

contractors involved : FFCUL, UPC

Task 4.1: Development of RT and automatic analysis softwares: Long-term recording and analysis of natural, artificial and biological sound sources; Identification and tracking of cetaceans; Long-term noise interactions and masking.

contractors involved : UPC, CIBRA

Task 5.1: Test and validation of low cost acoustic arrays and recording systems to be implemented in additional locations to extend the monitoring network and possibly evaluate new European sites for long term monitoring.

contractors involved : INFN, UPC

Task 6.1: Implementation of the administrative and financial decisions of the SC, within the framework set by the European Commission and under the authority of the ESONET NoE. The Activity Leaders are advised by the Advisory Council.

contractors involved : UPC

TABLE 1: WP DELIVERABLES LIST *(list and status of the deliverables of the WP)*
Already given before!!!

Deliverable Num.	Deliverable Name	Responsible Institution	Delivery Month	Actual or Forecast delivery date *(month)*	Estimated indicative person months	Used indicative person months
D1.1	Procedures for sea operations: recovery and deployment of SN-1 and Ovde stations (East Sicily)	INFN	1			
D1.2	Status of the SN-1 and Ovde stations, new requirements and technical specifications of the enhancements	INGV	3			
D1.3	Developments of the enhancements and tests	INFN	7			
D1.4	Sea operations procedures for recovery and deployment of GEOSTAR (Gulf of Cadiz) and refurbishment	TEC	5			
D1.5	New requirements and technical specifications of the enhancements of the GEOSTAR surface buoy	UPC	3			
D1.6	Demo mission planning, development and follow-up	INGV	5			
D2.1	Software of real-time detection of biological sounds (whales and dolphins) and anthropogenic noise	UPC	22			
D2.2	Software of automatic classification of biological sounds (whales and dolphins) and anthropogenic noise	UPC	22			
D2.3	Software of marine mammal localisation and tracking	UPC	22			
D2.4	Report on the implementation of prototype SWE concepts	UB	22			
D2.5	Report on the sensor registry	UB	22			
D3.1	Website with real-time transmission of	FFCUL/UPC	12			

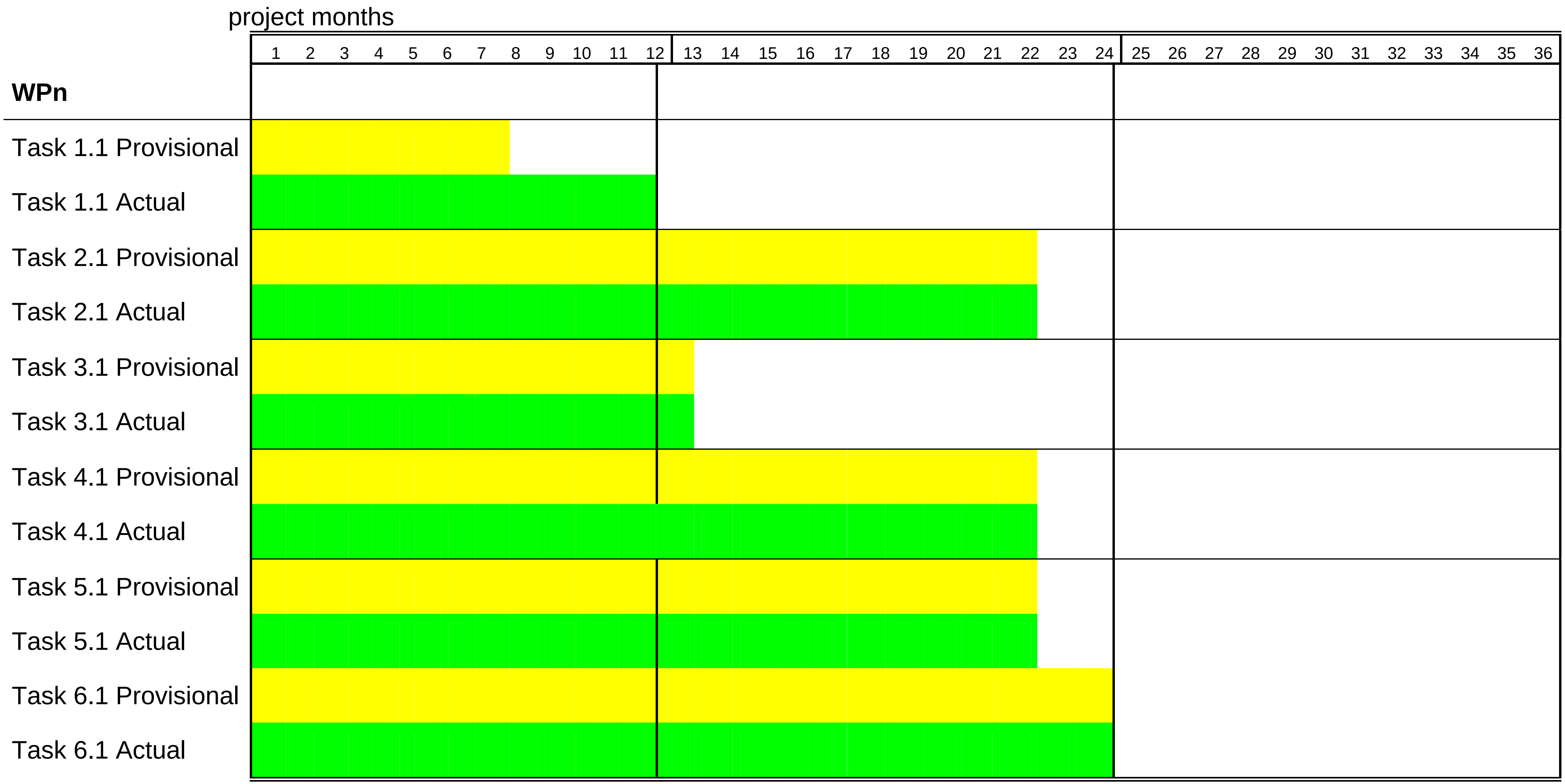
Deliverable Num.	Deliverable Name	Responsible Institution	Delivery Month	Actual or Forecast delivery date *(month)*	Estimated indicative person months	Used indicative person months
	marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions					
D4.1.	Report on functioning/mis-functioning parts and subsystems of the recovered instrumentation	TEC	3			
D4.2.	TDR of new hydrophone arrays; TDR of data acquisition, power and data transmission systems, sea operations	INFN	5			
D4.3.	Reports on testing activity	TEC	12			
D4.4.	Reports on integration activity	INFN	15			
D4.5.	Final report on station tests after integration.	INGV	18			
D4.6.	Periodic reports of underwater stations, on-shore and offshore systems under activity.	INGV	9,12,15,18, 21			
D4.7.	Report on technological conclusions from test activities.	INFN	22			
D4.8.	Report on possible standardisation and spreading of acoustic sensors and tsunami detectors	UB	22			
D5.1.	Six month based reports	UPC	6,12,18,24			
D5.2.	Final report		24			

TABLE 2: WP MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Already given!!

Miliestone Num.	Milestone Description	Month	Actual or Forecast delivery date
M1	Kick-off meeting	2	
M2	Infrastructures ready and Observatories deployed for the pilot experiment start.	7-8	
M3	Museum involved in the DM outreach	11-12	
M4	End of the pilot experiment	18-19	

UPDATED GANTT



ESONET Demonstration Missions

3rd Periodic Activity Report

LIDO DM

Reporting period: 1 July 2009 31 December 2009

Part I

DM acronym:	*LIDO*
DM title:	*LISTENING TO THE DEEP-OCEAN ENVIRONMENT*
ESONET Site:	*EAST-SICILY & GULF OF CADIZ*
Scientific Area(s):	*GEOPHYSICS & BIOACOUSTICS*
Technological Area(s):	*GEOPHYSICS & BIOACOUSTICS*
DM Start date:	*1 SEPTEMBER 2008*
DM duration:	*24 MONTHS*
Period of the reporting	from 1 October 2008 to 30 May 2009

Partner Num.	Partner Institution Name	Principal Investigator (PI) for the Demo Mission	PI coordinates (Address, Email, Telephone, fax..)
1.	UPC Universitat Politècnica de Catalunya	Michel André	michel.andre@upc.edu
2.	UB* University of Bremen (Marum)	Christoph Waldmann	waldmann@marum.de
3.	FFCUL/ CGUL* Fundação da Faculdade de Ciências da Universidade de Lisboa Centro de Geofísica da Universidade de Lisboa	Jorge Miguel Miranda	jmiranda@fc.ul.pt
4.	INGV Istituto Nazionale di Geofisica e Vulcanologia	Paolo Favali	paolofa@ingv.it
5.	ISMAR Consiglio Nazionale delle Ricerche Istituto Scienze Marine, Dipartimento di Bologna	Nevio Zitellini	nevio.zitellini@bo.ismar.cnr.it
6.	Istituto Nazionale di Fisica Nucleare INFN*	Giorgio Riccobene	riccobene@lns.infn.it
7.	Consejo Superior de Investigaciones CSIC* Cientificas – Unitat de Tecnologia Marina - Centre Mediterrani d'Investigacions Marines i Ambientals	Juan Josè Danobeitia	jjdanobeitia@cmima.csic.es
8.	dBScale dBS*	Eric Delory	eric@dbscale.com
9.	Centro Interdisciplinare di Bioacustica e	Gianni Pavan	gpavan@cibra.uni

	CIBRA Ricerche Ambientali, Università degli Studi di Pavia		pv.it
10.	Technische Fachhochschule Berlin -FB VIII TFH* - Maschinenbau, Verfahrens- und Umwelttechnik - AG Tiefseesysteme	Hans W. Gerber	hwgerber@ism.tu-berlin.de hwgerber@tfh-berlin.de
11.	Tecnomare-ENI S.p.A. TEC*	Francesco Gasparoni	francesco.gasparoni@tecnomare.it

Executive summary *(max one page)*

LIDO (Listening to the Deep Ocean environment) proposes to establish a first nucleus of a regional network of multidisciplinary seafloor observatorios contributing to the coordination of high quality research in the ESONET NoE by allowing the long-term monitoring of Geohazards and Marine Ambient Noise in the Mediterranean Sea and the adjacent Atlantic waters. Specific activities are addressed to a long-term monitoring of earthquakes and tsunamis and the characterisation of ambient noise induced by marine mammals (Bioacoustics) and anthropogenic noise.

The objective of the proposal will be achieved through the extension of the present capabilities of the observatories working in the ESONET key-sites of Eastern Sicily (NEMO-SN1) and of the Gulf of Cadiz (GEOSTAR configured for NEAREST pilot experiment) by installing not-already-included sensor equipments related to Bioacoustics and Geohazards;

Major achievements in the reporting period
- In the reporting period, the GEOSTAR observatory was tested and newly deployed in the Iberian Margin ESONET site for a new long-term mission in collaboration with NEAREST EC Project. GEOSTAR has been operating from 10 November 2009 sending periodical messages via acoustics to a surface buoy and via satellite on land.
The SN-1 observatory is close to be ready for deployment after the complete revision of the acquisition system now including the same tsunami detection algorithm as GEOSTAR.
- The Real-Time Acoustic Data Management architecture was tested and validated on previous recordings at SN-1 and is now ready to be implemented.
- The website for the public outreach is now online (with simulated data for the Iberian Margin) at http:/listentothedeep.com / http:/listentothedeep.org / http:/listentothedeep.net

Table 1: Deliverables List
Give the deliverable list and status

Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months*	Used indicative person months*	Lead contractor
D1.1	Procedures for sea operations: recovery and deployment of SN-1 and Ovde stations (East Sicily)	WP1	MONTH 1	MONTH 5 (feb 2009)			INFN
D1.2.	Status of the SN-1 and Ovde stations, new requirements and technical	WP1	MONTH3	MONTH 5 (feb 2009)			INGV

	specifications of the enhancements						
D1.3.	Developments of the enhancements and tests	WP1	MONTH7	DEC 2009- MONTH 16 (1st draft)			INFN
D1.4.	Sea operations procedures for recovery and deployment of GEOSTAR (Gulf of Cadiz) and refurbishment	WP1	MONTH5	MONTH 5 (feb 2009)			TEC
D1.5.	New requirements and technical specifications of the enhancements of the GEOSTAR surface buoy	WP1	MONTH3	MONTH 5 (feb 2009)			UPC
D1.6.	Demo mission planning, development and follow-up	WP1	MONTH5	MONTH 16 DEC 2009 (1st draft)			INGV
D2.1.	Software of real-time detection of biological sounds (whales and dolphins) and anthropogenic noise	WP4	MONTH22				UPC/INFN
D2.2.	Software of automatic classification of biological sounds (whales and dolphins) and anthropogenic noise	WP4	MONTH22				UPC/CIBRA
D2.3.	Software of marine mammal localisation and tracking	WP4	MONTH22				UPC/CIBRA
D2.4.	Report on the implementation of prototype SWE concepts	WP2	MONTH22				UB
D2.5.	Report on the sensor registry	WP2	MONTH22				UB
D3.1.	Website with real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions	WP3	MONTH12	MONTH 16 DEC 2009-			FFCUL/UPC
D4.1.	Report on functioning/mis-functioning parts and subsystems of the recovered instrumentation	WP5	MONTH3	MONTH 5 (feb 2009)			TEC
D4.2.	TDR of new hydrophone arrays; TDR of data acquisition, power and data transmission systems, sea operations	WP5	MONTH5	MONTH 5 (feb 2009)			INFN
D4.3.	Reports on testing activity	WP5	MONTH12	MONTH 22			TEC
D4.4.	Reports on integration activity	WP5	MONTH15	MONTH 22			INFN
D4.5.	Final report on station tests after integration.	WP5	MONTH18				INGV
D4.6.	Periodic reports of underwater stations, on-shore and offshore systems under activity.	WP5	MONTH9, 12, 15, 18, 21	MONTH 24			INGV
D4.7.	Report on technological conclusions from test activities.	WP5	MONTH22				UB
D4.8.	Report on possible standardisation and spreading of acoustic sensors and tsunami detectors	WP2	MONTH22				INFN

D 4.9	Report on possible standardisation and spreading of acoustic sensors and tsunami detectors	WP5	MONTH 22				UB
D5.1.	Six month based reports	WP6	MONTH6, 12, 18, 24	MONTH 16			UPC
D5.2.	Final report	WP6	MONTH24				UPC

**the person month must be the same as indicated in Part II- WP progress report (see pag. 10)*

Table 2: Milestones List

Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
M1	Infrastructures ready and Observatories deployed for the pilot experiment start	WP1	MONTH7,8	MONTH 13,14	INGV
M2	Museum involved in the DM Outreach	WP3	MONTH11,12	ON TIME	FFCUL
M3	End of the Pilot Experiment	WP1	MONTH18,19	MONTH22	INGV

WP bar chart (planned/actual):

insert the time extention of each workpackage (yellow for planned and green for actual) according to the individual WP reports (see example))

	Months																							
WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1 planned	x	X	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x				
1 actual	x	X	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x			
2 planned																								
2 actual																								
3 planned																								
3 actual																								
4 planned																								
4 actual																								
5 planned																								
5 Actual																								
6 planned																								
6 actual																								
Milestones planned								M2				M3						M4						
actual												M3									M2			

Link with ESONET main activities: *please update the dates and contents of the foreseen activities*

Inputs to the DM from ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments
WP1	01/06/2009	31/12/2009	Activity 1a4 Activity 1b4, 1b5 Task d: LIDO is currently collaborating with NEPTUNE and VENUS to implement in Canada the LIDO RT analysis software.
WP2	01/10/2008	31/03/2010	Activities 2b2, 2a2, 2b3, 2c2
WP3			Activities 3a1, 3a2, 3a3
WP4	01/09/2008	31/05/2010	Activities LIDO 1-5
WP5			Task b: LIDO is particularly sensitive on the effects of noise on marine organisms and is participating in the development and approval of ethical guidelines and procedures. This latter point constitutes a major criterion to award the ESONET LABEL to the observatories.
WP6			Activity 6a2 Activity 6b1, 6b2
WP7			Task a, b & c The LIDO website is being adapted to be displayed in Oceanopolis

Outputs to ESONET WPs :	Starting date: dd/mm/yy	Ending date: dd/mm/yy	Comments
WP4 - Deliverable D12	01/09/2008	31/01/2009	18 month
WP3 - Deliverable D13	01/09/2008	31/01/2009	18 month
WP6 - Deliverable D15	01/09/2008	31/01/2009	18month
WP7 - Deliverable D18	01/09/2008	31/01/2009	18 month
WP1 - Deliverable D19	01/09/2008	31/01/2009	18 month
WP8 - Deliverable D29	01/09/2008	-	12,24,36,48 months

Sensors & data management plan: *please update the following table: follow the guidelines issued from the ESONET Best Practice workshop*

Measured parameters	Depth	Sampling/storage/acquisition frequency	Access restriction / unrestriction (esonet partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	comments
three-component ground velocity	Up to 4000	20 ÷ 100 Hz	Raw data: immediate public access Processed data: delayed public access	
Pressure perturbations in water	Up to 4000	80 ÷ 100 Hz	Raw data: immediate public access Processed data: delayed public access	
gravity acceleration	Up to 4000	0.01 ÷ 1 Hz	Raw data: immediate public access Processed data: delayed public access	
magnetic field (scalar and three components)	Up to 4000	1 sample/min 1 sample/s	Raw data: immediate public access Processed data: delayed public access	
Seafloor water current (three components)	Up to 4000	2 Hz	Raw data: immediate public access Processed data: delayed public access	
ADCP	Up to 4000		Raw data: immediate public access Processed data: delayed public access	
Light transmission	Up to 4000	1 sample/hour	Raw data: immediate public access Processed data: delayed public access	
Conductivity	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	
Temperature	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	
Static Pressure	Up to 4000	1 sample/10 min (or 1 sample/hour)	Raw data: immediate public access Processed data: delayed public access	

Methane concentration	Up to 4000	1 Hz	Raw data: immediate public access Processed data: delayed public access	
H_2S concentration	Up to 4000	1 sample/10 min (averaged on 30 samples/s)	Public, delayed	
pH	Up to 4000	1 sample/6 hours*	Public, delayed	
water sampler	Up to 4000	Off-line analysis	Public, delayed	
Biological noise (cetacean: sperm whales, beaked whales, pilot whales, baleen whales) Anthropoge-nic noise (shipping and other activities) Natural noise	Up to 2500	4 Hydrophones: (sensitivity -195 de re 1V/mPa from 20Hz to 50kHz) preamplification (+20dB) and digitization underwater (at 96 kHz, 24 bit) All 4 hydrophones synchronized and phased All data are continuously sent to shore. Data acquisition and recording on-shore. Data distribution through internet.	ESONET partners, Scientific Community (RT optimised data and delayed if registered to download good quality raw data), Public Real-Time access of optimised data and access to previous recordings	

Dissemination and outreach : please update the table

School material that would be available at the issue of the mission: -photos, video, courses, … -others	Website, tutorials, Photos, videos, training, press events. Direct connection to the sites will allow the general public to access acoustic data stream as well as previous recording and information (historical statistics) Specific materials will be produce with a focus on the acoustic monitoring of the ocean, grouping anthropogenic, seismic and bio acoustic sources
Dissemination through collaborations with aquaria, museum, sciences centres, …	Near-real time images via internet from seafloor observatory in museums and aquaria. Direct connection to the sites will allow the general public to access acoustic data stream as well as previous recording and information (historical statistics). In the Lisbon Natural History Museum a panel will be installed where information concerning ESONET will be displayed, with a focus on real-time data.

Part II *(to be filled by each partners)*

ESONET Noe – Demonstration Mission	DM acronym: *LIDO*
Scientific Area(s):	*GEOPHYSISCS & BIOACOUSTICS*
Technological Area(s):	*GEOPHYSISCS & BIOACOUSTICS*
DM Start date:	*01/09/2008*
DM duration:	*24 MONTHS*

WP management report

(from 1 to 30 September 2008)

WORKPACKAGE	*WP1*
Full WP title	Recovery, Refurbishment and Deployment of Observatories
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*INGV*
Person in charge for the report (WP Leader)	*PAOLO FAVALI, GIUDITTA MARINARO, DAVIDE EMBRIACO*
Partners involved in the Work	*INGV, INFN, TEC, CSIC, TFH, UPC*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

Tasks/activities: Developments and enhancements of NEMO-SN1 and GEOSTAR observatories and infrastructures to open the nodes of a first nucleus of regional network to other disciplines (bioacoustics) and homogenization of geophysical equipments by integration of additional sensor, devices, and software.

Catania site
The on shore acquisition system for all the geophysical instruments of SN1 observatory was detailed projected in order to upgrade to the new configuration: the sensor management is now performed on shore. Data management was organized in order to locally store all data, make them available to the same data server which manages also the bio-acoustic data from the hydrophones for mammal sound recording.
The development of the software procedures to perform data acquisition with syncronized time stamp, storage, and sharing is quite completed and implemented on the server unit that will be installed in the CTSL-INFN facility and connected to the off shore observatory

SN1. The tsunami detection procedures were implemented in the acquisition software. Work in order to test the procedures with the sensors are in progress.
Partners involved: INGV, INFN, TEC, CSIC, TFH

Iberian Margin site
The GEOSTAR observatory and the communication buoy were upgraded with the new acoustic communication modems. Test of a simulated mission took places during September 2009 (month13); in October the mission for the re-deployment of the system was organized in collaboration with the EC NEAREST project. In November the cruise with the Sarmiento de Gamboa R/Vl owned by CSIC took place starting from Vigo port. GEOSTAR and the communication buoy were deployed as scheduled and are operating from November 10th. The system demonstrate to be able to send periodical data from the abyssal GEOSTAR station to the shore station in Italy.
Partners involved: INGV, ISMAR, TEC, CSIC, TFH

The Bioacoustic Antenna has been designed and is being assembled for testing at OBSEA test site befote deployment in the Gulf of Cadiz
Partner involved: UPC, CSIC

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Third period
Total person-months	12
Personnel costs	48000
Subcontracting	0
Travels	7000
Consumables	3800
Other costs	35400
Total Costs	94212

WORKPACKAGE	*WP2*
Full WP title	Standardisation and spreading of acoustic sensors and tsunami detectors
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*UB*
Person in charge for the report (WP Leader)	*CHRISTOPH WALDMANN*
Partners involved in the Work	*UB, DBSCALE*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

DBSCALE: -0- men months for this period
Reminder: Total men months planned for whole project: 3

UB: [TBD]

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

This period:

Following LIDO kick-off meeting in Barcelona where we have been working on the following deliverables:

D2.4.	Report on the implementation of prototype SWE concepts
D2.5.	Report on the sensor registry

In particular:

Some progress is underway on D2.4, in particular to adapt the content with a specific example of acoustic transducer characteristics SML encoding. As a reminder, as part of the LIDO mission, architecture concepts in D2.4 were published in the following conference paper (Delory et al., Passive 08 - Hyères, 2008). D2.4 will further develop the description of the SWE framework implementation concept meant to serve as an architectural guidance candidate to the LIDO Data Management and hardware interface development teams:

A proposed architecture for marine mammal tracking from globally distributed ocean acoustic observatories
E. Delory (1) , C. Waldmann (2), J. Fredericks (3)
(1) dBscale Environmental Sensing, C/ Leon y Castillo 25 Telde, Spain, eric.delory@dbscale.com
(2) University of Bremen/MARUM Leobener Strasse P.O. Box 330440 28334 Bremen Germany
(3) Woods Hole Oceanographic Institution, 266 Woods Hole Road, Woods Hole, MA 02543, USA

With respect to D2.5 the first SensorML instance for hydrophone available today is being developed and inputs are being collected from ESONET and LIDO partners. This instance will be used as a guide for and implemented within the ESONET Sensor Registry (ESONET WP2 & WP9) hydrophone registration interface.

Both D 2.4 and D2.5 are still to be delivered on Month 22 as they may need to be updated in the remaining course of the LIDO project.

WORKPACKAGE	*WP3*
Full WP title	Public Outreach
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*FFCUL*
Person in charge for the report (WP Leader)	*JORGE MIGUEL MIRANDA*

Partners involved in the Work	*UPC*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The major input for this period of this workpackage was the improvement and online publication of the website for the public outreach (http://listentothedeep.com , .org, .net), as well as the work in conjunction with WP7 to design the publication and display of the website in OCEANOPOLIS, Brest, France.

WORKPACKAGE	*WP4*
Full WP title	RT Software Development
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*UPC*
Person in charge for the report (WP Leader)	*MICHEL ANDRÉ*
Partners involved in the Work	*UPC, CIBRA*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

RT Software Development. Improvement of the RT and automatic analysis software: Long-term recording and analysis of natural, artificial and biological sound sources; Identification and tracking of cetaceans; Long-term noise interactions and masking. In the context of the WP3 and WP4 of Lido we contributed to the Data infrastructure of Esonet see activities of WP9, task a.

Overview: Several modules for the automated classification and localizations of biological and anthropogenic acoustic sources have been developed, tested and validated with data from deep sea observatories (e.g. from the NEMO-onde observatory) . These modules were specifically designed to process the outputs from the detection modules that were developed in the previous periods.

Classification modules: The automated real-time detection and classification of cetacean and anthropogenic sounds from deep-sea observatories can play a key role to study cetaceans in the field, to quantify the impact of anthropogenic sounds or to initiate mitigation measures during potentially harmful human activities. In the area of the NEMO-onde deep-sea observatory, sperm whales are often present together with heavy shipping. The spatial coincidence of both sound sources allows for the long term monitoring of their interaction. Some ships produce impulsive sounds and the automated separation of these impulses from sperm whale clicks is not a trivial task.
As part of a detection, classification and localisation system for acoustic data from marine observatories, we developed several modules performing the automated real-time classification of clicks from sperm whales, impulsive sounds produced by ships and ultrasonic cetacean clicks. First, the detection modules detect segments that contain impulsive sounds within a specifiable frequency band and return the impulse positions. Then, the classification modules classify the detected impulses as sperm whale click, ship impulse or ultrasonic cetacean click. Finally, at the level of 22 second segments, the outputs from individual impulses are combined into a decision on the presence of sperm whale clicks, ship impulses or ultrasonic cetacean clicks.
The modules' reliability was tested on data from the NEMO ONDE observatory. Training and testing data were separated by more than 2 months, enabling to assess the consistency of the system's predictions over the long term. The automated separation between segments with sperm whale clicks and ship impulses was high with Area Under the ROC Curve (AUC) values between 0.94 and 0.98. The automated separation between segments with ultrasonic cetacean clicks and the two former classes was nearly perfect.

Localization modules: In the frame of the European network ESONET (European Sea-floor Observatory Network) and the Demonstration Mission LIDO (Listening to the Deep-Ocean Environment), vocalising sperm whales were detected offshore the port of Catania (Sicily) with a bottom-mounted (around 2080m depth) tetrahedral compact array intended for the automated real-time detection, classification and localisation of cetaceans. Such Passive Acoustic Monitoring techniques have the potential to play a key role in cetaceans' conservation for they allow a non-invasive study of their behaviour, a better knowledge of their population dynamics, and a better understanding of their dynamic relationship with their environment. We investigated the development of efficient and accurate techniques to be used as the basis of a localisation module for an automated real-time Passive Acoustic Monitoring system. A well-known class of methods for acoustic source localisation is based on time differences of arrival (TDOA). Its capabilities have shown to be appreciable even in adverse situations (i.e. few sensors, high noise levels and/or poor calibration). A second class of methods, the space-time methods, originated in underwater applications such as sonar but reached its most significant achievements over the last twenty years in digital communications with recent progress in the treatment of broadband signals. These developments were revisited under the scope of the localisation and tracking of cetacean vocalisations.

Various broadband space-time methods were implemented and allowed to map the sound radiated during the detected clicks and to consequently localise both sperm whales and vessels. Hybrid methods were also developed which improved the robustness of space-time methods to noise and reverberation and reduced computation time. In most cases, the small variance obtained for these estimates lessened the necessity of additional statistical clustering. The capacities of the approach were validated by consistent tracks of both sperm whales and vessels.

WORKPACKAGE	*WP5*
Full WP title	Technical assessment
Period covered	from *01/09/2008* to 30/09/2008
Partner organisation full name	*INFN*
Person in charge for the report (WP Leader)	*GIORGIO RICCOBENE*
Partners involved in the Work	*UPC*

Period of the reporting: from 1 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

Test and validation of low cost acoustic arrays and recording systems to be implemented in additional locations to extend the monitoring network and possibly evaluate new European sites for long term monitoring.

The stream of data coming from the observatory will be directed to a server (ADS) that will distribute it to preprocessing servers where the first filters will be applied as well as where the following specific analysis of the data will be performed. A dedicated server (RADS) will compress and store the roar data. Through a WI-FI connection the processed data will then be sent tot he LNS station where one server will allow the safe public access to the low resolution data and another one will offer the access to high resolution data to registered users. Both servers will be separatedfor safety reasons and spam/virus protection.

- setup a workstation with 1Gbit link to a GARR node for fast data transfer from Catania
- setup a 8TB storage space for incoming data tested FLAC algorithms on NEMO-ONDE datasets provided NEMO-ONDE datasets for developing and testing detection, localization and tracking algorithms for sperm whales
- initiated the development of an FTP front-end to make data sharing easy
- initiated the development of a pulses/whistles discriminator and of a whistle classificator

- A **tabular overview of budgeted person-months and actual person-months** by workpackage (budgeted person –months to be taken from "Effort breakdown" Excel file)

WP number and name		First period	Permanent staff[1] first period
WP1	Actual person months		
	Planned total person months		
WP2	Actual person months		
	Planned total person months		
WP3	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
…	Actual person months		
	Planned total person months		
WPn	Actual person months		
	Planned total person months		
TOTAL	**Actual tot person months**		
	Planned total person months		

[1] *not charged to the DM*

Workpackage progress

(from 1 to 30 September 2008)

Workpackage objectives and starting point *(max 500 characters)*

Progress towards objectives – *(short description about Tasks status; each task has to be referred as Task n.m where n is the WP number and m is a progressive number)*

Task 1.1: Developments of enhancements of NEMO-SN1 and GEOSTAR observatories and infrastructures to open the nodes of a first nucleus of regional network to other disciplines (bioacoustics) and homogenization of geophysical equipments by integration of additional sensor, devices, and software.

contractors involved : INGV, INFN, TEC, ISMAR, CSIC, TFH, UPC

Task 2.1: Standardisation of ocean observatory measurements by implementing international accepted standard methods in data acquisition and management; Establishment of a sensor inventory; Long-term seismometric measurements and analysis.

contractors involved : UB, dBSCALE

Task 3.1: Real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions (e.g., Scientific Museums, Aquaria) where the whole ESONET network will be presented together with the “sonic imagery” of the LIDO stations.

contractors involved : FFCUL, UPC

Task 4.1: Development of RT and automatic analysis softwares: Long-term recording and analysis of natural, artificial and biological sound sources; Identification and tracking of cetaceans; Long-term noise interactions and masking.

contractors involved : UPC, CIBRA

Task 5.1: Test and validation of low cost acoustic arrays and recording systems to be implemented in additional locations to extend the monitoring network and possibly evaluate new European sites for long term monitoring.

contractors involved : INFN, UPC

Task 6.1: Implementation of the administrative and financial decisions of the SC, within the framework set by the European Commission and under the authority of the ESONET NoE. The Activity Leaders are advised by the Advisory Council.

contractors involved : UPC

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

A) *insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters*

Corrective actions: *insert description of the corrective actions max 500 characters*

B) *insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters*

Corrective action: *insert description of the corrective actions max 500 characters*

TABLE 1: WP DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Deliverable Num.	Deliverable Name	Responsible Institution	Delivery Month	Actual or Forecast delivery date *(month)*	Estimated indicative person months *(insert month according to the DM implementation plan)*	Used indicative person months
D1.1	Procedures for sea operations: recovery and deployment of SN-1 and Ovde stations (East Sicily)	INFN	1			
D1.2	Status of the SN-1 and Ovde stations, new requirements and technical specifications of the enhancements	INGV	3			
D1.3	Developments of the enhancements and tests	INFN	7			
D1.4	Sea operations procedures for recovery and deployment of GEOSTAR (Gulf of Cadiz) and refurbishment	TEC	5			
D1.5	New requirements and technical specifications of the enhancements of the GEOSTAR surface buoy	UPC	3			
D1.6	Demo mission planning, development and follow-up	INGV	5			
D2.1	Software of real-time detection of biological sounds (whales and dolphins) and anthropogenic noise	UPC	22			
D2.2	Software of automatic classification of biological sounds (whales and dolphins) and anthropogenic noise	UPC	22			
D2.3	Software of marine mammal localisation and tracking	UPC	22			
D2.4	Report on the implementation of prototype SWE concepts	UB	22			
D2.5	Report on the sensor registry	UB	22			

D3.1	Website with real-time transmission of marine mammal acoustic signals and acoustic images from seafloor cabled observatory to public institutions	FFCUL/UPC	12			
D4.1.	Report on functioning/mis-functioning parts and subsystems of the recovered instrumentation	TEC	3			
D4.2.	TDR of new hydrophone arrays; TDR of data acquisition, power and data transmission systems, sea operations	INFN	5			
D4.3.	Reports on testing activity	TEC	12			
D4.4.	Reports on integration activity	INFN	15			
D4.5.	Final report on station tests after integration.	INGV	18			
D4.6.	Periodic reports of underwater stations, on-shore and offshore systems under activity.	INGV	9,12,15,18, 21			
D4.7.	Report on technological conclusions from test activities.	INFN	22			
D4.8.	Report on possible standardisation and spreading of acoustic sensors and tsunami detectors	UB	22			
D5.1.	Six month based reports	UPC	6,12,18,24			
D5.2.	Final report		24			

TABLE 2: WP MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Miliestone Num.	Milestone Description	Month	Actual or Forecast delivery date
M1	Kick-off meeting	2	
M2	Infrastructures ready and Observatories deployed for the pilot experiment start.	7-8	
M3	Museum involved in the DM	11-12	

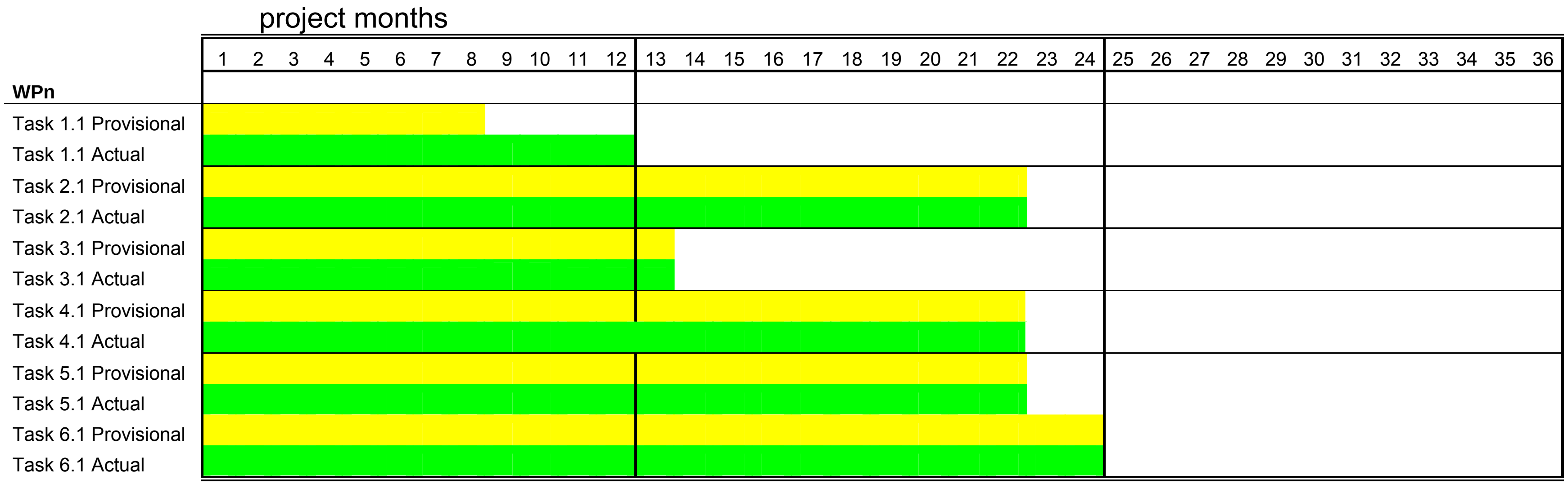
	outreach		
M4	End of the pilot experiment	18-19	

UPDATED GANTT

<u>for all the WP tasks</u>: fill in the 'Provisional' cells of the following table in yellow according to the time duration of the tasks as described in the implementation

<u>for the tasks to be developed in the period of this report</u>: fill in the 'Actual' cells of the following table in green according to the actual or forecast duration of the tasks.

(Example is reported below)



Project contract no. 036851

ESONET

European Seas Observatory Network

Instrument: **Network of Excellence (NoE)**
Thematic Priority: **1.1.6.3 – Climate Change and Ecosystems**
Sub Priority: **III – Global Change and Ecosystems**

LOOME Demonstration Mission

Periodic Reports

Start date of project: **March 2007** Duration: **48 months**

Start date of the Demonstration Mission: **February 2008** Duration: **35 months**

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

ESONET Demonstration Missions

1st Periodic Activity Report

The Periodic Activity Report contains an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken.

This document has to be filled in with reference to the DM Implementation plan. This means that Deliverables, Milestones and WPs have to be the same as in the DM Implementation plan.

The Periodic Report contains 2 parts:
- Part I: it is addressed to the coordinator with minimum input from the partners
- Part II: it is addressed to each WP Leader and reports a detailed update of each WP activity at task level.

The report includes a rough justification of the costs incurred and of the resources deployed by each contractor linking them to activities implemented and justifying their necessity.

Finally the report contains information on use and dissemination activities.

Reporting period: 1 February 2008 – 30 September 2008

Please indicate your DM starting date **1 February 2008**

Part I *(to be filled by the DM coordinator)*

DM acronym:	*LOOME*
DM title:	*Longterm Observatory on Mudvolcano Eruptions*
ESONET Site:	*Haakon Mosby Mud Volcano*
Scientific Area(s):	slope stabilities, sedimentary processes, fluids seeps and vents
Technological Area(s):	standardization, interoperability, data transmission systems and protocols, power supply
DM Start date:	*Febr 1, 2008*
DM duration:	*35 months*
Period of the reporting	from starting date to 30 September 2008

Partner Num.	**Partner Institution Name**	**Principal Investigator (PI) for the Demo Mission**	**PI coordinates (Address, Email, Telephone, fax..)**	**WP in charge***
1.	Marum (KDMpartner)	Christoph Waldmann	Leobener Str. D-28359 Bremen waldmann@uni-bremen.de tel. 0421 218 – 65606 Fax: 0421 218 – 65605	4, 8, 9, 12, 14
2.	AWI (KDMpartner)	Michael Schlueter	Am Handelshafen 12, 27570 Bremerhaven, Germany mschlueter@awi-bremerhaven.de Tel .+49 471 4831 1840 Fax:+49 471 4831 1425	2
3.	IfM Geomar (KDM partner)	Thomas Feseker	Wischhofstr. 1-3, 24148 Kiel, Germany tfeseker@ifm-geomar.de Tel. +49 431 6002321 Fax: +49 431 6002916	3
4.	Ifremer	Jean Paul Foucher	Technopole de Brest-Iroise BP 70 29280 PLOUZANE, France jean.paul.foucher@ifremer.fr Tel: +33 (0)2 98 22 40 40 FAX: +33 (0)2 98 22 40 45	3
5.	UiT	Juergen Mienert	Dramsveien 201 N-9037 Tromsø, Norway juergen.mienert@ig.uit.no Telephone: (+47) 77 64 44 46 Fax: (+47) 77 64 56 00	1, 10, 13
6.	MPI	Dirk de Beer	Celsiusstrasse 1, 28359 Bremen, Germany,	2, 7, 11, 13, 15

			tel. +494212028802 fax +494212028690	

* of original proposal. Several WPs were dropped due to the budget restrictions.

Executive summary *(max one page)*
Brief description of the objective of the DM and brief description of the work status

All components are purchased and seen by our engineers. Current progress:
1) the building of the frame.
2) the integration of the sonar, COSTOFF and the T-sensors.
3) the optimization of the sonar programming.
4) the pressure and temperature lances, and the geophones have been deployed at the Haakon Mosby Mud Volcano as planned. Recovery is planned in July 2009, followed by immediate redeployment.

Table 1: Deliverables List
Give the deliverable list and status

Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months **	Used indicative person months*	Lead contractor
1 2 3	Long-term seismometer Long-term chemical sensors (pH, O2, sulfide, redoX) Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed	1, 10, 13 2 2	6, 12*** 12 12	6, 12*** 12 12	16 16 11	5 1 2	UiT MPI-MM IFREMER/IFM-GEOMAR
4	Scanning sonar for gas flares detection	4	12	12	16	2	MARUM
5	Design of sensor network and operation platform	7	6	6	19	6	MPI
6	Deployment and recovery procedures for instruments and data	8	12	12	8	3	Marum
7	Design of underwater communication	9	9	9	17	4	MARUM/Ifremer/UiT
8	Documentation of inter-operability and standardization	14	24	24	7	2	MARUM
9	Cruise report Jan Mayen 2008,	10	6, 24****	6, 24****	15	5	MPI/UiT/Ifrem

	Polarstern 2009						er
10	Scientific reports	16	36	36	9	0	all partners

__the person month must be the same as indicated in Part II- WP progress report (see pag. 10)__
*** the number of person-months was drastically reduced as compared to the original proposal, due the strong reduction in funding. In this colum we gave the numbers for the full period. It is not clear if this is meant. If only the reporting period is meant, just take the numbers form the next column.*
*** *Will be deployed twice*
**** *Cruise report Jan Mayen is included.*

Table 2: Milestones List

Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
1	All partner meeting	15	2	2	MPI
2	LOOME website	15	5	5	MPI
3	Jan Mayen eXpedition, deployment PTlance	11	8	8	UiT
4	Integration of all components	7	9	9	MPI
5	Adjustments frame	7	11	11	MPI
6	test in MARUM tank	7	12	12	MPI, Marum
7	final adjustment sensor modules	2, 3, 7	14	14	MPI, GeoMar, Ifremer, AWI
8	deployment cruise	12	18	18	MPI
9	recovery	14	32	32	MPI, UiT
10	final meeting	17	36	36	MPI

WP bar chart (planned/actual):
This bar chart does not work for our project, as it will last 35 months. Anyway, all WPs are exactly on track, and they have to be exactly on track due to the absolutely fixed dates of deployments. The cruises are with big ships, and thus planned long in advance.

insert the time extention of each workpackage (yellow for planned and green for actual) according to the individual WP reports (see example))

	Months																							
WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1 planned																								
1 actual																								
2 planned																								
2 actual																								
3 planned																								
3 actual																								
4 planned																								
4 actual																								
5 planned																								
5 Actual																								
6 planned																								
6 actual																								
Milestones planned																								
actual																								

Link with ESONET main activities: *please update the dates and contents of the foreseen activities*
NONE

Inputs to the DM from ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments

Outputs of the DM activity to ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments

B.1.1.1. *Sensors & data management plan:* **please update the following table: follow the guidelines issued from the ESONET Best Practice workshop**

Measured parameters	**Depth**	**Sampling/storage/acquisition frequency***	**Access restriction / unrestriction** (ESONET partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	**comments**
P	1253	0.001667	free	
Surface-T	1253	0.001667	Free	
O_2, pH, redox	1253	0.001667	Free	
Current velocity	1253	0.016667	Free	
Water-T	1253	0.016667	Free	
Sonar-acoustics	1253	4.63E-05 0.016667	Free	Ω is variable, depending on wake-up call

**frequency (Ω) is given in SI (Hz [1/s])*

Dissemination and outreach: please update the table

NONE

Type of school material available at the issue of the mission (photos, video, courses,…others)	**Description**
Type of dissemination (through collaborations with aquaria, museum, sciences centres, etc.)	**Description**

Part II *(to be filled by each partner)*

ESONET Noe – Demonstration Mission	*LOOME*
Scientific Area(s):	slope stabilities, sedimentary processes, fluids seeps and vents
Technological Area(s):	standardization, interoperability, data transmission systems and protocols, power supply
DM Start date:	*Febr 14, 2008*
DM duration:	*35 months*

WP management report

(from 14 February 2008 to 30 September 2008)

WORKPACKAGE	*insert WP Number1*
	Insert WP title Long-term seismometer
Period covered	from 14/2/2008 to 30/09/2008
Partner organisation full name	*UiT*
Person in charge for the report (WP Leader)	*Jürgen Mienert*
Partners involved in the Work	

Period of the reporting: from 14 February 2008 *to 30 September 2008*
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *RV Jan Mayen cruise preparation for ESONET and Loome demo mission. Development and purchase of equipment for long term seismometer and P-T lance deployment. Cruise report delivered with contributions to WP 1, 10.*

The measuring *unit is deployed in sep. 2008, see attached cruise report. It will be recovered in Aug. 2009 and immediately redeployed.*

- ***Rough Estimation of Major Cost***: *Costs for personnel and consumable amounts t0 51000 Euro. Other costs of equipments amounts to 60000 Euro an are not paid by the EU.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	5
Personnel costs	20000
Subcontracting	-
Travels	1000
Consumables	30000
Other costs	60000
Total Costs	111000

WORKPACKAGE *insert WP Number2*

Insert WP title Monitoring of fluid chemistry (Long term chemical sensors)

Period covered from 14/2/2008 to 30/09/2008

Partner organisation full name *MPI*

Person in charge for the report (WP Leader) *Dirk de Beer*

Partners involved in the Work

Period of the reporting: from 14 February 2008 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The measuring unit is ordered, received, paid (45000) and tested. The next step is incorporation into the frame of the observatory.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

As indicated above, the deice costs 45000, which will not be paid by the EU. We have further spend 1 man-month on the selection, negotiations, and testing.

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	1
Personnel costs	4000

Subcontracting	-
Travels	1000
Consumables	
Other costs	45000 (investment not covered by ESONET)
Total Costs	50000

WORKPACKAGE *insert WP Number3*

Insert WP title Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed

Period covered from 14/2/2008 to 30/09/2008

Partner organisation full name *Ifm-Geomar*

Person in charge for the report (WP Leader) *Tom Feseker*

Partners involved in the Work **Ifremer, UiT**

Period of the reporting: from 14 February 2008 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The T-measuring unit is ordered, received, paid and tested. The next step is incorporation into the frame of the observatory.
The P-T lance is deployed in sep. 2008 (see cruise report), to be recovered in aug. 2009. If still intact, it will be redeployed.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	2
Personnel costs	8000
Subcontracting	-
Travels	1000

Consumables	
Other costs	
Total Costs	9000

WORKPACKAGE	*insert WP Number4*
	Insert WP title Scanning sonar for gas flares detection
Period covered	from 14/2/2008 to 30/09/2008
Partner organisation full name	*Marum*
Person in charge for the report (WP Leader)	*Christoff Waldmann*
Partners involved in the Work	**Ifremer, Ifm-Geomar**

Period of the reporting: from 14 February 2008 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The measuring unit is tested. The next step is integration with the T-unit, the communication will run via COSTOFF (Ifremer). Subsequently incorporation into the frame of the observatory.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	2
Personnel costs	8000
Subcontracting	-
Travels	1000
Consumables	
Other costs	
Total Costs	9000

WORKPACKAGE	*insert WP Number5*
	Insert WP title Design of sensor network and operation platform
Period covered	from 14/2/2008 to 30/09/2008
Partner organisation full name	*MPI*
Person in charge for the report (WP Leader)	*Frank Wenzhöfer /Dirk de Beer*
Partners involved in the Work	

Period of the reporting: from 14 February 2008 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The measuring unit that will be included have all been seen, and dimensions checked. The frame is designed and materials are ordered.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	6
Personnel costs	24000
Subcontracting	-
Travels	1000
Consumables	
Other costs	
Total Costs	25000

WORKPACKAGE	*insert WP Number6*
	Insert WP title Deployment and recovery procedures for instruments and data
Period covered	from 14/2/2008 to 30/09/2008
Partner organisation full name	*Marum*

Person in charge for the report (WP Leader) *Volker Rathmeier/Christoph Waldmann*

Partners involved in the Work

Period of the reporting: from starting date to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The deployment of the sensor strings (chemistry and T) by ROV has been extensively considered, and a good solution was found. Extensive discussions and thinking was spend on the design of the frame, to allow optimal and save operations with the ROV. Also several recovery procedures were reviewed, and here it was decided that a most flexible procedure would be needed, due to lack of experience. A first step will be securing of the sensors, then autonomous release will be triggered. When the observatory indeed surfaces, the most difficult operation is avoided. If it does not surface, we will have to hook the observatory on the ship winch, by ROV, a most delicate operation.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	3
Personnel costs	12000
Subcontracting	-
Travels	1000
Consumables	
Other costs	
Total Costs	13000

WORKPACKAGE *insert WP Number7*

Insert WP title Design of underwater communication

Period covered from 14/2/2008 to 30/09/2008

Partner organisation full name *Ifremer*

Person in charge for the report (WP Leader) *Jerome Blandin/Christoph Waldmann/ Tom Feseker*

Partners involved in the Work | **Marum (both Ifremer and Marum are equally intensively involved)**

Ifm-Geomar

Period of the reporting: from 14 February 2008 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The performance of COSTOFF was explained by Jerome to the Marum engineers. The system seems very suitable to connect the T-sensors to the scanning sonar. Ongoing activities are: the optimization of the sonar program, the integration of the T-output into COSTOFF and the triggering of the sonar programmes.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro)* First period
Total person-months	4
Personnel costs	16000
Subcontracting	-
Travels	3000
Consumables	
Other costs	
Total Costs	19000

***this is a collaborative WP of 3 groups**

WORKPACKAGE | *insert WP Number8*

Insert WP title Documentation of inter-operability and standardization

Period covered | from 14/2/2008 to 30/09/2008

Partner organisation full name | *Marum*

Person in charge for the report (WP Leader)	*Christoff Waldmann*
Partners involved in the Work	**All others**

Period of the reporting: from 14 February 2008 to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

??

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	2
Personnel costs	8000
Subcontracting	-
Travels	1000
Consumables	
Other costs	
Total Costs	9000

WORKPACKAGE	*insert WP Number9*
	Insert WP title Cruise report Polarstern 2009 & Jan Mayen 2008
Period covered	from 14/2/2008 to 30/09/2008
Partner organisation full name	*UiT*
Person in charge for the report (WP Leader)	*Jürgen Mienert/Jean Paul Foucher*
Partners involved in the Work	**Ifremer, MPI**

Period of the reporting: from 14 February 2008 to 30 September 2008

Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The cruise report (jan Mayen 2008) is attached.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	5
Personnel costs	20000
Subcontracting	-
Travels	1000
Consumables	
Other costs	
Total Costs	21000

WORKPACKAGE	*insert WP Number10*
	Insert WP title Scientific reports
Period covered	from 14/2/2008 to 30/09/2008
Partner organisation full name	*All partners*
Person in charge for the report (WP Leader)	*Dirk de Beer*
Partners involved in the Work	

Period of the reporting: from starting date to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

As no data are available yet, no science is done yet.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	0
Personnel costs	00
Subcontracting	-
Travels	00
Consumables	
Other costs	
Total Costs	0

WP number and name		First period	B.2. Permanent staff(1) B.3. first period
WP1	Actual person months	5	
	Planned total person months	5	
WP2	Actual person months	1	1
	Planned total person months	1	1
WP3	Actual person months	2	
	Planned total person months	2	
WP4	Actual person months	2	
	Planned total person months	2	
WP5	Actual person months	6	2
	Planned total person months	6	2
WP6	Actual person months	3	
	Planned total person months	3	
WP7	Actual person months	4	
	Planned total person months	4	
WP8	Actual person months	2	
	Planned total person months	2	
WP9	Actual person months	5	
	Planned total person months	5	
WP10	Actual person months	0	
	Planned total person months	0	
TOTAL	**Actual tot person months**	**30**	
	Planned total person months	30	

(1) *not charged to the DM*

Workpackage progress

(from 14 February 2008 to 30 September 2008)

Workpackage objectives and starting point *(max 500 characters)*

SEE ABOVE

Progress towards objectives – *(short description about Tasks status; each task has to be referred as Task n.m where n is the WP number and m is a progressive number)*

We have not divided the work in tasks, but WPs. Thus here is nothing to report.

Task n.1: *insert description of the tasks max 700 characters*

contractors involved : *Insert name of the partners involved in the task*

Task n.2: *insert description of the tasks max 700 characters*

contractors involved : *Insert name of the partners involved in the task*

…..

…..

Task n.m: *insert description of the tasks max 700 characters*

contractors involved : *Insert name of the partners involved in the task*

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

We have no deviations from the workprogramme after the redefinition of our work upon the strong reduction of the budget.

A) *insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters*

Corrective actions: *insert description of the corrective actions max 500 characters*

B) *insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters*

Corrective action: *insert description of the corrective actions max 500 characters*

TABLE 1: WP DELIVERABLES LIST *(list and status of the deliverables of the WP)*

The deliverable list can be found as table 2 in the proposal. It is unchanged.

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
Deliverable Num.	**Deliverable Name**	**Responsible Institution**				
1	Long-term seismometer	UiT	6	6		
2	Long-term chemical sensors (pH, O2, sulfide, redoX)	MPI-MM/Ifremer	12	12		
3	Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed	IFREMER/IFM-GEOMAR	6	6		
4	Scanning sonar for gas flares detection	MARUM	9	9		
5	Design of sensor network and operation platform	MPI	6	6		
6	Deployment and recovery procedures for instruments and data	Marum	12	12		
7	Design of underwater communication	MARUM/Ifremer/UiT	6	6		
8	Documentation of inter-operability and standardization	MARUM	24	24		
9	Cruise report Polarstern 2009Jan Mayen 2008	MPI/UiT/Ifremer	24	24		
10	Scientific reports	all partners	36	36		

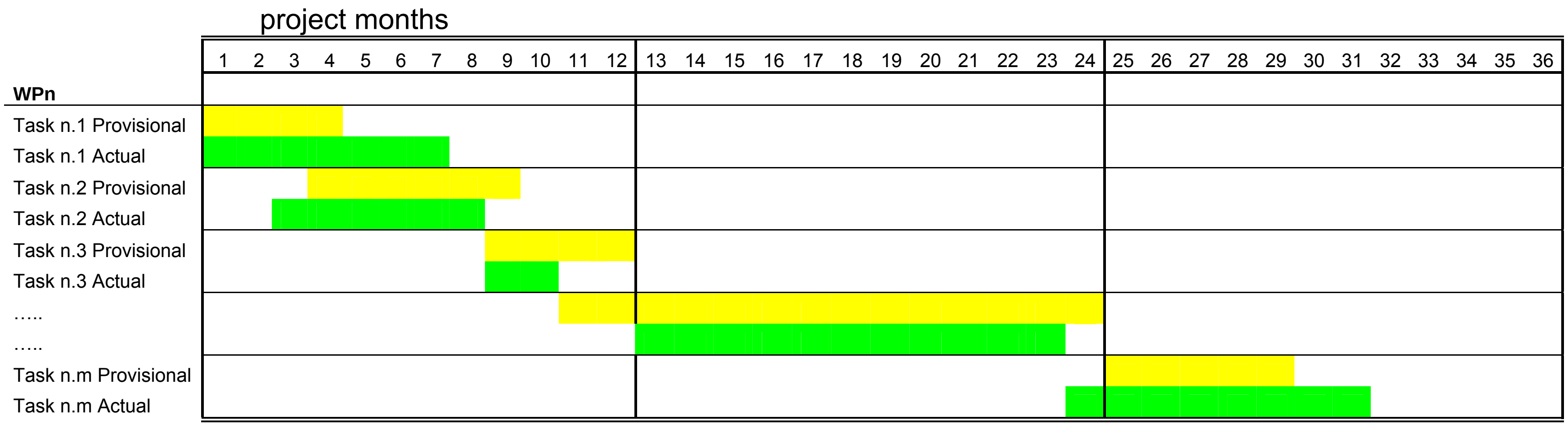
TABLE 2: WP MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
1	All partner meeting	2	2
2	LOOME website	5	5
3	Jan Mayen eXpedition, deployment PTlance	8	8
4	Integration of all components	9	9
5	Adjustments frame	11	11
6	test in MARUM tank	12	12
7	final adjustment sensor modules	14	14
8	deployment cruise	18	18
9	recovery	32	32
10	final meeting	36	36

Miliestone Num.	**Milestone Description**	**Month**
1	All partner meeting	2
2	LOOME website	5
3	Jan Mayen eXpedition, deployment PTlance	8
4	Integration of all components	9
5	Adjustments frame	11
6	test in MARUM tank	12
7	final adjustment sensor modules	14
8	deployment cruise	18
9	recovery	32
10	final meeting	36

UPDATED GANTT

SEE OUR PROPOSAL. WE STICK PRECISELY TO THIS SCHEDULE. FOR CONVENIENCE WE INSERTED THE PREVIOUSLY REPORTED MILESTONE LIST (ABOVE). WE HAVE NOT EDITED THE GANTT CHART BELOW.



LOOME (Longterm Observatory on Mudvolcano Eruptions)

ESONET Demonstration Missions

2nd Periodic Activity Report

The Periodic Activity Report contains an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken.

<u>This document has to be filled in with reference to the DM Implementation plan.</u> This means that Deliverables, Milestones and WPs have to be the same as in the DM Implementation plan.

The Periodic Report contains 2 parts:
- Part I: it is addressed to the coordinator with minimum input from the partners
- Part II: it is addressed to each WP Leader and reports a detailed update of each WP activity at task level.

The report includes a rough justification of the costs incurred and of the resources deployed by each contractor linking them to activities implemented and justifying their necessity.

Finally the report contains information on use and dissemination activities.

Reporting period:30 sept 2008 – 30 may 2009

DM starting date **1 February 2008**

Part I

DM acronym:	*LOOME*
DM title:	*Longterm Observatory on Mudvolcano Eruptions*
ESONET Site:	*Haakon Mosby Mud Volcano*
Scientific Area(s):	slope stabilities, sedimentary processes, fluids seeps and vents
Technological Area(s):	standardization, interoperability, data transmission systems and protocols, power supply
DM Start date:	*Febr 1, 2008*
DM duration:	*35 months*
Period of the reporting	30 sept 2008 – 30 may 2009

Partner Num.	**Partner Institution Name**	**Principal Investigator (PI) for the Demo Mission**	**PI coordinates (Address, Email, Telephone, fax..)**	**WP in charge***
1.	Marum (KDMpartner)	Christoph Waldmann	Leobener Str. D-28359 Bremen waldmann@uni-bremen.de tel. 0421 218 – 65606 Fax: 0421 218 – 65605	4, 8, 9, 12, 14
2.	AWI (KDMpartner)	Michael Schlueter	Am Handelshafen 12, 27570 Bremerhaven, Germany mschlueter@awi-bremerhaven.de Tel .+49 471 4831 1840 Fax:+49 471 4831 1425	2
3.	IfM Geomar (KDM partner)	Thomas Feseker	Wischhofstr. 1-3, 24148 Kiel, Germany tfeseker@ifm-geomar.de Tel. +49 431 6002321 Fax: +49 431 6002916	3
4.	Ifremer	Jean Paul Foucher	Technopole de Brest-Iroise BP 70 29280 PLOUZANE, France jean.paul.foucher@ifremer.fr Tel: +33 (0)2 98 22 40 40 FAX: +33 (0)2 98 22 40 45	3
5.	UiT	Juergen Mienert	Dramsveien 201 N-9037 Tromsø, Norway juergen.mienert@ig.uit.no Telephone: (+47) 77 64 44 46 Fax: (+47) 77 64 56 00	1, 10, 13
6.	MPI	Dirk de Beer	Celsiusstrasse 1, 28359 Bremen, Germany, tel. +494212028802 fax +494212028690	2, 7, 11, 13, 15

* of original proposal. Several WPs were dropped due to the budget restrictions.

Executive summary *(max one page)*

All components are purchased and seen by our engineers. Current progress:
1) the frame is build and weighed in air and seawater.
2) the sonar, COSTOFF and the T-sensors are electronically integrated.
3) the sonar program is finished.
4) the instruments have all arrived in Bremen and are now mounted on the frame.
5) june 8 to 11 all functions of the observatory were tested in the test tank of MARUM: all is working as it should. The testing was a joined task of engineers from Ifremer, Ifm-Geomar, Marum and the MPI.
6) Then LOOME will be brought on the Polarstern (Bremerhaven).
7) The recovery cruise in 2010 is now approved and fixed. It will be done with the RV Heinke.

Table 1: Deliverables List of the LOOME Demonstration Mission

LOOME Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months **	Used indicative person months*	Lead contractor
1	Long-term seismometer	1, 10, 13	6, 12***	6, 12***	16	5	UiT
2	Long-term chemical sensors (pH, O2, sulfide, redoX)	2	12	12	16	1	MPI-MM
3	Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed	2	12	12	11	2	IFREMER/IFM-GEOMAR
4	Scanning sonar for gas flares detection	4	12	12	16	2	MARUM
5	Design of sensor network and operation platform	7	6	6	19	6	MPI
6	Deployment and recovery procedures for instruments and data	8	12	12	8	3	Marum
7	Design of underwater communication	9	9	9	17	4	MARUM/Ifremer/UiT
8	Documentation of inter-operability and standardization	14	24	24	7	2	MARUM
9	Cruise report Jan Mayen 2008, Polarstern 2009	10	6, 24	6, 24	15	5	MPI/UiT/Ifremer

LOOME Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months **	Used indicative person months*	Lead contractor
10	Scientific reports	16	36	36	9	0	all partners

*__*the person month must be the same as indicated in Part II- WP progress report*__

*** the number of person-months was drastically reduced as compared to the original proposal, due the strong reduction in funding. In this colum we gave the numbers for the full period.*

**** Will be deployed twice*

Table 2: Milestones List of the LOOME Demonstration Mission

LOOME Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
1	All partner meeting	15	2	2	MPI
2	LOOME website	15	5	5	MPI
3	Jan Mayen eXpedition, deployment PTlance	11	8	8	UiT
4	Integration of all components	7	9	13	MPI
5	Adjustments frame	7	11	13	MPI
6	test in MARUM tank	7	12	15	MPI, Marum
7	final adjustment sensor modules	2, 3, 7	14	14	MPI, GeoMar, Ifremer, AWI
8	deployment cruise	12	18	18	MPI
9	recovery	14	32	32	MPI, UiT
10	final meeting	17	36	36	MPI

WP bar chart (planned/actual):

	Months																							
WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**30**	**31**	**32**	**33**	**34**	**35**
1 planned			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
1 actual			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
2 planned			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
2 actual			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
3 planned			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
3 actual			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
4 planned			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
4 actual			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
5 planned	x	x	x	x	x	x	x																	
5 Actual	x	x	x	x	x	x	x																	
6 planned					x	x	x	x	x															
6 actual					x	x	x	x	x															
7 planned												x												
7 actual												x												
8 planned										x	x									x	x	x		
8 Actual										x	x									x	x	x		
9 planned																				x				
9 actual																				x				
Milestones planned		1			2			3	4		5	6		7				8	9					10
actual		1			2			3	4		5	6		7				8	9					10

Link with ESONET main activities: **NONE!**
Quiet dangerous! What about link with WP2 and WP9 (standardisation and data management ?)

Inputs to the DM from ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments

Outputs of the DM activity to ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments
MASOX			We are in close contact with MASOX (Ian Wright) and exchange experiences and know-how

Sensors & data management plan:

Measured parameters	**Depth**	**Sampling/storage/acquisition frequency***	**Access restriction / unrestriction** (ESONET partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	**comments**
P	1253	0.001667	free	
Surface-T	1253	0.001667	Free	
O_2, pH, redox	1253	0.001667	Free	
Current velocity	1253	0.016667	Free	
Water-T	1253	0.016667	Free	
Sonar-acoustics	1253	4.63E-05 0.016667	Free	Ω is variable, depending on wake-up call

**frequency (Ω) is given in SI (Hz [1/s])*

Dissemination and outreach: please update the table

NONE

Type of school material available at the issue of the mission (photos, video, courses,…others)	**Description**
And the loome video?	
Type of dissemination (through collaborations with aquaria, museum, sciences centres, etc.)	**Description**
Seminars and visits to our institute during Oceans 2009, demonstartion of LOOME	

Part II

ESONET Noe – Demonstration Mission	*LOOME*
Scientific Area(s):	slope stabilities, sedimentary processes, fluids seeps and vents
Technological Area(s):	standardization, interoperability, data transmission systems and protocols, power supply
DM Start date:	*Febr 14, 2008*
DM duration:	*35 months*

WP management report

(from 30 September 2008 till May 30 2009)

WORKPACKAGE	*WP1*
	I Long-term seismometer
Period covered	from 30 September 2008 till May 30 2009
Partner organisation full name	*UiT*
Person in charge for the report (WP Leader)	*Jürgen Mienert*
Partners involved in the Work	

Period of the reporting: from 30 September 2008 till May 30 2009

- **Work Performed***:*

The measuring unit is deployed in sep. 2008. It will be recovered in Aug. 2009 and immediately redeployed. In this reporting period no work was done on this WP.

- **Rough *Estimation of Major Cost***: *Costs for personnel and consumable amounts to xx Euro. Other costs of equipments amounts to xx Euro and are not paid by the EU. To be completed*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	
Personnel costs	
Subcontracting	
Travels	
Consumables	
Other costs	
Total Costs	

Table to be completed

WORKPACKAGE	*WP 2*
	Monitoring of fluid chemistry (Long term chemical sensors)
Period covered	from 30 September 2008 till May 30 2009
Partner organisation full name	*MPI*
Person in charge for the report (WP Leader)	*Dirk de Beer*
Partners involved in the Work	

Period of the reporting: from 30 September 2008 till May 30 2009

-
- **Work performed:**

The measuring unit is tested and incorporated into the frame of the observatory. All units are now tested while integrated on the frame in a test tank, and deployment.

- **Rough Estimation of Major Cost**:

We have spend 1 man-month on the testing and incorporation into the frame. We further developed and build a deep-sea photon counter for detection of bioluminescence on and around the HMMV (6 man-months).

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	7
Personnel costs	4000
Subcontracting	-
Travels	1000
Consumables	

Other costs	18000 (3000 material costs LOOME, 15000 deep-sea light sensor)
Total Costs	23000

WORKPACKAGE *WP3*

Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed

Period covered from 30 September 2008 till May 30 2009

Partner organisation full name *Ifm-Geomar*

Person in charge for the report (WP Leader) *Tom Feseker*

Partners involved in the Work **Ifremer, UiT**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**:

The T-measuring unit is tested and incorporated into the frame of the observatory. The T-lance is electronically incorporated with COSTOFF, and a wake-up call algorithm is designed. The wake-up call by a T-dynamics is tested and functional.
The P-T lance is deployed in sep. 2008 , to be recovered in aug. 2009. If still intact, it will be redeployed.

-

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	2
Personnel costs	8000
Subcontracting	-
Travels	1000
Consumables	
Other costs	
Total Costs	9000

WORKPACKAGE	*WP 4*
	Scanning sonar for gas flares detection
Period covered	from 30 September 2008 till May 30 2009
Partner organisation full name	*Marum*
Person in charge for the report (WP Leader)	*Christoph Waldmann*
Partners involved in the Work	**Ifremer, Ifm-Geomar**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***:*

The measuring unit is tested and electronically integrated with the T-unit, via COSTOFF (Ifremer). Subsequently incorporation into the frame of the observatory. The integrated instruments were tested remotely, were tested again while integrated on frame in the test tank from MARUM on june 8 to 11. All tests were passed, the instruments work as they should, and integration was successful.

-

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	2
Personnel costs	8000
Subcontracting	-
Travels	1000
Consumables	8000
Other costs	
Total Costs	17000

WORKPACKAGE	*WP 5*
	Design of sensor network and operation platform
Period covered	from 30 September 2008 till May 30 2009
Partner organisation full name	*MPI*
Person in charge for the report (WP Leader)	*Frank Wenzhöfer /Dirk de Beer*

Partners involved in the Work ???

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***:*

The frame is ready. All measuring units have arrived and were incorporated onto the frame. The frame is weighed and physically tested. At some points re-enforcements were made.

-

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro) Second period**
Total person-months	9
Personnel costs	36000
Subcontracting	-
Travels	1000
Consumables	30000 (frame materials, chains, releasers)
Other costs	
Total Costs	67000

WORKPACKAGE *WP 6*

Deployment and recovery procedures for instruments and data

Period covered from 30 September 2008 till May 30 2009

Partner organisation full name *Marum*

Person in charge for the report (WP Leader) *Volker Rathmeier/Christoph Waldmann*

Partners involved in the Work ???

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***:*

The deployment was further discussed and refined. Recovery by winch is prepared. The ROV is prepared for the special tasks, deployment of the LOOME and various instruments. The deployment of instruments from AWI (Jutta Wollenburg) was designed.

-

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here after)*

•

Type of expenditure	Actual costs(Euro) Second period
Total person-months	1
Personnel costs	4000
Subcontracting	-
Travels	1000
Consumables	
Other costs	
Total Costs	5000

WORKPACKAGE	*WP 7*
	*/*Design of underwater communication
Period covered	from 30 September 2008 till May 30 2009
Partner organisation full name	*Ifremer*
Person in charge for the report (WP Leader)	*Jerome Blandin/Christoph Waldmann/ Tom Feseker*
Partners involved in the Work	**Marum, Ifremer (both Ifremer and Marum are equally intensively involved)** **Ifm-Geomar**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *:*

The optimization of the sonar program, the integration of the T-output into COSTOFF and the triggering of the sonar programmes is done and finished. The testing of the integrated instruments while physically integrated on the frame is finished.

•

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro)[*] Second period**
Total person-months	4
Personnel costs	16000
Subcontracting	8000 (programming of links between COSTOFF and T.lance and COSTOFF and Sonar)
Travels	1000
Consumables	
Other costs	
Total Costs	25000

WORKPACKAGE *WP 8*

Documentation of inter-operability and standardization

Period covered from 30 September 2008 till May 30 2009

Partner organisation full name *Marum*

Person in charge for the report (WP Leader) *Christoff Waldmann*

Partners involved in the Work **All others**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**:

A list of all instruments that are going to be deployed with all relevant specifications has been set up. This list will be entering the ESONET sensor registry for being able to document the variety of parameters that are collected and how they can be accessed. The ultimate goal of the sensor registry is to keep track on all measurements that are currently done within ESONET and here particularly within the LOOME demo mission. Within WP2 of ESONET suggestions has been made on how to harmonise the lists between different observatory sites (see deliverables on "recommendations for demo missions"). Within LOOME we are committed to follow these guidelines and we will implement them in a next step.

-

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

[*] this is a collaborative WP of 3 groups

Type of expenditure	Actual costs(Euro) Second period
Total person-months	0
Personnel costs	4200 (students)
Subcontracting	-
Travels	000
Consumables	
Other costs	
Total Costs	4200

WORKPACKAGE	*WP 9*
	Cruise report Polarstern 2009 & Jan Mayen 2008
Period covered	from 30 September 2008 till May 30 2009
Partner organisation full name	*UiT*
Person in charge for the report (WP Leader)	*Jürgen Mienert/Jean Paul Foucher*
Partners involved in the Work	**Ifremer, MPI**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *:*

In this WP no work was done during this reporting period. The next cruise report will be on the deployment cruise in July 2009.

-

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	0
Personnel costs	-
Subcontracting	-
Travels	-
Consumables	
Other costs	

Total Costs	0

WORKPACKAGE *WP 10*

Scientific reports

Period covered from 30 September 2008 till May 30 2009

Partner organisation full name *All partners*

Person in charge for the report (WP Leader) *Dirk de Beer*

Partners involved in the Work

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**:

As no data are available yet, no science is done yet.

- .

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	0
Personnel costs	00
Subcontracting	-
Travels	00
Consumables	
Other costs	
Total Costs	0

WP number and name		Second period	Permanent staff(1) Second period
WP1	Actual person months	0	
	Planned total person months	0	
WP2	Actual person months	7	7
	Planned total person months	1	1
WP3	Actual person months	2	
	Planned total person months	2	
WP4	Actual person months	2	2

	Planned total person months	2	2
WP5	Actual person months	9	2
	Planned total person months	3	2
WP6	Actual person months	1	
	Planned total person months	1	
WP7	Actual person months	4	4
	Planned total person months	4	4
WP8	Actual person months	0	
	Planned total person months	0	
WP9	Actual person months	0	
	Planned total person months	0	
WP10	Actual person months	0	
	Planned total person months	0	
TOTAL	**Actual tot person months**	**25**	
	Planned total person months	13	

(1)*not charged to the DM*

Workpackage progress

(from 14 February 2008 to 30 September 2008)

Workpackage objectives and starting point *(max 500 characters)*

SEE ABOVE

Progress towards objectives – *(short description about Tasks status; each task has to be referred as Task n.m where n is the WP number and m is a progressive number)*
We have not divided the work in tasks, but WPs. Thus here is nothing to report.

Task n.1: *insert description of the tasks max 700 characters*

contractors involved : *Insert name of the partners involved in the task*

Task n.2: *insert description of the tasks max 700 characters*

contractors involved : *Insert name of the partners involved in the task*

…..

…..
Task n.m: *insert description of the tasks max 700 characters*

contractors involved : *Insert name of the partners involved in the task*

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

We have no deviations from the workprogramme after the redefinition of our work upon the strong reduction of the budget.

A) *insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters*

Corrective actions: *insert description of the corrective actions max 500 characters*

B) *insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters*

Corrective action: *insert description of the corrective actions max 500 characters*

TABLE 1: WP DELIVERABLES LIST *(list and status of the deliverables of the WP)*

The deliverable list can be found as table 2 in the proposal. It is unchanged.

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
Deliverable Num.	**Deliverable Name**	**Responsible Institution**				
1	Long-term seismometer	UiT	6	6		
2	Long-term chemical sensors (pH, O2, sulfide, redoX)	MPI-MM/Ifremer	12	12		
3	Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed	IFREMER/IFM-GEOMAR	6	6		
4	Scanning sonar for gas flares detection	MARUM	9	9		
5	Design of sensor network and operation platform	MPI	6	6		
6	Deployment and recovery procedures for instruments and data	Marum	12	12		
7	Design of underwater communication	MARUM/Ifremer/UiT	6	6		
8	Documentation of inter-operability and standardization	MARUM	24	24		
9	Cruise report Polarstern 2009Jan Mayen 2008	MPI/UiT/Ifremer	24	24		
10	Scientific reports	all partners	36	36		

TABLE 2: WP MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
1	All partner meeting	2	2
2	LOOME website	5	5
3	Jan Mayen eXpedition, deployment PTlance	8	8
4	Integration of all components	9	9
5	Adjustments frame	11	11
6	test in MARUM tank	12	12
7	final adjustment sensor modules	14	14
8	deployment cruise	18	18
9	recovery	32	32
10	final meeting	36	36

Milestone Num.	Milestone Description	Month
1	All partner meeting	2
2	LOOME website	5
3	Jan Mayen eXpedition, deployment PTlance	8
4	Integration of all components	9
5	Adjustments frame	11
6	test in MARUM tank	12
7	final adjustment sensor modules	14
8	deployment cruise	18
9	recovery	32
10	final meeting	36

UPDATED GANTT

See our proposal, or the identical chart above. We stick precisely to this schedule. For convenience we inserted the previously reported milestone list (above).

project months

WPn	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Task n.1 Provisional			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.1 Actual			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.2 Provisional			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.2 Actual			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.3 Provisional			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.3 Actual			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.4 Provisional			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.4 Actual			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.5 Provisional	X	X	X	X	X	X	X																													
Task n.5 Actual	X	X	X	X	X	X	X																													
Task n.6 Provisional					X	X	X	X	X																											
Task n.6 Actual					X	X	X	X	X																											
Task n.7 Provisional												X																								
Task n.7 Actual												X																								
Task n.8 Provisional										X	X																				X	X	X			
Task n.8 Actual										X	X																				X	X	X			
Task n.9 Provisional																															X					
Task n.9 Actual																															X					

ESONET Demonstration Missions

3th Periodic Activity Report

LOOME DM

Reporting period: 1 June 2009 – 31 January 2010

Part I

DM acronym:	*LOOME*
DM title:	*Longterm Observatory on Mudvolcano Eruptions*
ESONET Site:	*Haakon Mosby Mud Volcano*
Scientific Area(s):	slope stabilities, sedimentary processes, fluids seeps and vents
Technological Area(s):	standardization, interoperability, data transmission systems and protocols, power supply
DM Start date:	*Febr 1, 2008*
DM duration:	*35 months*
Period of the reporting	1 june 2009 – 31 Jan 2010

Partner Num.	Partner Institution Name	Principal Investigator (PI) for the Demo Mission	PI coordinates (Address, Email, Telephone, fax..)	WP in charge*
1.	Marum (KDMpartner)	Christoph Waldmann	Leobener Str. D-28359 Bremen waldmann@uni-bremen.de tel. 0421 218 – 65606 Fax: 0421 218 – 65605	4, 8, 9, 12, 14
2.	AWI (KDMpartner)	Michael Schlueter	Am Handelshafen 12, 27570 Bremerhaven, Germany mschlueter@awi-bremerhaven.de Tel .+49 471 4831 1840 Fax:+49 471 4831 1425	2
3.	IFM-GEOMAR (KDM partner)	Tomas Feseker	Wischhofstr. 1-3, 24148 Kiel, Germany tfeseker@IFM-GEOMAR.de Tel. +49 431 6002321 Fax: +49 431 6002916	3

4.	Ifremer	Jean Paul Foucher	Technopole de Brest-Iroise BP 70 29280 PLOUZANE, France jean.paul.foucher@ifremer.fr Tel: +33 (0)2 98 22 40 40 FAX: +33 (0)2 98 22 40 45	3
5.	UiT	Juergen Mienert	Dramsveien 201 N-9037 Tromsø, Norway juergen.mienert@ig.uit.no Telephone: (+47) 77 64 44 46 Fax: (+47) 77 64 56 00	1, 10, 13
6.	MPI	Dirk de Beer	Celsiusstrasse 1, 28359 Bremen, Germany, tel. +494212028802 fax +494212028690	2, 7, 11, 13, 15

* of original proposal. Several WPs were dropped due to the budget restrictions.

Executive summary *(max one page)*

All components are purchased and seen by our engineers. Current progress:
The P- and T-lances were recovered.
The whole observatory, as described in the previous report is deployed on the Hakon Mosby Mud Volcano. Deployment was done during the ARK XXIV/2; 10. July - 03. August 2009.
Duirng the testing on board an electronic board of the sonar became damaged. The board accepted commands from COSTOFF, and could awake the sonar for scanning. It was replaced by a board that could awake the sonar for scanning, but cannot communicate. Thus the sonar could operate at preprogrammed time intervals, but could not be activated by COSTOFF, in response to a T-signal. It now scans twice per day for 10 minutes.
The remaining instruments functioned good. The deployment went, as planned, by lowering the frame by winch, positioning the frame by ROV at the desired position near the hot spot, pulling out the T-string and chemosensor cables.
On the next dive the camera was positioned in front of LOOME on the edge of hydrates near the hot spot. It will take video synchronous with the sonar.
During the workon the deployment, the site was visited by a Norwegian party on the RV Jan Mayen. They deployed the OBS, that was then inspected by the ROV. The position was ideal, near the hot spot, on a location opposite of the LOOME frame. However, the geophone appeared not to make contact with the seabottom. Therefore, the OBS was redeployed at the same spot in September 2009.
The T-lance was redeployed near the hot spot.

Additional measurements:
Wood pieces that were deployed in 2008 were recovered and analysed for colonization by wood eating fauna.
A detailed temperature study across the hot spot with the 13 m T-lance was performed. The highest temperature gradients were recorded, indicating high seepage activity.
A variety of geochemical and microbial analyses.
An in situ incubation with Insinc with $^{13}CO_2$ as tracer was performed on *Beggiatoa* mats for 48 hours, to measure the primary productivity of the sulfur oxidising community.
An experiment with a photon counter was done, to test the hypothesis that bioluminescence is particularly high near the cold seep. The hypothesis had to be rejected.
The recovery cruise will be with the RV Merian in september 2010.

Table 1: Deliverables List

Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months **	Used indicative person months*	Lead contractor
1	Long-term seismometer	1, 10, 13	6, 12***	6, 12***	16	5	UiT
2	Long-term chemical sensors (pH, O2, sulfide, redoX)	2	12	12	16	1	MPI-MM
3	Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed	2	12	12	11	2	IFREMER/IFM-GEOMAR
4	Scanning sonar for gas flares detection	4	12	12	16	2	MARUM
5	Design of sensor network and operation platform	7	6	6	19	6	MPI
6	Deployment and recovery procedures for instruments and data	8	12	12	8	3	Marum
7	Design of underwater communication	9	9	9	17	4	MARUM/Ifremer/UiT
8	Documentation of inter-operability and standardization	14	24	24	7	2	MARUM
9	Cruise report Jan Mayen 2008, Polarstern 2009	10	6, 24	6, 24	15	5	MPI/UiT/Ifremer
10	Scientific reports	16	36	36	9	0	all partners

*__the person month must be the same as indicated in Part II- WP progress report (see pag. 10)__

*** the number of person-months was drastically reduced as compared to the original proposal, due the strong reduction in funding. In this colum we gave the numbers for the full period.*

*** *Was deployed twice*

Table 2: Milestones List

Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
1	All partner meeting	15	2	2	MPI
2	LOOME website	15	5	5	MPI
3	Jan Mayen expedition, deployment PTlance	11	8	8	UiT
4	Integration of all components	7	9	13	MPI
5	Adjustments frame	7	11	13	MPI
6	test in MARUM tank	7	12	15	MPI, Marum
7	final adjustment sensor modules	2, 3, 7	14	14	MPI, GeoMar, Ifremer, AWI
8	deployment cruise	12	18	18	MPI
9	recovery	14	32	32	MPI, UiT
10	final meeting	17	36	36	MPI

WP bar chart (planned/actual):

	Months																							
WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**30**	**31**	**321**	**332**	**34**	**35**
1 planned			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
1 actual			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
2 planned			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
2 actual			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
3 planned			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
3 actual			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
4 planned			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
4 actual			x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x	x					
5 planned	x	x	x	x	x	x	x																	
5 Actual	x	x	x	x	x	x	x																	
6 planned					x	x	x	x	x															
6 actual *					x	x	x	x	x															
7 planned												x												
7 actual												x												
8 planned										x	x									x	x	x		
8 Actual										x	x									x	x	x		
9 planned																				x				
9 actual																				x				
Milestones planned		1			2			3	4		5	6		7				8	9					10
actual		1			2			3	4		5	6		7				8	9					10

* The integration was build succesfully, but the electronics became damaged. As a consequence, COSTOFF and the sonar can no longer communicate. Thus the sonar is now operating autonomously.

insert the time extention of each workpackage (yellow for planned and green for actual) according to the individual WP reports (see example))

Link with ESONET main activities:

Inputs to the DM from ESONET WPs :	**Expected period** mm/yy	**Actual period** mm/yy	**Comments**

Outputs of the DM activity to ESONET WPs :	**Expected period** mm/yy	**Actual period** mm/yy	**Comments**
MASOX			We are in close contact with MASOX (Ian Wright) and exchange experiences and know-how

Sensors & data management plan:

Measured parameters	**Depth**	**Sampling/storage/acquisition frequency***	**Access restriction / unrestriction** (ESONET partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	**comments**
P	1253	0.001667	free	
Surface-T	1253	0.001667	Free	
O_2, pH, redox	1253	0.001667	Free	
Current velocity	1253	0.016667	Free	
Water-T	1253	0.016667	Free	
Sonar-acoustics	1253	4.63E-05	Free	

**frequency (Ω) is given in SI (Hz [1/s])*

Dissemination and outreach: please update the table

NONE

Type of school material available at the issue of the mission (photos, video, courses,…others)	Description
Type of dissemination (through collaborations with aquaria, museum, sciences centres, etc.)	**Description**
Seminars and visits to our institute during Oceans 2009, demonstration of LOOME	

Part II

ESONET Noe – Demonstration Mission	*LOOME*
Scientific Area(s):	slope stabilities, sedimentary processes, fluids seeps and vents
Technological Area(s):	standardization, interoperability, data transmission systems and protocols, power supply
DM Start date:	*Febr 14, 2008*
DM duration:	*35 months*

WP management report

(from 30 September 2008 till May 30 2009)

WORKPACKAGE	*insert WP Number1*
	Insert WP title Long-term seismometer
Period covered	from 1 June 2009 – 31 Januari 2010
Partner organisation full name	*UiT*
Person in charge for the report (WP Leader)	*Jürgen Mienert*
Partners involved in the Work	

Period of the reporting: from 1 June 2009 till Januari 31 2010
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***:*

The measuring unit is deployed in sep. 2008, recovered in Aug. 2009 and immediately redeployed.

- ***Rough Estimation of Major Cost****: Costs for personnel and consumable amounts to xx Euro. Other costs of equipments amounts to xx Euro and are not paid by the EU.*

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro) Second period**
Total person-months	
Personnel costs	4000
Subcontracting	
Travels	2000
Consumables	
Other costs	
Total Costs	

WORKPACKAGE *insert WP Number2*

Insert WP title Monitoring of fluid chemistry (Long term chemical sensors)

Period covered from 1 June 2009 – 31 Januari 2010

Partner organisation full name *MPI*

Person in charge for the report (WP Leader) *Dirk de Beer*

Partners involved in the Work

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The measuring unit is incorporated into the frame of the observatory and calibrated. The sensors were deployed with the frame and positioned across the hot spot as planned.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

We have spend 4 man-month on the deployment cruise. We further used a deep-sea photon counter for detection of bioluminescence on and around the HMMV.

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	7
Personnel costs	16000
Subcontracting	-
Travels	10000
Consumables	
Other costs	
Total Costs	26000

WORKPACKAGE	*insert WP Number*3
	Insert WP title Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed
Period covered	from 1 June 2009 – 31 Januari 2010
Partner organisation full name	*IFM-GEOMAR*
Person in charge for the report (WP Leader)	*Tomas Feseker*
Partners involved in the Work	**Ifremer, UiT**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The temperature lance and the pore-pressure lance were recovered. The temperature lance was re-deployed. Temperature and bottom water pressure sensing systems were integrated into the LOOME frame and deployed as a part of the main observatory module. All sensors were installed at the planned positions at the seafloor. First data was obtained via the ROV using the CLSI.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

€ 4,407.46 were spent on travel on logistics for the ARK XXIV/2 cruise of R/V Polarstern to the Hakon Mosby mud volcano.

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro) Second period**
Total person-months	3
Personnel costs	12,826.80
Subcontracting	-
Travels	1,142.67
Consumables	
Other costs	3,264.79
Total Costs	17,234,26

WORKPACKAGE *insert WP Number4*

Insert WP title Scanning sonar for gas flares detection

Period covered from 1 June 2009 – 31 Januari 2010

Partner organisation full name *Marum*

Person in charge for the report (WP Leader) *Christoff Waldmann*

Partners involved in the Work **Ifremer, IFM-GEOMAR**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

Due to the electronic failure, the sonar is now operating autonomously. The sonar is deployed together with the frame.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	1
Personnel costs	4000
Subcontracting	-
Travels	2000
Consumables	
Other costs	
Total Costs	6000

WORKPACKAGE *insert WP Number*5

Insert WP title Design of sensor network and operation platform

Period covered from 1 June 2009 – 31 Januari 2010

Partner organisation full name *MPI*

Person in charge for the report (WP Leader) *Frank Wenzhöfer /Dirk de Beer*

Partners involved in the Work

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The frame is deployed with all instruments. It worked very well, as it is light and strong.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	2
Personnel costs	8000

Subcontracting	-
Travels	4000
Consumables	
Other costs	
Total Costs	12000

WORKPACKAGE	*insert WP Number6*
	Insert WP title Deployment and recovery procedures for instruments and data
Period covered	from 1 June 2009 – 31 Januari 2010
Partner organisation full name	*Marum*
Person in charge for the report (WP Leader)	*Volker Rathmeier/Christoph Waldmann*
Partners involved in the Work	

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed**: *A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The deployment was executed as planned by the ROV.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	9
Personnel costs	36000
Subcontracting	-
Travels	18000
Consumables	
Other costs	
Total Costs	54000

WORKPACKAGE	*insert WP Number7*
	Insert WP title Design of underwater communication
Period covered	from 1 June 2009 – 31 Januari 2010
Partner organisation full name	*Ifremer*
Person in charge for the report (WP Leader)	*Jerome Blandin/Christoph Waldmann/ Tom Feseker*
Partners involved in the Work	**Marum, Ifremer (both Ifremer and Marum are equally intensively involved)** **IFM-GEOMAR**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

COSTOFF was deployed and used to read the T-signals via the CSLI. The camera was deployed and tested via CSLI.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro)* Second period
Total person-months	2
Personnel costs	8000
Subcontracting	
Travels	4000
Consumables	
Other costs	
Total Costs	12000

***this is a collaborative WP of 3 groups**

WORKPACKAGE	*insert WP Number8*
	Insert WP title Documentation of inter-operability and standardization
Period covered	from 1 June 2009 – 31 Januari 2010
Partner organisation full name	*Marum*
Person in charge for the report (WP Leader)	*Christoff Waldmann*
Partners involved in the Work	**All others**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

TEXT CHRISTOPH WALDMANN

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	0
Personnel costs	
Subcontracting	-
Travels	000
Consumables	
Other costs	
Total Costs	

WORKPACKAGE

	Insert WP title Cruise report Polarstern 2009 & Jan Mayen 2008
Period covered	from 1 June 2009 – 31 Januari 2010
Partner organisation full name	*UiT*
Person in charge for the report (WP Leader)	*Jürgen Mienert/Jean Paul Foucher*
Partners involved in the Work	**Ifremer, MPI**

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

The cruise report of the deployment mission in July 2009 is included.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	1
Personnel costs	4000
Subcontracting	-
Travels	-
Consumables	
Other costs	
Total Costs	4000

WORKPACKAGE

	Insert WP title Scientific reports
Period covered	from 1 June 2009 – 31 Januari 2010
Partner organisation full name	*All partners*
Person in charge for the report (WP Leader)	*Dirk de Beer*
Partners involved in the Work	

Period of the reporting: from 30 September 2008 till May 30 2009
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed***: A brief description (max 700 char) of the work performed by each contractor during the period. This should be addressed at the workpackage level, and the work specification should be detailed enough to justify the resources employed - "Contributing to workpackage X" or "Contributing YY% to workpackage X" is too unspecific. Rather e.g. "Developed the ...module for…in workpackage X".*

As no data are available yet, no science is done yet.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

- **Overview of the Actual Costs***, by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) Second period
Total person-months	0
Personnel costs	00
Subcontracting	-
Travels	00
Consumables	
Other costs	
Total Costs	0

WP number and name		Thirth period	Permanent staff[1] Thirth period
WP1	Actual person months	2	2
	Planned total person months	2	2
WP2	Actual person months	2	2
	Planned total person months	2	2
WP3	Actual person months	2	0
	Planned total person months	2	0
WP4	Actual person months	6	5
	Planned total person months	6	0
WP5	Actual person months	6	2
	Planned total person months	6	2
WP6	Actual person months	1	1
	Planned total person months	1	1
WP7	Actual person months	9	9
	Planned total person months	9	9
WP8	Actual person months	0	
	Planned total person months	0	
WP9	Actual person months	1	1
	Planned total person months	1	1
TOTAL	**Actual tot person months**	**29**	**22**
	Planned total person months	29	17

[1] *not charged to the DM*

Workpackage progress

(from 14 February 2008 to 30 September 2008)

Workpackage objectives and starting point *(max 500 characters)*

SEE ABOVE

Progress towards objectives – *(short description about Tasks status; each task has to be referred as Task n.m where n is the WP number and m is a progressive number)*
We have not divided the work in tasks.

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

We have no deviations from the workprogramme after the redefinition of our work upon the strong reduction of the budget.

A)

Corrective actions:

B)

Corrective action:

TABLE 1: WP DELIVERABLES LIST *(list and status of the deliverables of the WP)*

The deliverable list can be found as table 2 in the proposal. It is unchanged.

Del.n. *(insert deliverable num.)*	Deliverable name Workpackage *(insert deliverable title)*	Responsible partners of the deliverable	Due Date *(insert month according to the DM implementation plan)*	Actual or Forecast delivery date *(month)*	Estimated indicative person months *(insert month according to the DM implementation plan)*	Used indicative person months
Deliverable Num.	**Deliverable Name**	**Responsible Institution**				
1	Long-term seismometer	UiT	6	6		
2	Long-term chemical sensors (pH, O2, sulfide, redoX)	MPI-MM/Ifremer	12	12		
3	Long-term temperature sensors on surface. Temperature and pore pressure in the subsurface seabed	IFREMER/ IFM-GEOMAR	6	6		
4	Scanning sonar for gas flares detection	MARUM	9	9		
5	Design of sensor network and operation platform	MPI	6	6		
6	Deployment and recovery procedures for instruments and data	Marum	12	12		
7	Design of underwater communication	MARUM/Ifremer/UiT	6	6		
8	Documentation of inter-operability and standardization	MARUM	24	24		
9	Cruise report Polarstern 2009Jan Mayen 2008	MPI/UiT/Ifremer	24	24		
10	Scientific reports	all partners	36	36		

TABLE 2: WP MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
1	All partner meeting	2	2
2	LOOME website	5	5
3	Jan Mayen eXpedition, deployment PTlance	8	8
4	Integration of all components	9	9
5	Adjustments frame	11	11
6	test in MARUM tank	12	12
7	final adjustment sensor modules	14	14
8	deployment cruise	18	18
9	recovery	32	32
10	final meeting	36	36

Miliestone Num.	Milestone Description	Month
1	All partner meeting	2
2	LOOME website	5
3	Jan Mayen eXpedition, deployment PTlance	8
4	Integration of all components	9
5	Adjustments frame	11
6	test in MARUM tank	12
7	final adjustment sensor modules	14
8	deployment cruise	18
9	recovery	32
10	final meeting	36

UPDATED GANTT

(Example is reported below)

SEE OUR PROPOSAL, OR THE IDENTICAL CHART ABOVE. WE STICK PRECISELY TO THIS SCHEDULE. FOR CONVENIENCE WE INSERTED THE PREVIOUSLY REPORTED MILESTONE LIST (ABOVE).

project months

WPn	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36
Task n.1 Provisional			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.1 Actual			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.2 Provisional			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.2 Actual			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.3 Provisional			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.3 Actual			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.4 Provisional			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.4 Actual			X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X												X						
Task n.5 Provisional	X	X	X	X	X	X	X																													
Task n.5 Actual	X	X	X	X	X	X	X																													
Task n.6 Provisional					X	X	X	X	X																											
Task n.6 Actual					X	X	X	X	X																											

Task n.7 Provisional												X																								
Task n.7 Actual												X																								
Task n.8 Provisional										X	X																			X	X	X				
Task n.8 Actual										X	X																			X	X	X				
Task n.9 Provisional																														X						
Task n.9 Actual																														X						

Project contract no. 036851

ESONET

European Seas Observatory Network

Instrument: **Network of Excellence (NoE)**
Thematic Priority: **1.1.6.3 – Climate Change and Ecosystems**
Sub Priority: **III – Global Change and Ecosystems**

MARMARA Demonstration Mission

Periodic Reports

Start date of project: **March 2007** Duration: **48 months**

Start date of the Demonstration Mission: **April 2008** Duration: **30 months**

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

ESONET Demonstration Missions

1st Periodic Activity Report

The Periodic Activity Report contains an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken.

<u>This document has to be filled in with reference to the DM Implementation plan.</u> This means that Deliverables, Milestones and WPs have to be the same as in the DM Implementation plan.

The Periodic Report contains 2 parts:
- Part I: it is addressed to the coordinator with minimum input from the partners
- Part II: it is addressed to each WP Leader and reports a detailed update of each WP activity at task level.

The report includes a rough justification of the costs incurred and of the resources deployed by each contractor linking them to activities implemented and justifying their necessity.

Finally the report contains information on use and dissemination activities.

Reporting period:
From April 1st, 2008 to 30 September 2008

Part I *(to be filled by the DM coordinator)*

DM acronym:	MARMARA-DM
DM title:	Multidisciplinary Seafloor Observatories for Seismogenic Hazards Monitoring in the Marmara Sea
ESONET Site:	MARMARA SEA, Turkey
Scientific Area(s):	- Earthquake hazards - Relations between fluids and seismicity - Processess at fluid controlled ecosystems
Technological Area(s):	Lon-term, permanent monitoring of seismicity, sediment pore fluid, fluid geochemistry and gas emission activity
DM Start date:	*April 1st, 2008*
DM duration:	*30*
Period of the reporting	from April 1st to 30 September 2008

Partner Num.	Partner institution short name	Principal Investigator (PI) for the Demo Mission	WP in charge *(insert WP num. and title)*
1.	IFREMER	Géli, Louis	WP2. Marine Operations with Ifremer facilities WP5. Comparative and feasibility studies
2.	ITU	Çağatay, Namık	WP6. Public Outreach, education, coordination at Turkish level and fund rising
3.	ISMAR	Gasperini, Luca	WP4. Data Integration and modelling
4.	INGV	Favali, Paolo	WP3. Land and Seabottom Integration; WP2. Marine operations with INGV facilities (SN-4 station)
5.	CNRS	Henry, Pierre	WP1. MarNaut data integration
6.	DEU/IMST	Çifçi, Günay	WP2. Marine operations with DEU facilities

Executive summary *(max one page)*

Brief description of the objective of the DM and brief description of the work status

The goal of MARMARA-DM is to contribute to the establishment of optimized permanent seafloor observatory stations for earthquake monitoring in the Marmara Sea (MS), as part of ESONET NoE. Workpackages description and status are:

WP 1 : Analysis of the available time series data and in-situ samples from the Marnaut cruise. This workpackage is in progress. One paper has already been published *[Zitter et al, 2008 ; Géli et al, 2008]*, and many abstracts presented at international conferences *[Geological Congress of Turkey, 2008 ; EUG 2008 ; 9th International Conference on Gas in marine Sediments, Bremerhaven, 2008 ; AGU 2008].* One Ph. D. Thesis, co-funded by Ifremer, Total and Bakerhughes is currently under way, conducted by Jean-Baptiste Tary.

WP 2 : Marine operations. A number of cruises are planned for 2009 :

- R/V Le Suroît cruise by IFREMER, scheduled from august 23rd to october 2nd, 2009. This cruise will comprise three parts : part 1 for acoustic dectection of gas emissions and AUV microbathymetry ; part 2 for high resolution, 3D seismic survey at one observatory site ; part 3 for instrument deployments

- R/V Piri Reis cruise by DEU/IMST of Izmir, to carry out HR resolution seismics and bathymetry in the east Çınarcık Basin.

In addition 3 proposals will be submitted for additional shiptime in 2009 :

- R/V Urania : in east Çınarcık Basin (proposal to be submitted to CNR by ISMAR) for the deployment of the SN-4 observatory

- R/V Piri Reis : proposal to be submitted to TUBITAK in January 2009 for extra site suveys in Central High and Çınarcık areas.

- R/V Yunus (İU Fisheries): one week of survey with the Medusa system to decide the best location for SN4 deployment in east Çınarcık Basin.

The activity includes the preparation and deployment of a seafloor observatory (SN-4; INGV facility) for long-term monitoring of fluid seepage and seismic activity.

WP 3 : Integration of land and seafloor seismological data. This workpackage has started with the merging of OBS data from the MarNaut cruise and land data from Turkish institutions (KOERI and TUBITAK).

WP 4 : Data integration and modeling. This work under this WP has not started yet. It will start as soon as the data from the MarNaut piezometer and flowmeters have been processed. The work will continue after the 2009 cruises.

WP 5 : Comparative study and project feasibility. Not started yet

WP 6 : Public and education outreach, coordination at national (Turkish) level and fund raising. Two project meetings were conducted with participation of collaborating Turkish institutions : the kick-off meeting in Istanbul (June 2008) was held KOERI, Tubitak and MTA ; the cruise preparation meeting in Brest (29-30 october, 2008) with KOERI. Contacts with Turkish Petroleum (TPAO) are planned in 2009. TV interviews and articles in science magazines were given in the Turkish press in june 2008. A special Marmara session was held at the *Geological Congress of Turkey* in Ankara during 23-27 March 2008. A specific website is under construction at ITU : www. esonet-marmara-dm.itu.edu.tr

Table 1: Deliverables List
Give the deliverable list and status

Deliverab. n.	Deliverable name	WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months*	Used indicative person months*	Lead contractor
D1.1	Paper on piezometer and OBS results[a]	1	T0 + 12	T0 + 12	48	14,5	5
D1.2	Paper on flowmeters/osmo-samplers	1	T0 + 14	T0 + 18	12	0	5
D1.3	Paper on fluid analysis	1	T0+12	T0 + 12	10	3,5	5
D1.4	Paper synthetizing Marnaut results	1	T0+12	T0 + 20	20	5	5
	TOTAL WP1				90	23	
D2.1	Reports on DEU cruises[b]	2	T0+14	T0 + 18	60	0	6
D2.2	Report on Ifremer (Marmesonet) cruise[b]	2	T0+14	T0 + 18	70	0	1
D2.3	1-year time series at 3 sites[c]	2	T0+23	T0 + 28	36	37	4
	TOTAL WP2				166	37	
D3.1	Report (including integrated database) combining marine and land seismological data	3	T0+26	T0 + 30	32	0	2
D3.2	Report on the ambient noise and recommendation for implementating permanent seabottom station	3	T0+26	T0 + 30	10	5	4
D3.3	High Res Seismic Images at the 3 sites[a]	3	T0+18	T0 + 20	91	0	6
	TOTAL WP3				133	5	
D4.1	Integration of all available data (including sedimentology)	4	T0+24	T0 + 28	36		3
D4.2	GIS including all available data	4	T0+24	T0 + 28	18		5
D4.3	Report to test working hypothesis and validate concept of seafloor observatories	4	T0+24	T0 + 30	8		5
D4.4	Report on best site selection	4	T0+28	T0 + 30	6		3
	TOTAL WP4				68	0	
D5.1	Recommendation Report on the preferred option	5	T0+28	T0 + 30	12		1
D5.2	Cost estimation report	5	T0+28	T0 + 30	12		1
D5.3	Implementation plan	5	T0+28	T0 + 30	12		4
	TOTAL WP5				36	0	
D6.1	Support agreement contract with Turkish authorities	6	T0+30	T0 + 30	8		2
D6.2	Web Site	6	T0+18	T0 + 18	42		2
D6.3	Training course	6	T0+24	T0 + 24	24		2
	TOTAL WP6				74	0	
	TOTAL Ma-Mo				567	65	

**the person month must be the same as indicated in Part II- WP progress report (see pag. 10)*
[a] *Time in men-month here corresponds to a 3-years Ph. D. Thesis and supervisor's time*
[b] *Time in men-month includes instrument preparation, cruise preparation and realization, and reporting*
[c] *Time in men-month includes OBS data reduction and analysis, include earthquakes characterization*

Table 2: Milestones List

Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
1	Kick-off meeting	6	T0+1	**Done (T0+3)**	2 (ITU)
2	Ifremer Cruise (Marmesonet)	2	T0+11	T0+16	1 (Ifremer)
3	DEU Cruises (High Res Seismics with R/V Piri Reis)	2	T0+12	T0+16	6 (DEU)
4	Training Course	6	T0+24	T0+24	2 (ITU)
5	Closure meeting with conclusions	4	T0+30	T0+30	6 (ISMAR)

WP bar chart (planned/actual):

insert the time extention of each workpackage (yellow for planned and green for actual) according to the individual WP reports (see example))

WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**	**25**	**26**	**27**	**28**	**29**	**30**
1 planned																														
1 actual																														
2 planned																														
2 actual																														
3 planned																														
3 actual																														
4 planned																														
4 actual																														
5 planned																														
5 Actual																														
6 planned																														
6 actual																														
Milestones planned	SEE TABLE 2 (Milestones list)																													
actual	SEE TABLE 2 (Milestones list)																													

Link with ESONET main activities: *please update the dates and contents of the foreseen activities*

Inputs to the DM from ESONET WPs :	**Expected period** mm/yy	**Actual period** mm/yy	**Comments**
ESONET-WP1	Month 2	Month 9	WP-1 proposal deadline planned on November 21, 2008

Outputs of the DM activity to ESONET WPs :	**Expected period** mm/yy	**Actual period** mm/yy	**Comments**
ESONET-WP5	month 18	month 22	Marmesonet cruise delayed from may 2009 to august 2009

B.1.1.1. *Sensors & data management plan:* please update the following table: follow the guidelines issued from the ESONET Best Practice workshop

Measured parameters	Depth	Sampling/storage/acquisition frequency	Access restriction / unrestriction (ESONET partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	comments
ground velocity (OBS+SN4)	1000 m 200 m (SN-4)	sampling : 100 Hz storage ~ 50 Gb/year acquisition frequency : continuous	- raw and processed (SAC format files) - unrestricted access on raw data - 1 year deployment - data availability only after instrument recovery	at 3 sites
seabottom water pressure (hydrophones)	- Idem -	sampling : 250 kHz storage ~ 25 Gb/year acquisition frequency : continuous	- unrestricted access on raw data - 1 year deployment - data availability only after instrument recovery	at 3 sites
seabottom water pressure	- Idem -	sampling : 1 sample/minute storage ~ 0.4 Gb/year acquisition frequency : continuous	- Idem -	at 3 sites
sediment pore pressure	- Idem -	sampling : 1 Hz storage ~ 3 Gb/year acquisition frequency : continuous	- Idem -	at 3 sites
sediment pore water temperature	- Idem -	sampling : 1 sample/minute storage ~ 0.4 Gb/year acquisition frequency : continuous	- Idem -	at 3 sites
CH_4 concentration in seabottom water	200 m (SN-4)	Sampling : 1 Hz storage ~ 0.4 Gb/year acquisition frequency : continuous	- Idem -	SN-4 at 1 site
sediment trap and collection of settling part.material	1200	1 sample / month ; acquisition after one year	- raw data - unrestricted access - 1 year deployment - data availability only after instrument recovery	sediment trap at 1site with funds permitting
Flowmeters	600-1250	Continuous, about 1 sample per month	- raw data - unrestricted access - 1 year deployment - data availability only after instrument recovery and analysis	flowmeters
Osmosample	600-	Continuous, about 1 sample per	- raw data	osmo-

rs	1250	month	- unrestricted access - 1 year deployment - data availability only after instrument recovery and analysis	samplers
bubbling activity using an acoustic detector of gas bubbles		sampling : 1 sample/minute during 60 minutes 1 sample = 1 acoustic image 3 Mb per sample storage ~ 65 Gb/year acquisition frequency : 2 per day		1 site, funds permitting
Currentmeter	200 m (SN-4)	5 Hz	- unrestricted access on raw data - 1 year deployment - data availability only after instrument recovery	SN-4 at 1 site
CTD	200 m (SN-4)	1 sample/10 minute	idem	SN-4 at 1 site
Turbidimeter	200 m (SN-4)	1 sample/10 minute	idem	SN-4 at 1 site
oxigen	200 m (SN-4)	1 Hz	idem	SN-4 at 1 site

- A **tabular overview of budgeted person-months and actual person-months** by workpackage (budgeted person –months to be taken from "Effort breakdown" Excel file)

WP number and name		First period	B.2. Permanent staff[1] B.3. first period
WP1	Actual person months	7	
	Planned total person months	91	
WP2	Actual person months	13	
	Planned total person months	168	
WP3	Actual person months	29,5	
	Planned total person months	128	
WP4	Actual person months	0	
	Planned total person months	58	
WP5	Actual person months	0	
	Planned total person months	75	
WP6	Actual person months	3	
	Planned total person months	47	
TOTAL	**Actual tot person months**	**71,5**	
	Planned total person months	**567**	

[1] *not charged to the DM*

Dissemination and outreach : please update the table

Type of school material available at the issue of the mission (photos, video, courses,…others)	Description
	TRAINING COURSE PLANNED FOR SCIENTISTS AND ENGINEERS in TURKEY ON DEEP SEAFLOOR OBSERVATORIES
Type of dissemination (through collaborations with aquaria, museum, sciences centres, etc.)	Description **WEB SITE UNDER CONSTRUCTION AT ITU** **www. esonet-marmara-dm.itu.edu.tr**

Part II *(to be filled by each partners)*

ESONET Noe – Demonstration Mission	DM acronym: *MARMARA-DM*
Scientific Area(s):	- Earthquake hazards - Relations between fluids and seismicity - Processess at fluid controlled ecosystems
Technological Area(s):	Lon-term, permanent monitoring of seismicity, sediment pore fluid, fluid geochemistry and gas emission activity
DM Start date:	*April 1st, 2008*
DM duration:	*30*

Note : Only WP1, WP2, WP3 and WP6 have started before September 30, 2008
Hence no management report is provided for WP4 and WP5

WP1 management report

(from April 1st to 30 September 2008)

WORKPACKAGE	*WP1*
Full WP title	*ANALYSIS OF DATA FROM MARNAUT CRUISE*
Period covered	from 01/04/2008 to 30/09/2008
Partner organisation full name	*CNRS / CEREGE / Chaire de Géodynamique du Collège de France*
Person in charge for the report (WP Leader)	*Pierre Henry*
Partners involved in the Work	*5, 1, 2, 3*

Period of the reporting: from starting date to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period.*

The work performed under WP1 consist in analyzing the data collected during the MarNaut cruise. Major results concern :

- the acoustic detection of gas emissions [Géli et al, EPSL, 274, 34-39, 2008]
- the analysis of deep sea eco-systems [Lara et al, Environ. Microbiol., doi: 10.1111/j.1462-2920.2008.01737.x, Sep 18, 2008].
- the analysis of heat flow data [André, Mastère 2, Université de Bretagne Occidentale, Juin 2008]
- the geochemical analysis of gases [Bourris et al, 9th International Conference of Gas in Marine Sediments, September 2008]
- the pore fluid chemistry of cold seeps [Tryon et al, AGU Fall Meeting]
- the analysis of Ocean Bottom Seismometers [J. B. Tary, Ph. D. Thesis]

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Person-Months

Ifremer : 14,5 Ma-Mo
ITU : 1,5 Ma- Mo
INGV : 0 Ma-Mo
ISMAR : 2 Ma-Mo
Cnrs : 5 Ma-Mo
DEU : 0 Ma-Mo

Travels :

Ifremer : 2500 €
L. Géli : 9th International Conference on Gas in Marine Sediments 2 x 1000 = 700 €

C. André : Visit to CEREGE ; 1 travel round trip from Brest to Aix en Provence : 500 €

CNRS: 1615,12 €

T Zitter: 9th International Conference on Gas in Marine Sediments, Bremen, Sept 15-19, 2008. Cost: 1137.47 E

P Henry: Geological Society of London meeting: Subsurface sediment remobilization and fluid flow in sedimentary basins, Oct 21-22, 2008. Cost: 477.65 E

Other costs :

ITU : 2611 Euros for rental of RV Yunus for two days WP2

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	23 Ma-Mo
Personnel costs	120900€
Subcontracting	
Travels	2815,12 €
Consumables	
Other costs	2611 €
Total Costs	126326 €

WP-1 progress

(from start date to 30 September 2008)

Workpackage objectives and starting point *(max 500 characters)*

Progress towards objectives – *(short description about Tasks status; each task has to be referred as Task n.m where n is the WP number and m is a progressive number)*

Task WP1.T1: Analyze OBS and Piezometers (Ph. D. Thesis of J. B. Tary started in November 2008, with supervision of Louis Géli, Ifremer, and Pierre Henry, Cnrs)

Contractors involved : Ifremer, Cnrs, ITU (including Tubitak) and support from KOERI

The data from four OBSs deployed for 2,5 months in the eastern Sea of Marmara were analyzed together with land stations data provided by KOERI. The recorded events are distributed in two groups. The first is a cluster of events located below the Western Ridge, below a zone where gas and oil seeps where found at the seafloor. Events of the second group are located deep in the crust and aligned along a NNE direction crossing the northern escarpment of the Tekirdag Basin. Gas emissions occur through NNE oriented tensile cracks near the base of this escarpment. These cracks could well be the surface expression of a deep seated active fault.

Task WP1.T2: Analyze flowmeters and osmo-sampler data from MarNaut

Contractors involved : ITU (including SIO), Cnrs

Seven flowmeters / osmosamplers from the Scripps Insitution of Oceanography were deployed during the Marnaut cruise in May/June 2007. The instruments were recovered in June 2008 with a research vessel from ITU. However, due to customs problems, the equipment is still in Istanbul. Hence, the data have not been analyzed yet.

Task WP1.T3 : Analyze sediment cores, rock and fluid samples, heat flow data

Contractors involved : ITU (including SIO), Cnrs, Ifremer, Ismar

Analysis of pore fluids from Marnaut were done at Scripps Institute of Oceanography (SIO). These results, as well as earlier analyses performed at CEREGE show convective mixing of brackish pore fluid and present day seawater occurs within the first 5 m of sediment, with non-steady state profiles. This mixing is attributed to episodic gas expulsion, which may be enhanced by earthquake activity. Advection diffusion modelling was performed to constrain the timing of seawater downflow into the sediment. At one site, brines influenced by upward fluid advection from deeper levels (and associated with oil) were sampled and analysed.

A total of 45 heat flow measurements were carried out during the MarNaut cruise, exhibiting heat flow values ranging between about 15 and 55 $mW.m^{-2}$, except at one single location near the northern Cinarcik Basin escarpment, where heat flow reaches 120 $mW.m^{-2}$ in response to deep, upward fluid flow. Corrections were made to account for blanketing and basement topography effects. Results provide constraints to estimate the age of initiation of the North Anatolian Fault within what is now the Sea of Marmara.

ISMAR staff reprocessed most of the available geophysical data collected in the areas potentially interesting for the purposes of the DM. Multibeam bathymetry, chirp-sonar profiles and side-scan sonar mosaics were processed and analysed to find evidence of earthquake related surface ruptures and fuid emission in the water column. Sediment cores available were also studied to find evidence of earthquake relate mass-wasting events in the sedimentary sequence. Luca Gasperini and Giovanni Bortoluzzi worked on geophysical data processing and interpretation. Alina Polonia worked on geophysical data and core analysis. Luca Giorgio Belluci worked on core analysis.

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

A) ***Deviation : Insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters***

Customs delays. Deviation from the project work programme concerns Task WP1-T2. The 7 flowmeters / osmosamplers that were deployed during the MarNaut cruise were recovered in June 2008. But, custom problems prevented us to transfer the equipment from Istanbul back to Scripps Institution of Oceanography in San Diego, where the data are expected to be processed.

Partnership limitations from ESONET contract. Part of the analysis of sediments, cores, rock and fluid done by CNRS are taking place in laboratories not included in the original ESONET contract (noble gasses at CRPG, carbonates at LOCEAN).

B) Corrective actions: *insert description of the corrective actions max 500 characters*

Our Turkish colleagues from ITU have multiplied the interventions to obtain custom clearance. Clearance is now expected hopefully before November 15^{th}, 2008.

The partnership limitations from ESONET contract did not impact the science results. Laboratories involved in Marnaut cruise performed the analyses planned (CRPG, LOCEAN), but do not report to ESONET.

TABLE 1-1: WP1 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. (*insert deliverable num.)*	**Deliverable name Workpackage** (*insert deliverable title)*	**Responsible partners of deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D1-1	Paper on OBS and piezometer results	1, 5	T0 + 12	T0 + 12	72	14
D1-2	paper on flowmeters and osmosamplers	2, 5	T0 + 14	T0 + 18	18	
D1-3	paper on fluid analysis	5, 2, 1	T0+12	T0 + 12	15	2
D1-4	paper synthesizing results from the MarNaut cruise	5	T0+12	T0 + 20	24	12

TABLE 1-2: WP1 DETAILED MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
M1-1	MarNaut Data integration	T0+24	T0+24
M1-2	Scientific papers	T0+24	T0+24

WP2 management report

(from start date to 30 September 2008)

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period.*

ITU. ITU rented the RV Yunus of the Faculty of Fisheries of the Istanbul University for the recovery of osmometers-flowmeters deployed during the MARNAUT cruise one year earlier. The equipment recovery cruise took place during 20-21 June 2008. Dursun Acar (engineer) of ITU-EMCOL and Mike Tryon of Scripps Institution of Oceanography (SIO) participated in the cruise.

ITU-EMCOL is still trying to send the equipment to SIO. There are difficulties with customs because there is no record of the entry of these equipment onboard RV L'Atalnte into Turkey. We are still trying to solve the customs problem.

INGV. As foreseen in the task WP2-T1 (Appendix 1 of DM proposal), INGV performed the upgrade of SN4 observatory adding new sensors to the basic SN-4 configuration. This upgrade was made in order to execute a multiparametric monitoring requested by the project objectives (gas seepage and seismicity). SN-4 will be able to assess the temporal relationships between fluid expulsion, related environmental effects (e.g. temperature, oxygen variations) and seismic activity.

The station will be deployed in a selected site (200 m deep) as recommended in a technical note (cf Notes on SN-4 Observatory deployment in the Sea of Marmara by INGV and ISMAR issued on October 2008 for the Brest meeting).

The deployment will be done by using a mechanical rope and an acoustic release; the recovery will be based on the use of a recall buoy canister actuated by an acoustic release. To facilitate the recovery procedure the total weight in water is going to be reduced to 1.5 kN installing 8 benthospheres on the frame and adopting new lighter vessels for batteries and electronics. As the Lithium battery pack will guarantee 6 months of autonomy, this procedure for recovery should make easier the battery pack replacement for next missions.

ISMAR. A proposal for the use of R/V Urania during the 2009 Spring/Summer was submitted by ISMAR to the Ship-Office of the Italian CNR.

IFREMER. Ifremer started with the preparation of the instruments that will be deplyed during the Marmesonet cruise in september 2009. The development of an autonomous seafloor observatory was initiated for the monitoring of bubble emissions, using high frequency (38 kHz) active acoustics. Some improvements were also made on Ifremer OBSs to measure the orientation of the OBSs sensors.

DEU. DEU-Seislab performed Marmara Cruise in July 2008 onboard R/V K. Piri Reis, in the frame of a colloborative research (Basin evolution along continental transforms: Nested Hi-Resolution Multichannel Survey in the Marmara Sea,Turkey) between Lamont-Doherty Earth Observatory(LDEO) of Columbia University and Institute of Marine Sciences and Technology. The primary goal of acquiring high-resolution seismic data was to provide stratigraphic ties between subbasins in the Marmara Sea and details on shallow stratigraphy and structure, which can be used to reconstruct the recent history of the Marmara basin.

2- A colloborative cruise was done between Memorial University of Newfounland and Institute of Marine Sciences and Technology in the Mediterranean Sea in August 2008. (Miocene-Recent tectonic and sedimentary evolution of the Hellenic and Cyrus Arc junction (including the Pliny-Strabo Trenches, Rhodes, Finike and Antalya Basins and Anaximander Mountains), and its comparison with the tectonic evolution of the western Tauride Mountains, eastern Mediterranean Project).

3- Two different cruises in the Aeagean and Black Seas within the frame of Marmara Sea Gateway Project;

1st area: At the Black Sea outlet of İstanbul strait onboard R/V K.Piri Reis. Multibeam, high resolution seismic reflection (Huntec Deep Tow system), current meter (acoustic doppler current profiler) and ROV investigations are planned to perform.

2nd area: At the Agean Sea outlet of Dardanelles Strait onboard R/V K.Piri Reis; High resolution Huntec Deep Tow system, seismic reflection with airgun and piston coring are planned to perform in the area between Gelibolu and Gökçeada Peninsulas.

Although these cruise are not *per se* part of Marmara-DM project, the data collected and the experience gained will be of critical importance for the preparation of the marine operations in 2009.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Person-Months
Ifremer : 12 Ma-Months
INGV : 12 Ma-Mo
ISMAR : 0.5 Ma-Mo
ITU : 0,5 Ma-Mo
DEU : 9 Ma-Mo

Other costs :
Ifremer : preparation of equipment
Consumables : 7498,02
Other costs : 61719,19 €

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	37 Ma-Mo
Personnel costs	108700
Subcontracting	
Travels	
Consumables	7498,02
Other costs	61719,19
Total Costs	177917,21 €

WP3 management report

(from April 1st, 2008 to 30 September 2008)

WORKPACKAGE	*WP3*
Full WP title	*INTEGRATION OF LAND AND SEAFLOOR SEISMOLOGICAL DATA*
Period covered	from *April 1st, 1008* to 30/09/2008
Partner organisation full name	*INGV*
Person in charge for the report (WP Leader)	*Paolo Favali*
Partners involved in the Work	*4, 1, 5, 2*

Period of the reporting: from starting date to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period.*

The work consisted in integrating the data from the OBSs that were deployed during the MarNaut cruise and the land data recorded from KOERI and from TUBITAK between may 14th and august 12th 2008. The land data from KOERI can improve the characterization of the seismic events (location, magnitude) recorded by the OBSs. The integration of TUBITAK data is in progress.

This work will considerably speed up the process that will be done at the end of 2009 to integrate the data that will be collected after the Marmesonet Cruise and after SN-4 observatory recovery.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Person-Months
Ifremer : 2 Ma-Months
ITU : 1,5 Ma-Mo
CEREGE : 0,5 Ma-Mo

Travels :
Ifremer : Visit to Magnitude/Baker-Hughes (2 travels from Brest to Manosque round-trip) : 1000 €

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period

Total person-months	4 Ma-Mo
Personnel costs	19030
Subcontracting	
Travels	1000
Consumables	
Other costs	
Total Costs	20030

WP-3 progress

(from April 1st, 2008 to 30 September 2008)

Workpackage objectives and starting point *(max 500 characters)*

Progress towards objectives – *(short description about Tasks status; each task has to be referred as Task n.m where n is the WP number and m is a progressive number)*

Task WP3.T1: Analyze land stations from TUBITAK network

Contractors involved : INGV, Ifremer, Cnrs, ITU (including Tubitak) and support from KOERI

The data from four OBSs deployed during for 2,5 months in the eastern Sea of Marmara were analyzed together with land stations data provided by KOERI. The recorded events are distributed in two groups. The first is a cluster of events located below the Western Ridge, below a zone where gas and oil seeps where found at the seafloor. Events of the second group are located deep in the crust and aligned along a NNE direction crossing the northern escarpment of the Tekirdag Basin. Gas emissions occur through NNE oriented tensile cracks near the base of this escarpment. These cracks could well be the surface expression of a deep seated active fault.

Task WP3.T2: Analyze OBS data from each site (1 year deployment)

Contractors involved : INGV, Ifremer, Cnrs, ITU (including Tubitak) and support from KOERI

This task will start only after recovery of the OBSs that will be deployed during the Marmesonet Cruise.

Task WP3.T3 : Site survey High Res Seismics

Contractors involved : Ifremer, DEU

This task will start only after completion of the Marmesonet Cruise.

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

NO DEVIATION.

TABLE 3-1: WP3 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D3-1	Report comparing OBS (including SN-4) and land stations	2,4,1	T0+26	T0 + 30	36	6
D3-2	Report on the ambient noise in th Sea of Marmara and recommendation for implementating permanent seabottom station	4,1	T0+26	T0 + 30	12	4
D3-3	High res seismic images at 3 sites	6	T0+18	T0 + 24	72	0

TABLE 3-2: WP3 DETAILED MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
M3-1	Integration of MarNaut OBSs	T0+6	T0+12
M3-2	Analysis of land data	T0+24	T0+24
M3-3	Analysis and integration of DM data	T0+30	T0+30
M3-4	Reporting	T0+30	T0+30

WP6 management report

(from april 1st, 2008 to 30 September 2008)

WORKPACKAGE	*WP6*
Full WP title	*PUBLIC AND EDUCATION OUTREACH. FUND RISING.*
Period covered	from *April 1st, 1008* to 30/09/2008
Partner organisation full name	*ITU*
Person in charge for the report (WP Leader)	*Namik Çagatay*
Partners involved in the Work	*2, 6, and all partners*

Period of the reporting: from starting date to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

MARMARA-DM PROJECT WP6
ACTIVITIES FOR THE FIRST 6 MONTHS

WP 6 : Public and education outreach, coordination at national (Turkish) level and fund raising

COORDINATION (Tasks WP6.T2 and WP6.T3)

At present coordination efforts are in progress between different Turkish organizations, such as TPAO (Turkish Petroleum Company), TUBITAK (Scientific and Technological Council of Turkey) and MTA (Geological Suvey of Turkey), for permanent seafloor observartories in the Sea of Marmara. These efforts are explained below.

1. KOERI's Project for cabled seafloor seismological observatories funded by Turkish Authorities independently of ESONET. Talks are in progress with KOERI and GURALP regarding collaboration with multidisciplinary ESONET and Marmara-DM observatory studies in the Sea of Marmara. Regarding this issue, ESONET and EMSO representatives met with KOERI management in Istanbul on March 28th, 2008 (see Minutes of the meeting attached as Appendix I).
2. Turkish marine research community was informed of the ESONET and ESONET Marmara-DM activities in the Sea of Marmara in the *Annual Coordination Meeting of Marine Research in Turkey*, convened by the Department of Navigation Hydrography and Ocenaography of the Turkish Navy (SHOD) in KOERI during 29-30 May 2008.
3. An invitation letter was sent to MTA (Geological Survey of Turkey) by Namık Çağatay and Naci Görür on 10 July 2008 for MTA's collaboration in the ESONET activities in the Sea of Marmara. Namık Çağatay visited MTA on 29 August 2008 and had a meeting with Dr. Ziya (Deputy Director General) and Mr. Kerim Sarıkavak (Head of the Marine Geology Department). The MTA officials were informed about the ESONET, MarmaraDM and EMSO projects. MTA would like to provide logistic support for the activities in the Sea of Marmara node. It was agreed that MTA would

participate in these activities and include such activities in their annual work plan for the next year with a budget for the marine operations. MTA is constructing a new 22 m vessel which could be used for Marmara-DM marine surveys and equipment deployment /recovery. MTA is also planning to buy a research vessel for marine geological and geophysical all surveys, which could be operational in about two years. (See Appendix II for invitation letter).

4. Namık Çağatay contacted TPAO on 17 October 2008 and informed them of the results MARNAUT cruise and ESONET Marmara-DM project. It was agreed that a short written document on the Marmara-DM project be prepared and sent to TPAO by Namık Çağatay. This will be followed by a presentation of the project in the TPAO headquarters in Ankara and discussions on TPAO's participations in the ESONET activities in the Sea of Marmara node.

DISSEMINATION OF RESULTS (Task WP6.T1)

1. Scientific workshop on MarNaut results : A workshop was organized in ITU during 16-17 June 2008, before the kick-off meeting of the Marmara-DM project. The purpose was mainly to review the scientific results of the MARNAUT cruise carried in the Sea of Marmara one year earlier during May-June 2007. A total of 17 high quality scientific papers were presented during the workshop. Most of the out presentations were on Marnaut Cruise results, with a couple of presentations on the planned KOERI seafloor seismological network and seafloor radon monitoring. The workshop presentations set up the scene for an efficient discussion of the planning of activities for the Marmara-DM project during the kick-off meeting. The workshop programme is appended as Appendix III.

The workshop was attended also by the representatives of TPAO, MTA, TUBITAK Marmara Research Centre, KOERI and Istanbul University. It was widely covered by the Turkish media (TV channels, newspapers, popular science magazines). Louis Geli, Pierre Henry, Luca Gasperinin, Naci Görür and Namık Çağatay held press conference on 16 June 2008 before the startof the press conference. Several interviews were held on Turkish TV channels: Namık Çağatay on CNN Turk and Radio ChannelTRT FM 1 and Naci Görür on ATV and Show TV during 16 - 17 June, 2008. See Appendix IV for the newspaper news item.

2. "Sea of Marmara Special Session" of the Geological Congress of Turkey: A special Marmara session of the *Geological Congress of Turkey* was held in Ankara during 23-27 March 2008. The session was convened by Namık Çağatay, Naci Görür and Celal Şengör of ITU. Louis Geli, Pierre Henry, Celal Şengör, Naci Görür, and Namık Çağatay presented the results of the Marnaut cruise. The programme of the session is appended as Appendix V.

3. Publications

Peer-reviewed publications on Marnaut cruise results:

1. Géli, L., Henry, P., Zitter, T.. Dupré, S., Tryon, M., Çagatay, M. N., de Lépinay, B. Mercier, Le Pichon, X., Sengör, A. M. C., Görür, N., Natalin, B., Uçarkus, G., Özeren, S., Volker, D., Gasperini, L., Burnard, P., Bourlange, S., the Marnaut Scientific, Party, 2008. Gas emissions and active tectonics within the submerged section of the North Anatolian Fault zone in the Sea of Marmara. Earth and Planetary Science Letters, 274(1-2): 34-39.
2.

Two articles were published *in Turkish* in the weekly popular science magazine *Cumhuriyet Bilim ve Teknoloji (CBT),* summarizing the workshop results, and informing the general public on the ESONET studies in the Sea of Marmara.

1. Naci Görür : Seafloor earthquake studies in the Sea of Marmara. *Cumhuriyet Bilim ve Teknoloji (CBT),* 1112/10, 11 July 2008.
2. Namık Çağatay: Results of the Sea of Marmara Workshop. *Cumhuriyet Bilim ve Teknoloji (CBT),* 1114/21, 25 July 2008.

See attached JPG images of these articles (Appendix V).

<u>Papers presented at scientific meetings:</u>

1. Çağatay, M.N., Belucci, L. Polonia, A. Sancar, U. Dikçe, D. Eriş, K. Damci, E., Gasperini, L. Gorur, N. Henry, P. Zitter, T.A.C. Geli, L. Tryon, M., 2008. Sedimentary earhquake records in the Sea of Marmara, Presented at EGU meeting, Vienna, 2008.

2. Çağatay, M.N., Sancar, Ü. Henry, P. Gasperini, L. Tryon, M. Dikçe, D. and the Marnaut Scientific Party, Origin of the black Sulphidic Patches Along the Main Marmara Fault and their tectonic and paleoseismological implications. Presented at Geological Congress of Turkey 2008, Ankara, Turkey.

3. Geli, L. Henry,P. Dupré , S. Volker, D. Zitter, T. Le Pichon, X. Tryon, M. Çağatay, N. and the Marnaut Scientific Party, 2008. Acoustic detection of gas emissions within the submerged section of the North Anatolian Fault zone in the Sea of Marmara. Presented at Geological Congress of Turkey 2008, Ankara, Turkey.

4. Görür, N., Özeren, S., Çağatay, N., Şengör, C., and the Marnaut Scientific Party, 2008. Geological observations of the Marnaut dives north of the Çınarcık Basin and their implications. Presented at Geological Congress of Turkey 2008, Ankara, Turkey.

5. Henry, P. Zitter, T.A.C., Le Pichon, X., Geli, L., Tryon, M. D., Mercier de Lepinay, B., Cagatay, M. N., Sengor, A.M.C., Gorur, N., Bourlange S. and the Marnaut Scientific Party, Cold seeps in the North Anatolian Fault zone, Sea of Marmara: hints for a deep connection. Presented at EGU meeting, Vienna, 2008.

6. Henry, P. Zitter, T.A.C., Le Pichon, X., Sengor, A.M.C., Gorur, N. Cagatay, N. Gasperini, L. Geli, L., Tryon, M. D., Mercier de Lepinay, B., and the Marnaut Scientific Party, Manned submersible observations at cold seeps in the North Anatolian Fault zone, Sea of Marmara. Presented at Geological Congress of Turkey 2008, Ankara, Turkey.

7. Özeren, M. S. Çağatay, N. Şengör, A.M. C. Görür, N. Zitter, T, Henry, P., Gasperini, L., Eris, K., Postacioglu, N., Geli, L., Sultan, N. 2008. Submarine landslide risk in the Sea of Marmara revisited after Marnaut cruise. Presented at EGU meeting,Vienna, 2008.

MARMARA-DM KICK-OFF MEETING (All Tasks WP6)

Kick-off meeting with participation representatives of all the Marmara-DM project partners, KOERI, TUBITAK-Marmara Research Centre, TPAO, MTA and Istanbul University was held in ITU, Istanbul during June, 18, 2008, following the two-day workshop. During the meeting the results of the workshop were summarized, type of useful sensors to be used for the Marmara-DM projects was discussed and the preliminary cruise planning was made. It was decided to have second workshop and coordination meeting in Ifremer, Brest during October, 29-30, 2008. Minutes of the Istanbul Marmara-DM kick-off meeting is attached as Appendix VI.

MARMARA-DM WEB SITE (Task WP6.T5)

A web-site was initiated at ITU : www.esonet-marmara-dm.itu.edu.tr. This web site is both in Turkish and English, includes all news items announcements, workshop presentations and data concerning the project results.

This activities are big step forward achieving the deliverable D6.2 “Web Site” of the Marmara-DM project.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Person-Months

Ifremer : 1 Ma-Month (L. Géli)
ITU : 3,5 months (1,5 for permanent + 2 for non permanent)
Cnrs : 1.5 Ma-Mo
DEU : 9 Ma-Mo
INGV : 1.0 Ma-Mo
ISMAR : 0.5 Ma-Mo

Travels :

Ifremer : Géli, Tary, Bourris, Charlou : Kick-Off meeting, Istanbul, June 16-18, 2008. Cost ~ 3200 €
INGV : G. Etiope, G. Marinaro, F. Italiano : Kick-Off meeting, Istanbul. Cost ~ 2400 €
ISMAR : L. Gasperini : Kick-Off meeting, Istanbul, June 16-18, 2008. Cost 800 €
CNRS : P. Henry, T. Zitter, B. Mercier de Lepinay: Kick-Off meeting, Istanbul. Cost ~1621.19 E
DEU :Mustafa Ergün : Kick-Off meeting, Istanbul, June 16-18, 2008. Cost ~ 700 €

Other costs :

ITU = 511 € (Expenditure for the Workshop and Kick off meeting in Istanbul)

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	15,5 Ma-Mo
Personnel costs	37220
Subcontracting	
Travels	8721
Consumables	
Other costs	511
Total Costs	46452 €

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

NO DEVIATION

TABLE 6-1: WP6 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D6-1	Support agreement contract with Turkish Authorities	2	T0+30	T0 + 30	6	2
D6-2	Web Site	2	T0+18	T0 + 18	42	2,5
D6-3	Training Course	2	T0+24	T0 + 24	12	0

TABLE 6-2: WP6 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
M1	Kick-off meeting	T0+1	T0+3
M4	Training course	T0+24	T0+24
M5	Closure meeting with conclusions	T0+30	T0+30

APPENDICES

I. **Report of meeting at KOERI on seafloor observatories in the Sea of Marmara, March 28, 2008**

II. **SEA OF MARMARA SESSION, The Geological Congress of Turkey, 26 March, 2008, Ankara (Session Conveners: Namık Çağatay, Naci Görür and Celal Sengör) : Programme**

III. **Press release by ITU/EMCOL on ESONET (in Turkish)**

IV. **Press articles in Turkish national newspapers**

V. **ESONET / MARMARA Workshop, June 16-17, 2008 : Programme**

VI. **Full report of Marmara-DM Kick-Off meeting, ITU, June 18, 2008.**

APPENDIX I

Meeting at KOERI on seafloor observatories in the Sea of Marmara, March 28, 2008

Gülay Altay, KOERI Director
Cemil Gürbüz, KOERI, Marmara region land and sea bottom seismic project coordinator, Esonet expert
Doğan Kalafat, KOERI
Mehmet Yilmazer, KOERI
Roland Person, Ifremer, Brest, Esonet coordinator
Paolo Favali, INGV, Roma, EMSO coordinator
Namik Çagatay, ITU, Esonet steering committee member and coordinator for Turkey
Louis Geli, Ifremer, Brest, Marmara-DM coordinator, member of Esonet science council
Pierre Henry, CEREGE (CNRS), Aix-en-Provence, MarNaut coordinator, member of Esonet science council.

1. Gülay Altay opens the meeting and presents the project of KOERI "Marmara region land and sea bottom seismic project".

   The goal of this project (coordinated by Cemil Gürbüz) is to extend and densify the existing network of broadband seismometers and accelerometers around the Sea of Marmara:

   - Installation of 10 new land stations on the southern shore of the Marmara Sea is planned for ~ may-june 2008.
   - Installation of 5 offshore stations is planned within 1 year.

   Each offshore station comprises pressure and temperature sensors, current meter, hydrophone, three component broadband, pressure gauge, seismometer and accelerometers. Each station will be connected to land with a fiber optic and DC power cable. The total length of cable is 60 km.

   Guralp will provide the sensors and data logger and Turkish Telecom will provide the cables. A third company is developing the interface in Turkey.

   C. Gürbüz mentions that the KOERI project is part of an early warning system for earthquake and tsunami, and therefore will include sea-level monitoring. Bathymetric data along cable route will also be acquired prior to cable deployment. The exact location of the offshore stations is not decided yet and could be subject to slight modifications, within the limits of the available budget.

2. Pierre Henry presents a summary of the major scientific results from previous work on fluid emissions associated with the North Anatolian fault system in the Sea of Marmara (Marmascarps, MarmaraVT and Marnaut scientific cruises), the scientific

objectives of the Marmara node of Esonet, the MarmaraDM observatory demonstration mission and the Marmesonet cruise, planned for 2009.

The scientific question underlying the Esonet observatory project in the Sea of Marmara is whether fluid expulsion is influenced by physical and chemical processes occurring at the depth of the seismogenic zone. Brackish water, brines, gas and oil are expelled through the seafloor and sustain cold seep ecosystems and carbonate precipitation. Marnaut cruise brought evidence that gas expulsion sites are generally located on deep rooted tectonic structures and that several of them involve relatively deep fluid sources (T > 120°C – z > 4 km), originating near the upper limit of the seismogenic zone. The distribution of gas emission sites may also relate with the history of earthquake slip. Remarkably, the Kumburgaz fault segment has few gas seeps and did not rupture for the last 240 years.

The primary goal of deploying long term instrumentation is thus to investigate temporal relationships between seismicity and fluid emission. During Marnaut, a mini network of 4 OBSs and a piezometer were deployed for 3 months at a fluid emission site in the Tekirdag basin. 7 flowmeters and osmosamplers (from Scripps Institution of Oceanography, San Diego) were deployed for one year at this site, as well as at two others on the Western High and in Çinarcik basin. More deployments of similar instruments are planned (Marmara Demonstration Mission and Marmesonet cruise). Instruments for acoustic monitoring of gas seeps are under development at Ifremer and new site surveys are planned: systematic mapping of gas emission sites using multibeam sonar data and AUVs, AUV microbathymetry, and HR seismic imaging of fluid conduits. Other objectives of MarmaraDM are to involve Turkish authorities, notably for public outreach and education and for fund raising, and to integrate resources and expertise at EU level.

3. R. Person presents ESONET, a European Network of Excellence active from March 2007 to February 2011. The goal of Esonet is the conception, demonstration and implementation of seafloor observatories for geohazards, global change and biodiversity. Eleven key sites were designated: Arctic, Norwegian Margin, Nordic Sea, Porcupine basin, Azores, Iberian Margin, Ligurian Sea, Eastern Sicily, Hellenic trenches, Sea of Marmara and Black Sea. Cables exist at neutrino telescope sites (Antares near the Ligurian margin, Eastern Sicily, Hellenic trench) and at an additional, shallow water site in Denmark. Esonet comprises 50 partners.

   ESONET main issues are:

   i. Standardization of procedures for data collection & transfer processing, data dissemination & exchange format, data processing & quality control
   ii. Definition of an Esonet label to guarantee data quality, accessibility, long term measurements and open access to new sensors
   iii. Regional implementation by Regional Legal Entity (RLE)
   iv. Definition of a permanent structure linked to RLE

   RLE comprises scientists, end users and one Esonet representative (e. g. Namik Cagatay, ITU, for Turkey). Objectives of RLEs are i) define scientific objectives of the observatory, ii) organize programs to collect complementary data, iii) propose an implementation plan of the observatory with the support of ESONET technical groups, iv) lobby to find regional, national and international funds, v) identify tools (ships, ROVs, submersibles,..) which could be used for deployment and maintenance, vi) identify and apply the legal context for implementation.

4. P Favali presents EMSO (European Multidisciplinary Seafloor Observatory), which is one of the 35 new large Research Infrastructures defined in the European Strategy Forum for Research Infrastructures (ESFRI) report (Sept 2006). The objectives of the EMSO preparatory phase (2008-1012) are :
   i. To establish the governance entity for the EMSO: infrastructure serving scientists and stakeholders in and outside Europe for long-term deep water observations and investigations
   ii. To enable the deployment of the infrastructure and its long-term management, including the solution of technical bottlenecks
   iii. To promote the catalytic process and synergic effort at EC and national levels, coordinating and harmonising all available resources.

EMSO-PP participants are 12, one per country involved, eight of them are ESONET core partners. The participants do not all have an observatory status (e.g. Ifremer), their role is coordination and representation for their country. They will have to work directly with ministries and funding agencies. ITU-EMCOL is the Turkish participant. The EMSO structure will comprise the Regional Legal Entities and a single coordination entity (CLE-Core Legal Entity). Incentive funding will come from the European Commission, but the Member States, and other stakeholders (e.g. industry) will have to cover most of the cost of observatory implementation and maintenance. However, the EIB (European Investment Bank) can provide long term, low interest, loans for up to 50% of the costs.

5. Discussion

5.1 Gülay Altay reminds that the KOERI observatory project was planned before ESONET was launched and funded independently of ESONET/EMSO. It should remain an independent project run exclusively by KOERI. Gülay Altay also points out that communication should be improved between ESONET partners.

5.2 Roland Person and Paolo Favali remind that in practice, the main Turkish institution involved in Esonet and EMSO in the Sea of Marmara are ITU, DEU (Izmir), and KOERI, ITU being coordinator. Main institutions involved in other countries are Ifremer and CNRS in France, ISMAR and INGV in Italy, SCIO in USA, but this list is not exclusive. Although Tubitak MRC was not involved in ESONET NoE, it joined the Marmara-DM project as associated partner through ITU. GFZ in Germany, is not an ESONET partner either but its participation to Marmesonet cruise is considered if all other parties agree.

5.3 Pierre Henry points out that the monitoring of fluid processes does not require a real time cable connection at this stage (see § 5.5.5 here below). Existing instruments are autonomous, although a cable connection could be considered in the long term (2011 and beyond).

5.4 Once the points above are well understood, there should remain no obstacle to exchange of information and to collaboration on scientific as well as technical issues.

5.5 Hence, meeting participants readily identify several possibilities of interaction :

5.5.1 Instrument location. The KOERI observatory offshore site locations are not final. They could be refined taking into account all technical constrains and scientific objectives. Marmesonet/MarmaraDM sites are also subject to discussion. The high resolution seismic and high resolution bathymetric data that will be collected with R/V le Suroit hopefully in 2009 could be used to optimize the implementation of the cabled observatories.

5.5.2 Cruises. Participation of KOERI to future research cruises is open (but, of course, limited by the number of bench on ships).

5.5.3 Data sharing. Data from KOERI seismic network are public. Data and results acquired by ESONET are available to KOERI, which is a partner.

5.5.4 Observatory concepts. Currently, monitoring of slope instability is neither included in the KOERI project, nor in MarmaraDM. This objective is potentially important, but the monitoring strategy still needs to be defined.

5.5.5 Future observatory design and maintenance. Ideally, a port might be left open on the KOERI instrumental package for connecting EMSO instruments in the future. As the KOERI system is still under development, the KOERI partners kindly accept - upon ESONET request - to ask Guralp (which is developing the sensor and data logger package), and the Turkish company (name ?) which is developing the instrument-cable interface if this is feasible with minimal consequences.

5.5.6 KOERI is invited to participate to the Marnaut post-cruise and MarmaraDM kick off meeting, which will take place week 25 (June 16-20) in Istanbul. It is also proposed that KOERI invites Guralp and/or Turkish company (name ?) to join the meeting.

APPENDIX II

SEA OF MARMARA SESSION
The Geological Congress of Turkey
26 March, 2008, Ankara

Session Conveners: Namık Çağatay, Naci Görür and Celal Sengör

1. A.M.C. Şengör: Recent tectonics and paleogeography of the Marmara Sea

2. P. Henry, T.A.C Zitter, X. Le Pichon, A.M.C. Sengor, N. Gorur, N. Cagatay, L. Gasperini, L. Geli, M. D. Tryon, B. Mercier de Lepinay, and the Marnaut Scientific Party: Manned submersible observations at cold seeps in the North Anatolian Fault zone, Sea of Marmara. .

3. L. Geli, P. Henry, S. Dupré , D. Volker, T. Zitter, X. Le Pichon, M. Tryon, N. Çağatay and the Marnaut Scientific Party: Acoustic detection of gas emissions within the submerged section of the North Anatolian Fault zone in the Sea of Marmara.

4. Naci Görür, Celal Şengör, Namık Çağatay, and the Marnaut Scientific Party, Geological observations of the Marnaut dives north of the Çınarcık Basin and their implications.

5. N. Çağatay, Ü. Sancar, P. Henry, L. Gasperini, M. Tryon, D. Dikçe, and the Marnaut Scientific Party: Aktif Marmara Fayı Boyunca İzlenen Siyah Sülfidli Zonların Kökeni ve Tektonik ve Paleosismolojik Açıdan Önemi

6. Mustafa Ergin, Alper Sakitaş: Sediment Mass Flows On The Slopes Of The Çınarcık Basin (Eastern Marmara Sea)

7. Engin Meriç, Doğan Perinçek, Niyazi Avşar, Atike Nazik, Fulya Yücesoy-Eryılmaz, İpek F. Barut, Mutlu Özdoğan, Feyza Dinçer: Determination of environmental pollution of Yenikapı (Southern Istanbul) ancient coastline between 5th and 12th centuries using benthic foraminifera.

8. Füsun Yiğit-Faritfathi, Mustafa Ergin: Manganese Distribution in Deep Sea Sediments from the Tekirdağ Basin

APPENDIX III

Doğu Akdeniz Oşinografi ve Limnoloji Araştırmaları Merkezi
Eastern Mediterranean Centre for Oceanography and Limnology
İstanbul Teknik Üniversitesi

10 Temmuz 2008

Maden Tetkik ve Arama
Genel Müdürlüğü
06520 Ankara

Bilindiği gibi, Marmara Denizi, AB 6.Çerçeve ESONET NoE projesi (European Seafloor Observatory Network) tarafından depremsellik ile ilgili deniz çalışmaları için önemli bir araştırma alanı olarak seçilmiştir. Bu projenin Marmara denizi ayağı ile ilgili ilk çalıştayı İTÜ-EMCOL'de 16-18 Haziran 2008 tarihlerinde yapılmıştır. İkinci çalıştay IFREMER'de (Fransız Deniz Araştırmaları Estitüsü'nde, Brest, Fransa) 29-30 Ekim 2008 tarihlerinde yapılacaktır. Bu çalıştayda gelecek iki yılda Marmara Denizin'de yapılacak deniz tabanı gözlemleri ile ilgili deprem araştırmalarının ayrıntılı planlaması gerçekleştirilecektir. Aynı konu ile ilgili olarak benzer amaçlı bir toplantı da "2nd Euro-Mediterranean International Symposium"adı altında İtalya'nın Messina kentinde yapılacaktır. Bu toplantıda Marmara Denizi ile ilgili bir oturum planlanmaktadır.

Anılan toplantıların nihai amacı Marmara Denizi'nde deprem araştırmalarına yönelik çok parametreli ve gerçek zamanlı veri elde edebilen deniz tabanı gözlem istasyonlarının kurulmasıdır. Ülkemiz açısından hayati öneme haiz olan bu faaliyetlerin MTA Genel Müdürülüğü'nün ilgi alanına girdiği gerçektir. Bu nedenle kurumunuzun ortak bir proje kapsamında İTÜ-EMCOL ile birlikte anılan faaliyet ve projelerde yeralması arzu edilmektedir. Yukarıda belirtilen toplantılara birlikte katılımın uygun olacağı mütalaa edilmektedir.

Bilgilerinize saygılarımızla arz ederiz.

Prof.Dr. Namık Çağatay
İTÜ-EMCOL Müdürü
ve AB 6. Çerçeve ESONET
Projesi Yönetim Kurulu Üyesi

Prof.Dr. Naci Görür
Genel Koordinatör

EMCOL, İTÜ Maden Fakültesi, 34469 Maslak, İstanbul
Tel: 90-212-2856211, Fax: 90-212-285

APPENDIX IV

TARTIŞMA - EDİTÖRE MEKTUP

Marmara Denizi Çalıştayı sonuçları

Prof.Dr. Namık Çağatay, İTÜ, Doğu Akdeniz Oşinografi ve Limnoloji Araştırmaları Merkezi (EMCOL) Başkanı ve ESONET (European Seafloor Observatory Network) Projesi Yönetim Kurulu Üyesi

İstanbul Teknik Üniversitesi Doğu Akdeniz Oşinografi ve Limnoloji Araştırmaları Merkezi (İTÜ-EMCOL) tarafından 16-18 Haziran tarihlerinde deprem araştırmaları ile ilgili "Marmara Denizi Çalıştayı" yapıldı. Bu çalıştayda, geçen yıl 12 Mayıs – 11 Haziran tarihleri arasında MARNAUT projesi kapsamında L'Atalante gemisi ve Nautil insanlı denizaltısı ile elde edilen veriler ile; sıvı, gaz, çamur ve karbonat örneklerinin analiz sonuçları sunuldu, tartışıldı ve bundan sonra Marmara Denizi'nde yapılacak deprem araştırmalarının planlanması ve egşüdümü yapıldı.

Geçen bir yıl içerisinde yapılan gözlem ve araştırmaların sonuçlarını şu şekilde özetleyebiliriz:

1. Kuzey Anadolu Fay zonunun Marmara Denizi altında kalan bölümünde, bir bölge hariç, yoğun sıvı ve gaz çıkışları görülüyor (Şekil 1). Batı ve Orta Marmara Denizi'nde çıkan gazlar yüksek miktarda Helyum-3 ve termal metan içermekte olup, derin kökenlidir ve fay kırıklarını kullanarak yüzeye ulaşmaktadır (Geli v.d., 2007; Zitter v.d., 2008).

2. Fay boyunca gaz çıkışlarının görülmediği tek bölge, İstanbul'da Adaların GB'sından, batıda Silivri güneyinde Orta Çukurluğa kadar uzanan fay parçasıdır (Şekil 1). Bu bölgede izlenen tek gaz çıkışı fay üzerinde olmayıp; fayın güneyinde bir antiklinal (kıvrım) yapısı ile ilgilidir. Bu kesim, uzun süredir sismik bir suskunluğun yaşandığı ve 1766'dan beri büyük bir depremin oluşmadığı sismik bir boşluğu temsil etmektedir. Tüm bu veriler, büyük olasılıkla bu kesimde Anadolu/Avrasya levha sınırının kilitlenmiş olduğuna işaret etmektedir.

3. Sıvı ve gaz çıkışları ile depremsellik arasında bir ilişkinin bulunduğu çok kuvvetli bir olasılıktır. Bu ilişki, 1999 Kocaeli Depremi sırasında İzmit Körfezi'ndeki gözlemlerle de kanıtlanmıştır (Alpar, 1999; Kuşçu v.d., 2005).

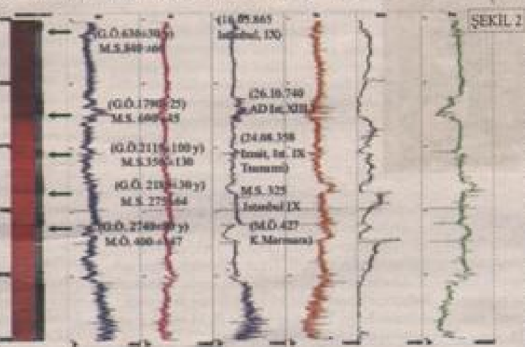
4. Bu ilişkiyi dikkate alarak, deniz altında fay boyunca çıkan gaz ve sıvıların miktar ve bileşimindeki değişimlerin fay etkinliği ile birlikte uzun süreli, kısa aralıklı ölçümlerle izlenmesi ve araştırılması için denizaltı gözlem istasyonlarına ihtiyaç bulunmaktadır.

5. Marmara Denizi tabanından "karotiyer" adını verilen örnekleyicilerle deniz tabanından aldığımız çamur istiflerinde eski depremlerin kayıtlarına ulaşabilmenin mümkün olduğu saptandı (Çağatay v.d., 2008; Şekil 2). Bu kayıtların analizi ve radyokarbon yöntemi ile yaşlandırılması ile Marmara Denizi'nde, değişik fay parçaları üzerinde, tarih ve tarih öncesi dönemlerde oluşmuş depremler konusunda bilgilere ulaşmamız mümkün. Bu bilgilerin elde edilmesi, deprem riski değerlendirmeleri açısından önemli. Bundan sonra Marmara-ESONET projesi kapsamında yapılması planlanan çalışmaları iki ana başlık altında toplayabiliriz:

A. Marmara Denizi'nde Batı Sırtı (Marmara Ereğlisi ve Marmara Adası arasındaki kesim), Orta Sırt (Çekmece güneyi), Çınarcık Çukurluğu doğusunda ile İzmit Körfezi basınında (Gebze güneyi) olmak üzere üç bölgede 12-18 ay süre ile depremsellik ve gaz-sıvı çıkışları ile ilgili deniz tabanı gözlemlerinin yapılması planlanmakta. Bu bölgelerde gözlem ve ölçüm için seçilecek uygun noktaların hangisi olacağına 2009 İlkbaharında Piri Reis (DEÜ) ve Urania (CNR-İtalya) gemileri ile yapılacak etüdlerden sonra karar verilecek.

B. Gözlemlerin yapılacağı üç istasyonda; gözenek suyu basıncı ölçen piezometre (Şekil 3), sıvı çıkışlarını ölçen ve zaman serisi oluşturarak örnekleyen akışkan metre (flowmeter)-ozmometre (Şekil 4) ile küçük depremleri kayıt eden deniz tabanı sismometresi, metan, oksijen, hidrojen sülfür, türbidite, sıcaklık, tuzluluk ve basınç ölçen sensörleri içeren SN-4 istasyonu gibi cihaz sistemleri kullanılacak. Ayrıca İzmit Körfezi batısında bir radon ölçen cihazın yerleştirilmesi düşünülüyor. Cihazların yerleştirilmesi Le Suroit (Fransız) ve Urania gemileri ile 2009 yaz-sonbahar aylarında yapılacak.

Marmara Denizi'nde Siyah çizgi halinde gösterilen aktif fay zonu boyunca echosounder ile soğuk akışkan çıkışları (cold seep) araştırılmıştır. Bu etüdler sonucu akışkan çıkışlarının olabileceği yerlerde Nautil denizaltısı ile doğrudan gözlemler yapılmıştır. Haritada Nautil gözlemleri sonucu bulunan akışkan çıkışları kırmızı; akışkan çıkışlarının olmadığı yerler beyaz nokta ile gösterilmiştir. Çekmece-Silivri güneyi arasındaki fay parçası üzerinde akışkan çıkışı izlenmemiştir. Büyükçekmece açıklarındaki tek akışkan çıkışı fayın üzerinde değil, güneyinde yer almaktadır (Geli v.d., 2007).



İzmit Körfezi karotunun bir bölümünden elde edilen eski depremlerin çökel kayıtları ve tarihsel kayıtlarla deneştirilmesi. Bu kayıtlara göre son 2400 yılda İzmit Körfezi odaklı 9 büyük deprem oluşmuştur (Çağatay v.d., 2008). Analizler, XRF karot tarayıcı ile yapılmış ve çökellerde yaşlar radyokarbon yöntemi ile elde edilmiştir.

Deniz tabanında akışkan miktarındaki değişimleri ölçen ve zaman serisi örneklemesi yapan akışkanmetre-ozmometre (flowmeter-Osmometer). Bu sistem M. Tryon tarafından Scripps Oşinografi Enstitüsünde (ABD) geliştirilmiştir.

Piezometre: 15 metreye varan uzunluktaki boru üzerinde 5 basınç sensörü vardır. Sensörlerin her biri üstteki hidrostatik basınçla gözenek suyu basıncı arasındaki farkı ölçmektedir.

İKİ AMAÇ

Deneme özelliğindeki bu etüdler ile 12-18 ay sürecek gözlemlerin sonuçları analiz edilerek, başlıca şu amaçlara ulaşılmaya çalışılacak:

1.Marmara Denizi tabanında özellikle depremle ilişkili en etkili izlemenin yapılabileceği sürekli gözlem istasyonları için uygun yerlerin tesbit edilmesi, ve

2.Depremsellikle ilişkili en uygun parametrelerin saptanması, bunları gerçek zamanlı ve sürekli ölçen gözlem istasyonlarının tasarlanması.

Denizaltı deprem araştırmaları ile ilgili bu tür denemeler ve gözlemler dünyada henüz yeni olup, bu çalışmalarda en son teknoloji cihaz ve cihaz sistemleri kullanılacaktır. Tasarlanacak sürekli gözlem istasyonlarından elde edilecek verilerden Marmara depremi ile ilgili ön uyarıcı sinyallerin elde edilmesi hedeflenmekte.

Kurulacak sürekli gözlem istasyonları; denizdeki deprem, yamaç kayması ve tsunami gibi doğal afetler yanında; oşinografik, derin deniz ekosistemindeki değişimler, iklim değişimi ve buna bağlı deniz-atmosfer etkileşimi gibi değişik disiplinlerle ilgili önemli bilgiler de sağlayacak.

Yukarıda bahsedilen deneme etüdleri ve gözlemleri; AB Çerçeve Programı ESONET projesi kaynakları yanında, Fransa ve İtalyan Ulusal Bilim Kurumlarından (CNRS ve CNR) sağlanacak kaynaklarla yürütülecek. Çok parametreli ve gerçek zamanlı veri elde edebilen daimi gözlem istasyonlarının kurulması ve işletilmesi ise ancak ulusal kaynaklarla mümkün olabilecek.

Hayati öneme sahip bu konuda, gerek deneme aşamasında ve gerekse ilerdeki daimi gözlem istasyonlarının oluşturulması sırasında başta yetkili devlet yöntecilerimiz olmak üzere, TÜBİTAK, DPT ve MTA gibi ilgili resmi makamların gerekli ilgi, lojistik destek ve proje kaynağını yeni oluşturulacak bir "ulusal deniz araştırmaları stratejisi" kapsamında sağlaması önem ve ivedilik arz etmektedir.

Kaynaklar: Alpar, B. 1999. Underwater signatures of the Kocaeli earthquake (August 17th 1999). Turkish Journ. Mar. Sci. 5: 111-130.

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CBT 1114 / 21 | 25 Temmuz 2008

DEPREM

Marmara'da depremle ilgili deniz altı araştırmaları sonuçları

16–18 Haziran 2008 tarihleri arasında İTÜ-EMCOL (Doğu Akdeniz Oşinografi ve Limnoloji Araştırmaları Merkezi) tarafından düzenlenen çalıştayda geçen yıl mayıs-haziran aylarında L'Atalante gemisi ve üzerindeki Nautile denizaltısı ile yapılan araştırmaların sonuçları tartışıldı. İşte sonuçlar... *Prof. Naci Görür*

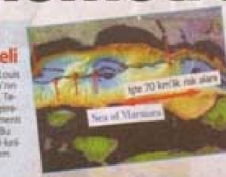
ÇALIŞTAY

AKŞAM — GÜNCEL

Marmara Denizi'nde 70 kilometrelik tehlike

Tuzla'ya kadar olan kesim tehlikeli

FRANSA'DAN gelen bilim adamı Louis Geli de şu bilgileri verdi: "Marmara'nın batısı ve Tuzla'ya kadar olan kısım, Tekirdağ Çukurluğu dikkat edilmesi gereken yerler. Çekmece-Silivri fay segmenti üzerinde gaz çıkışları görülmüyor. Bu kısmın kilitlendiği ve 1766'dan beri kırılmamış olduğu düşünülüyor. Deprem gaz çıkışı arasında ilgi var."



İstanbul depremi için kötü haber. Prof. Çağatay, Marmara Denizi'nin orta bölümünde 70 kilometrelik faydan gaz çıkışı olmadığını belirterek, "Bu, fayın kırılmamış olduğu ve enerji biriktirdiği anlamına gelir" dedi

Marmara Denizi Çalıştayı'na Prof. Naci Görür, Prof. Namık Çağatay ile Fransız ve İtalyan bilimadamları da katıldı.

Erdinç AKKOYUNLU / İSTANBUL

İstanbul Teknik Üniversitesi (İTÜ) Maden Fakültesi Öğretim üyeleri Prof. Dr. Naci Görür ve Prof. Dr. Namık Çağatay ile Fransız ve İtalyan bilim adamlarının yer aldığı "Marmara Denizi Çalıştayı" dün başladı.

İTÜ Maden Fakültesi'nde düzenlenen çalıştaya katılan bilim adamlarıyla bir basın toplantısı düzenleyen Prof. Görür ve Prof. Çağatay, geçen yıl MARNAUT projesi kapsamında L'Atalante gemisi ve Nautil denizaltısı ile yaptıkları çalışmaları değerlendirdi. Denizaltının dalışı sırasında faya çeşitli ölçüm cihazları yerleştirdiklerini belirten Prof. Görür, "Bu cihazların verilerini değerlendireceğiz" dedi.

Prof. Görür, Adalar'ın güney batısından başlayıp orta Marmara çukurluğuna kadar yaklaşık 70 kilometrelik fay hattında gaz ve sıvı çıkışı tespit etmediklerini belirterek, şöyle dedi: "Muhtemelen bu bölüm çok riskli. Orta Marmara çukurluğu ile Tekirdağ arasında, doğuda ise Çınarcık çukurluğunda gaz ve sıvı çıkışları görülüyor. Arada bir sismik boşluk var. Bu gaz ve sıvı çıkışlarını izlemek olası depremler açısından önemli. Marmara'da senaryolara göre depremin 7, 7.4, 7.6 büyüklüğünde olması bekleniyor."

ORTA MARMARA'DA TEHLİKE

Prof. Namık Çağatay ise faydan gaz çıkışı ile deprem arasında bir ilişki bulunduğunu belirterek, kötü haber verdi: "1999 depreminden sonra Körfez Bölgesinde hâlâ gaz çıkışı olduğunu gördük; Marmara Denizi'nin batısı ve doğusunda da gaz çıkışları olduğu tespit edildi. Gaz çıkışları fayın kırıldığı yerde meydana geliyor, fakat Orta Marmara'da 70 kilometrelik bölüm boyunca gaz ve akışkan çıkışı olmadığını gözlemledik. Bu da demek ki sözü edilen bölgede bir sıkışma ve bir enerji birikimi var. Bu konunun iyice araştırılması için denizaltı gözlem istasyonu kurulması gerekli."

BALIKESİR'DE 4'LÜK DEPREM

Öte yandan, Balıkesir'de dün akşam saat 18.49'da 4 büyüklüğünde deprem meydana geldi. Merkez üssü Dursunbey olan depremde can ve mal kaybı yok.

Allah copunuzu keskin etsin

INTERNETTE binlerce kişinin üye olduğu Facebook'ta polis olduğunu söyleyen bazı kişilerin dilek ve temennileri dikkat çekti. Yeni Harman dergisinin son sayısında yayınlanan derlemede Facebook'ta gerçek isimleriyle haberlere yorum yapan polislere yer verildi. Bir grup üyesi şöyle diyor: "Biber gazı sıkmakla adil davranmıyorsunuz; bence bunlara direk mermi sıkacaksınız; hem de kafalarına, tek tek. Hem nüfus planlamasına katkı olur hem de ülke pisliklerden temizlenmiş olur." Bir grup üyesi "Yanlış kişilere müdahale edildi" diyor ve devam ediyor "Önce basının hakkından gelinecekti" Bir başka polis ise 1 Mayıs için "Metropol Aslanları; gazınız mübarek olsun. Allah copunuzu keskin, gazınızı bol eylesin" diye dua etmiş.

APPENDIX V

ESONET-MARMARA WORKSHOP

PROGRAMME

Venue: İhsan Ketin Conference Hall in Faculty of Mining building, ITU Maslak Campus

Monday, 16 June 2008

MORNING SESSION

Tectonics

9:30 - 10:00 Opening
10:00-10:30 Naci Görür and Namık Çağatay: Tectonic and paleogeographic evolution of the Sea of Marmara
10:30 - 11:00Luca Gasperini: The 1999 surface rupture: what we think after MARNAUT.

11:00 – 11:30 Coffee break

11:30 – 12:00 Mustafa Ergun: General tectonics of the Marmara Sea deduced from gravity and tectonic data.

12:00 – 12:30 Günay Çifci: Geophysical studies offshore Ambarlı-Silivri in the Sea of Marmara.

12:30 – 14:00 Lunch break

AFTERNOON SESSION

Slope stability and fluids
14:00 – 14:30 Jean-Luc Charlou : Geochemical analysis of gas hydrates and gas sampled with PEGAZ
14:30 – 15:00 Sinan Özeren: Slope Stability issues in the Sea of Marmara under the light of Marnaut and possible projections for the future work
15:00–15:30 Tiphaine Zittter: Relationships between fluid seepage and mass movement deposits in the Sea of Marmara".

15:30-16:00 Coffee break

Cold seeps, fluids, carbonate crusts

16:00–16:30 Pierre Henry: Cold seeps in the Sea of Marmara and their relationships with
active faults.
16:30 – 17:00 Mike Tryon: Pore fluid chemistry of Sea of Marmara cold seeps
17:00–17:30 Louis Géli: MARNAUT heat flow data

Tuesday, 17 June 2008

MORNING SESSION

9:30–10:00 Bernard Mercier de Lepinay: Detailed structure and deformation of superficial
sediments on the deep basins of the Sea of Marmara: Implications for fluid
circulation.
10:00 - 10:30 Sylvain Bourlange and Pete Burnard: Helium isotope evidence for a deep
source of fluids on the Marmara Fault.
10:30 – 11:00 Jean-Luc Schneider: Some characteristics of the Late Quaternary co-seismic
sedimentation in the deep basins of the Sea of Marmara".

11:00 – 11:30 Coffee break

11:30 – 12:00 Namık Çağatay: Sedimentary records of earthquakes in the Sea of Marmara

12:00 - 12:30 Catherine Pierre and Nicolas Chevalier: Mineralogy and isotope geochemistry
of the carbonate crusts.

12:30 – 14:00 Lunch break

AFTERNOON SESSION

14:00-14:30 Jean-Baptiste Tary: Preliminary results from the OBS data
14:30-15:00 ChristosTsabaris: In-Situ radon progeny measurement on Submarine Faults
15:00-15:30 Cemil Gürbüz: Seafloor observatory project in the Marmara Sea: Land and
seafloor observation stations.

Wednesday, 18 June 2008

ESONET Marmara-DM Project: Kick-off meeting

Whole day: Starting at 9:30

Issues to be discussed:

1) Project objectives
2) Observation sites
3) Site surveys
4) Sensors and instruments to be deployed
5) Cruise planning
6) Tasks and responsibilites

APPENDIX VI

MarmaraDM Kick Off Meeting
ITU, June 18, 2008.

Participants
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Context:

The MarmaraDM kick off meeting took place at İhsan Ketin Conference Hall in Faculty of Mining building, ITU Maslak Campus in Istanbul after the post-cruise meeting of the Marnaut cruise (held June 16-17 at the same place). Marnaut is a cruise of RV Atalante with manned submersible Nautile, which took place May 12-June 12, 2007. General information on this cruise and related projects can be found at http://www.cdf.u-3mrs.fr/~henry/marmara/

Meeting Report:

1) Project objectives

Louis Geli presents the initial projects objectives: MarmaraDM is a Demonstration Mission funded by the ESONET European Network of Excellence, with its end goal being the implementation of permanent seafloor observatories in European seas, including the sea of Marmara. As a demonstration mission, MarmaraDM can only cover part of the expenses related to the seafloor observatory operations. The initial description of MarmaraDM is available at:
http://www.cdf.u-3mrs.fr/~henry/marmara/public/MarmaraDM_13200.pdf
The initial objectives of MarmaraDM were:
1. To characterize the temporal and spatial relations between fluids and seismic activity in the Marmara Sea (MS)
2. To test the relevance of long-term seafloor observatories for an innovative monitoring of earthquake related hazards
3. To propose the technological option (cable, buoys, etc) that is the most adapted for the Sea of Marmara
4. To involve the local authorities in Turkey ; public outreach and education ; fund rising
5. Integration of existing resources at national and EU level

The Marmara Sea Bottom Observatory (MSBO) project of KOERI is funded independent of the ESONET. However, coordination with MSBO is essential for the objectives of MarmaraDM and a meeting was organized at KOERI March 28, 2008. The meeting report is available at:
http://www.cdf.u-3mrs.fr/~henry/marmara/public/rapport_KOERI_ESONET_final.doc)
The implementation of MSBO has obvious implications for the choice of technological option (objective 3). However, the most adapted technological option may depend on the type of parameter to be measured (e.g.: hydrogeochemistry vs. seismology).

Aside from the main objectives, other issues will have to be considered in the science plan:
–Slope instability and their consequences, with obvious implications for the societal impact.
–Tectonic evolution of the Sea of Marmara fault system, as good understanding of this aspect will be essential for the interpretation of fluid processes and seismic activity.

2) Information on cruise planning

a)R/V Le Suroît cruise Marmesonet will most likely be scheduled in the second half of 2009.
The cruise proposal is available here:
http://www.cdf.u-3mrs.fr/~henry/marmara/public/MARMESONET.pdf
Le Suroît is a 55 m ship operated by Ifremer/Genavir, offering 13 berths for both scientists and technical team. The cruise will comprise three parts:

Part 1 (21 days): EM 300 for the detection of bubble emissions. AUV for micro-bathymetry, chirp and EK-60 bubble detection.

Part 2 (14 days): High resolution seismics: 3D survey at one site

Part 3 (5 days): Instrument deployments

b)R/V Piri Reis: 10 days of survey will be funded by MarmaraDM in 2009, comprising

-HR resolution seismics

-Deep tow chirp

The cruise plan still needs to be defined with DEU / Izmir University

3) Instrumentation

a)Available instruments

-OBSs: Ifremer can provide 12 OBSs, 6-8 OBS from Scripps IO will be requested by Mike Tryon in a collaboration with LeRoy Dorman. Additionnally SN-4 INGV station comprises a broad band three component seismometer.

-Piezometers: Ifremer can provide 6 piezometers.

-Flowmeters: ScrippsIO flowmeters will be integrated into the base of the OBSs (as previously done for on the Costa Rica margin (Brown et al., 2005). 8 instruments should be available, as all instruments deployed during Marnaut were recovered in good conditions.

-SN4 Station comprises seismological, environmental, and hydrochemical sensors (see Table 1). Deployment methods impose depth limitations. On Urania, Camera assisted deployment is possible down to 200 m water depth. ROV assisted deployment is possible down to 600 m water depth.
The hydrochemical sensors used (Methane and Oxygen) would be best used at a site with relatively low background activity (e.g. black patches without visible bubble emissions) as the dynamics of bubble emissions will make measurements more difficult to interpret.

-A system for acoustic monitoring of bubble emissions, based on a scanning sonar with a range of about 100 m is currently under development at Ifremer. A prototype should be available for deployment during Marmesonet.

b) Koeri instruments
The KOERI plans to deploy 5 cabled seafloor seismological stations in 2009 equipped with 3 component accelerometers and broadband seismometers. The preliminary coordinates are given in Table 2 and locations in Figure 1.

c) Additional instruments
-Hydrophones: Monitoring of bubble emissions with hydrophone is a technique which may be tried at strong bubble emission sites such as Boris Bubbler, the western high and the central high.
-Hydrochemical sensors. Hydrochemical sensor stations are currently only available for one site through the SN4 deployment. At least two others (one per observatory) would be needed. A submarine radon monitoring instrument equipped with an acoustic release system could also be deployed and tested at a shallow site (<400 m depth). Improvement of methane sensors is also needed, as these do not provide quantitative information yet.
-Lapse cameras would be a useful tool to monitor the most active gas seeps as well as brackish water seeps. In the long term these could also monitor the growth of carbonate chimneys. Such devices are available from biologists.

Table 1 – SN4 Payload

Sensor	*Mfr. & model*	*Sampling rate*
Seismometer	**Guralp CMG-40T**	**100 Hz**
Hydrophone	**OAS E-2PD**	**100 Hz**
Current meter	**Nobska MAVS-3**	**5 Hz**
CTD	**SeaBird SBE-16plus**	**1 sample/10 min**
Turbidimeter	**Wet Labs Echo-BBRTD**	**1 sample/10 min**
CH_4 #1	**Franatech METS**	**1 Hz**
CH_4 #2	**Contros HydroC**	**1 Hz**
Oxygen	**Aanderaa Oxygen Optode 3830**	**1 Hz**

Table 2 – Currently planned coordinates of the KOERI seafloor observatories

Location	**Latitude**	**Longitude**	**Distance to land (km)**	**Depth(m)**
North of Yalova (SBO1)	40.7403	29.1806	9	1200
South of Yesilkoy (SBO2)	40.8548	28.8589	11	600
South of Çorlu (SBO3)	40.8571	28.0849	16	1000
South of Tekirdağ (SBO4)	40.7625	27.6752	12	550
North of Imrali Island (SBO5)	40.6535	28.5874	10	400

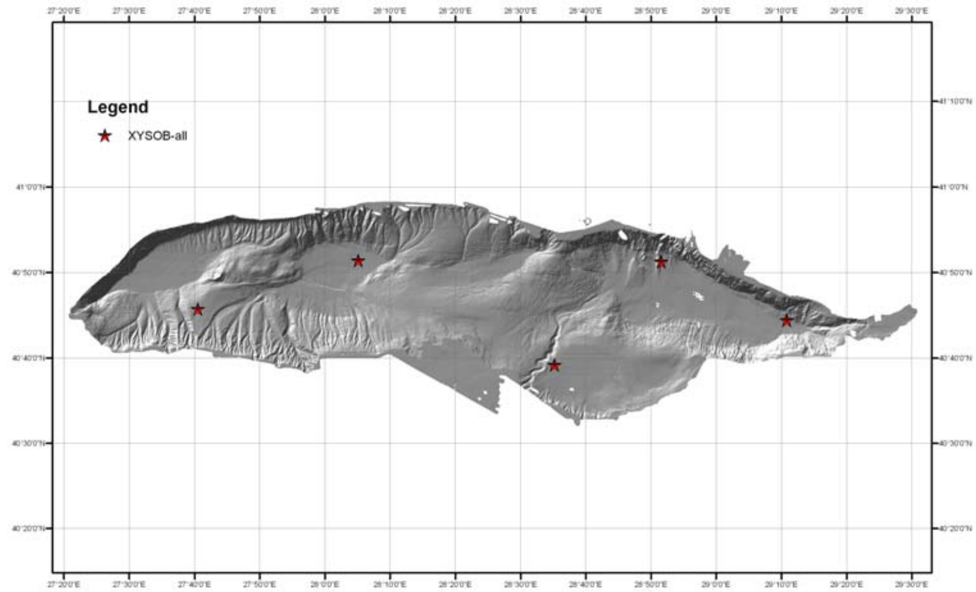

Figure 1: Currently planned locations of the KOERI seafloor observatories

4) Observatory sites

Three sites were broadly defined in the MarmaraDM proposal: one in the Tekirdag Basin area, one on the Central High SW of Istanbul, one in the Cinarcik area. Schematically, the Tekirdag observatory and the Cinarcik observatory will monitor the rupture tips of previous earthquakes (Ganos 1912 and Izmit 1999) also corresponding to zones of active microseismicity. The Istanbul observatory will be seated on the Kumburgaz and central basin seismic gap, where microseismic activity is low.

The deployment of OBS should be coordinated between Ifremer and SIO, keeping in mind that 6 of the SIO OBSs will be equipped with flowmeters. One strategy could be to combine the 20 OBSs in a single network covering the whole Sea of Marmara. As the instruments will be deployed from the ship, the purpose of the flowmeters will be to monitor background flow and strain. The OBSs equipped with flowmeters as well as the stand-alone flowmeters should preferentially be deployed in zones where strain concentration is expected based on geological evidence. These should not be deployed next to gas vents or brackish water chimney sites because these systems have intrinsic time variability and results will be difficult to interpret as the precise location of the instruments with respect to the emission sites will not be known. An array of SIO OBS with flowmeters could be deployed at one of the observatory sites (e.g. the Cinarcik observatory). Recovery of all flowmeters deployed during Marnaut took place June 19-20. Preliminary results from the Marnaut deployment will be very useful for the planning of the next deployment.

Instruments for monitoring fluid parameters should be deployed at known sites. Sites explored with the Nautile are shown in Figure 2 and numbered 1 to 18.

-SN4 should preferentially be deployed at relatively shallow depths because of operational constraints.

Primary site is Site 18 at 190 m depth at the bottom of a canyon near the entrance of the Izmit Gulf. This site has advantages that the fault zone is well defined and that the crustal strain can be monitored with GPS land stations. One objection is that manifestations of fluid outflow are very limited at this site. A preliminary study to identify anomalies in the water column is recommended.

An alternate site is Site 10a on the central high at less than 400m depth. Most manifestations of fluid outflow are located on the anticlinal ridge south of the main fault trace. There is very little evidence for fluid emission along the fault trace itself.

A second alternate Site is Site 6a at 600-700 m depth. The context is similar but black patches appear more abundant on the fault trace and were mapped.

-The ifremer acoustic monitoring device should be deployed on a flat bottom at a site where bubble emissions occur through fractures, and ideally are associated with crustal microseismicity. Site 16 fits all requirements.

-Pete Burnard reported that Boris'Bubbler at Site 2 has very high $^{3}He/^{4}He$ ratio, implying a component of fluid migration from the mantle (70% of the Helium). This situation is exceptional in the Sea of Marmara and Boris'Bubbler should be designated as a monitoring site. Hydrophones and cameras are considered for monitoring the vigorous bubble emission at this site.

-Piezometers should be deployed in pairs (or more) in order to assess whether recorded anomalies are local (and possibly instrumental artifacts) or regional.
-On the highs comparing pressure variations in the fault valley and within gas outflow zones at the top of the anticlines could be performed by pairing piezometers at 6a and 6b, and/or at 10a and 10 b.
-In the basins, the western end of the Cinarcik Basin. GPS data suggest that strain rates have not relaxed to background values after the Izmit earthquake and this area is considered as the most likely zone of nucleation for the next earthquake (according to stress transfer models). Furthermore, we expect that at this location, slip on strike slip faults at a crustal level cause extensional strain in the sediment within the basin. This, and its consequence on fluid pressure can be computed from poroelastic models. This area has thus the best potential to yield understandable records, leading to quantitative modeling. Ideally, a transect of piezometer and flowmeters could be installed across the basin.

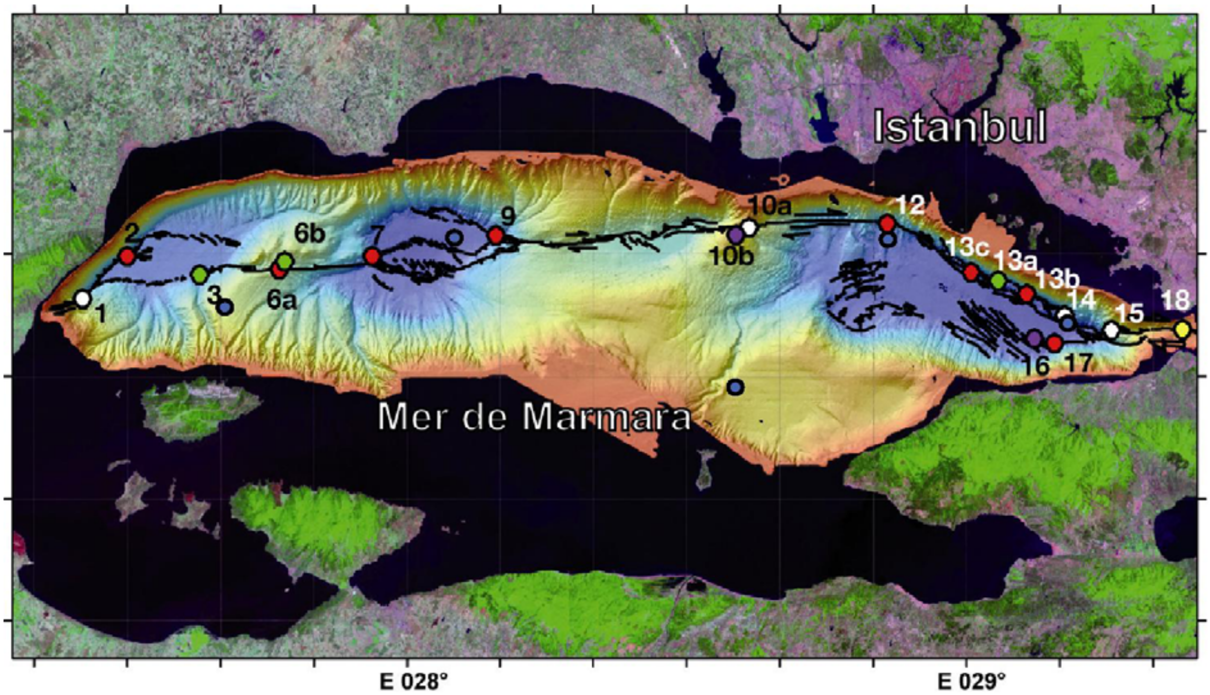

Figure 2: Location in the Sea of Marmara of sites explored with the Nautile submersible during Marnaut. White circles are sites with no manifestation of fluid outflow, all other sites have seafloor manifestations (bacterial mats, authigenic carbonates, water and/or gas emissions). Site 18 (yellow) is the site of INGV SN-4 deployment in the Gulf of Izmit. Sites 3, 6b and 13a (green) were instrumented during Marnaut. Sites 16 and 10b (purple) should be instrumented during MARMESONET in 2009. Blue dots are planned locations for KOERI Seafloor Stations.

A preliminary observatory layout can here be proposed based on the discussions

1) Cinarcik observatory
-6 OBSs with flowmeters + 2 OBSs without flowmeters
-Piezometers at 13b and 16
-Acoustic monitoring station at 16
-SN4 and Rn probe at 18 (provided a signal can be detected in the water column)

2) Tekirdag-Western High observatory:
-6 OBSs + 3 flowmeters
-Hydrophones at Site 2
-Lapse camera at Sites 2 and 3.
-Piezometers at 6a and 6b

3) Istanbul Observatory
-6 OBSs + 3 flowmeters
-Piezometers at 10a and 10b

5) Site surveys

Detailed site surveys should be performed around observatory sites to image fluid conduits and their relationships with structures. These surveys may be performed either by surface high resolution seismics or with broad band deep tow chirps (e.g. Ifremer SYSIF 250-1000Hz). Both systems can well image gas conduits in the sediment, deep tow systems have higher resolution but less penetration. Such surveys are required at each observatory site: Western High, Central High and Cinarcik Basin.

-The main objective of a Western High 3D survey would be to determine the nature of the conduits feeding the main hydrocarbon seeps several hundreds of meter northward of the main fault zone.
-The Cinarcik basin has dense MCS profiles from seismarmara cruise, Chirp data from Marmarascarps and Marnaut cruises as well as some HR coverage from Marmara Suroît cruise. However the imagery of gas migration pathways can be improved, either with a deep tow chirp or with surface HR. The relationships between landslides and faults near the entrance of Izmit Gulf may also be addressed with these tools.
-The Central High seeps are located on an anticlinal ridge south of the main fault zone. The Kumburgaz basin to the west and the transition toward Cinarcik basin to the east also appear as interesting targets where sediment deformation is not fully understood. A grid covering a wider area may thus be considered. Any dense survey in this area would require protection from coast guards.

-A 14 day 3D survey is planned during Marmesonet cruise, corresponding to a 10.8 by 3.6 km box.

-A 10 day cruise of Piri Reis funded by MarmaraDM could be used for a 3D survey (or a dense grid, details should be decided later).

-A proposal to survey a 3rd site with the Piri Reis should be submitted by DEU to the Turkish system for a cruise in 2009.

-Assuming Urania is used for the deployment of SN-4, a site survey could also be performed in the Cinarcik-Izmit area during the Urania cruise.

A series of HR profiles will be shot in August 2007 as collaboration between Lamont-Doherty Earth Observatory and Dokuz Eylül University. Contacts should be taken for coordination and to identify possible collaborations.

-One week of water column measurements and sampling is required to decide the best location for SN4 deployment.
Some measurement were already performed during previous cruise and need to be taken into account. Methane concentrations in seawater were determined by JC Caprais (Ifremer, Environnement Profond) at several of the Marnaut CTD sites and these data are available from the Marnaut website.
(http://www.cdf.u-3mrs.fr/~henry/marmara/data/MarNaut_data/Chemistry/MARNNCH4.xls).

Similar sampling with CTD-rosette were performed during Meteor cruise M44/1 in Feb 1999 and methane anomalies were found on the western high and in the western part of the central basin.
Measurements at site 18 are needed and additional measurements will be useful at sites 10 and 6, as well as in Çinarcik basin. The ITU fisheries ship could be used for 1 week of survey with the Medusa system. This cruise could be funded by MarmaraDM (estimated ship cost is 1500 Euro/day)

-Both Suroît and Urania have coring capabilities. Cores will be needed for geotechnical assessment and pore fluid chemistry determination prior to piezometer deployment.

Decisions regarding site survey responsibilities are still pending. According to one scenario, a 3D HR survey on the Western High could be performed with the Suroît during Marmesonet Cruise. The Eastern Cinarcik area could be surveyed with RV Piri Reis with MarmaraDM funding and coverage extended toward Izmit Gulf with Urania. A survey covering the Central High south of Istanbul and Kumburgaz basin may be done with RV Piri Reis provided more shiptime is obtained.

6) Additional tasks and responsibilities

a) Cruise chief scientists should take care of cruise authorization and contact with Turkish Navy

b) ITU has primary responsibility for public outreach

c) Additional instrumentation. Adaptation and deployment of existing instruments can be covered by MarmaraDM, but new developments need to be funded from other sources.

-Cerege, Ifremer and Geosciences Montpellier submitted proposal OFMOGH to ANR, which includes development of an acoustic monitoring system prototype for Marmesonet and prospective studies for simultaneous monitoring of pore pressure and pore fluid conductivity in the sediment.

-INGV in responsible for providing additional chemical sensors.

-HCMR is responsible for the implementation of radon sensors. One of the existing systems could be adapted and deployed with SN4 in 2009.

d) Additional shiptime should be requested:

-L. Gasperini will organize 1 week of Medusa survey on ITU fisheries vessel, and investigate the use of Urania for the deployment of SN4 and a site survey in the Cinarcik-Izmit area. Alternatively SN4 could be deployed with Le Suroît during Marmesonet cruise.

-DEU will request Piri Reis Shiptime for a 3D HR site survey (September 2008 or January 2009 call) at one of the observatory sites.

e) Involvment of oil industry

Contact will be taken by ITU with TPAO and, possibly, other companies. Collaboration with the industry will be particularly valuable for the development and implementation of better hydrocarbon sensors.

f) Next meeting

A meeting will be organized at Ifremer Brest in fall for the detailled planning of cruises, notably of Marmesonet and Piri Reis cruises. Preliminary cruise plans should be prepared before these meeting.

ESONET Demonstration Missions

2nd Periodic Activity Report

The Periodic Activity Report contains an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken.

<u>This document has to be filled in with reference to the DM Implementation plan.</u> This means that Deliverables, Milestones and WPs have to be the same as in the DM Implementation plan.

The Periodic Report contains 2 parts:
- Part I: it is addressed to the coordinator with minimum input from the partners
- Part II: it is addressed to each WP Leader and reports a detailed update of each WP activity at task level.

The report includes a rough justification of the costs incurred and of the resources deployed by each contractor linking them to activities implemented and justifying their necessity.

Finally the report contains information on use and dissemination activities.

Reporting period:
From October 1st, 2008 to May, 31st, 2009

Part I *(to be filled by the DM coordinator)*

DM acronym:	MARMARA-DM
DM title:	Multidisciplinary Seafloor Observatories for Seismogenic Hazards Monitoring in the Marmara Sea
ESONET Site:	MARMARA SEA, Turkey
Scientific Area(s):	- Earthquake hazards - Relations between fluids and seismicity - Processess at fluid controlled ecosystems
Technological Area(s):	Lon-term, permanent monitoring of seismicity, sediment pore fluid, fluid geochemistry and gas emission activity
DM Start date:	*April 1st, 2008*
DM duration:	*30*
Period of the reporting	from September 1st, 2008 to May 31st, 2009

Partner Num.	Partner institution short name	Principal Investigator (PI) for the Demo Mission	WP in charge *(insert WP num. and title)*
1.	IFREMER	Géli, Louis	WP2. Marine Operations with Ifremer facilities WP5. Comparative and feasibility studies
2.	ITU	Çağatay, Namık	WP6. Public Outreach, education, coordination at Turkish level and fund rising
3.	ISMAR	Gasperini, Luca	WP4. Data Integration and modelling
4.	INGV	Favali, Paolo	WP3. Land and Seabottom Integration; WP2. Marine operations with INGV facilities (SN-4 station)
5.	CNRS	Henry, Pierre	WP1. MarNaut data integration
6.	DEU/IMST	Çifçi, Günay	WP2. Marine operations with DEU facilities

Executive summary *(max one page)*
Brief description of the objective of the DM and brief description of the work status

The goal of MARMARA-DM is to contribute to the establishment of optimized permanent seafloor observatory stations for earthquake monitoring in the Marmara Sea (MS), as part of ESONET NoE. Workpackages description and status are:

WP 1 : Analysis of the available time series data and in-situ samples from the Marnaut cruise. This workpackage is in progress. Three papers have been published *[Zitter et al, 2008 ; Géli et al, 2008 ; Bourry et al, 2009]*. One Ph. D. Thesis, co-funded by Ifremer, Total and Bakerhughes is currently under way, conducted by Jean-Baptiste Tary. Funding for a second Ph. D. has been obtained from Ifremer and CNRS, to start on September 1st, 2009, by Céline Grall, under the supervision of Pierre Henry. Deliverable

WP 2 : Marine operations. A number of cruises are planned for 2009 :

- R/V Le Suroît cruise (named “Marmesonet”) by IFREMER, was initially scheduled from august 23rd to october 2nd, 2009, divided in two parts : part 1 for acoustic detection of gas emissions and AUV microbathymetry ; part 2 for high resolution, 3D seismic survey at one observatory site. Due to the crash of AirFrance flight off Brazil on june 1st, 2009, Ifremer was requested to contribute to the deep-sea search operations of the remains of the aircraft. In consequence, the agenda of the Ifremer’s fleet was changed, hence the “Marmesonet” cruise was postponed. Part 1 is now scheduled from november 5th to november 29th, 2009. Part 2 will occur on march-april, 2010.

- R/V Piri Reis cruise by DEU/IMST of Izmir, will carry out HR resolution seismics and bathymetry in the east Çınarcık Basin, between october 1st to october 10th, 2009.

- R/V Urania will deploy instruments, from september 22 (start in Brindisi) to october 12 (return to Brindisi), under supervision of Luca Gasperini, ISMAR (partner 4). R/V Urania will deploy SN-4 in the east Çınarcık Basin and all Ifremer instruments (10 OBSs and 5 piezometers).

The activity under WP2 include the preparation of all marine operations.

WP 3 : Integration of land and seafloor seismological data. This workpackage has started with the merging (work done) of OBS data from the MarNaut cruise and land data from Turkish institutions (KOERI and TUBITAK).

WP 4 : Data integration and modeling. This work is in process and will continue after the next cruises (fall 2009 and spring 2010).

WP 5 : Comparative study and project feasibility. In progress, under supervision of Yves Auffret (Ifremer).

WP 6 : Public and education outreach, coordination at national (Turkish) level

and fund raising. An important activity has been undertaken under this Workpackage (see specific report on WP6).

Table 1: Deliverables List of the MARMARA Demonstration Mission
Give the deliverable list and status

Marmara Deliverab. n.	Deliverable name LAST UPDATE : AUGUST 2009	WP n.	Due Date	Actual/ Forecast delivery date IN RED: LAST UPDATE, AUGUST 2009	Estimated indicative person months*	Used indicative person months*	Lead contractor
D1.1	Paper on piezometer and OBS results[a]	1	T0 + 12	**T0 + 20**	48	14,5	5
D1.2	Paper on flowmeters/osmo-samplers	1	T0 + 14	**T0 + 20**	12	0	5
D1.3	Paper on fluid analysis	1	T0+12	**DONE**	10	3,5	5
D1.4	Paper synthetizing Marnaut results	1	T0+12	**DONE**	20	5	5
	TOTAL WP1				90	23	
D2.1	Reports on DEU cruise[b]	2	T0+14	**T0 + 20**	60	0	6
D2.2	Report on Ifremer (Marmesonet) cruise[b]	2	T0+14	**T0 + 24**	70	0	1
D2.3	**6 months** time series at 3 sites[c,d]	2	T0+23	T0 + **30**	36	37	4
	TOTAL WP2				166	37	
D3.1	Report (including integrated database) combining marine and land seismological data	3	T0+26	T0 + 30	32	0	2
D3.2	Report on the ambient noise and recommendation for implementating permanent seabottom station	3	T0+26	T0 + 30	10	5	4
D3.3	High Res Seismic Images at the 3 sites[a]	3	T0+18	**T0 + 30**	91	0	6
	TOTAL WP3				133	5	
D4.1	Integration of all available data (including sedimentology)	4	T0+24	T0 + 28	36		3
D4.2	GIS including all available data	4	T0+24	T0 + 28	18		5
D4.3	Report to test working hypothesis and validate concept of seafloor observatories	4	T0+24	T0 + 30	8		5
D4.4	Report on best site selection	4	T0+28	T0 + 30	6		3
	TOTAL WP4				68	0	
D5.1	Recommendation Report on the preferred option	5	T0+28	T0 + 30	12		1
D5.2	Cost estimation report	5	T0+28	T0 + 30	12		1
D5.3	Implementation plan	5	T0+28	T0 + 30	12		4
	TOTAL WP5				36	0	
D6.1	Support agreement contract with Turkish authorities	6	T0+30	T0 + 30	8		2
D6.2	Web Site	6	T0+18	T0 + 18	42		2
D6.3	Training course	6	T0+24	**DONE**. In advance to schedule (august 2009)	24		2
	TOTAL WP6				74	0	
	TOTAL Ma-Mo				567	65	

the person month must be the same as indicated in Part II- WP progress report (see pag. 10)
[a] *Time in men-month here corresponds to a 3-years Ph. D. Thesis and supervisor's time*
[b] *Time in men-month includes instrument preparation, cruise preparation and realization, and reporting*
[c] *Time in men-month includes OBS data reduction and analysis, include earthquakes characterization*
[d] *Only 6 months time series will be collected from the seafloor*

Table 2: Milestones List of the MARMARA Demonstration Mission

MARMARA Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date IN RED : LAST UPDATE, AUGUST 2009	Lead contractor
1	Kick-off meeting	6	T0+1	**Done (T0+3)**	2 (ITU)
2	Ifremer Cruise (Marmesonet)	2	T0+11	**T0+24**	1 (Ifremer)
3	DEU Cruises (High Res Seismics with R/V Piri Reis)	2	T0+12	**T0+19**	6 (DEU)
4	Training Course	6	T0+24	T0+24 (Done August 2009)	2 (ITU)
5	Closure meeting with conclusions	4	T0+30	T0+30	6 (ISMAR)

WP bar chart (planned/actual):

insert the time extention of each workpackage (yellow for planned and green for actual) according to the individual WP reports (see example))

WP#	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30
1 planned																														
1 actual																														
2 planned																														
2 actual																														
3 planned																														
3 actual																														
4 planned																														
4 actual																														
5 planned																														
5 Actual																														
6 planned																														
6 actual																														
Milestones planned	SEE TABLE 2 (Milestones list)																													
actual	SEE TABLE 2 (Milestones list)																													

Link with ESONET main activities: *please update the dates and contents of the foreseen activities*

Inputs to the DM from ESONET WPs :	**Expected period** mm/yy	**Actual period** mm/yy	**Comments** IN RED : LAST UPDATE, AUGUST 2009
ESONET-WP1	Month 2	Month 9	WP-1 proposal deadline planned on November 21, 2008
ESONET-WP7	Month 17	Month 17	Training Course, August 2009, Istanbul

Outputs of the DM activity to ESONET WPs :	**Expected period** mm/yy	**Actual period** mm/yy	**Comments** IN RED : LAST UPDATE, AUGUST 2009
ESONET-WP5	month 18	month 22	Marmesonet cruise delayed from may 2009 to, respectively november 2009 (Part I) and march 2010 (Part II).

B.1.1.1. *Sensors & data management plan:* **please update the following table: follow the guidelines issued from the ESONET Best Practice workshop**

Measured parameters	**Depth**	**Sampling/storage/acquisition frequency**	**Access restriction / unrestriction** (ESONET partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	**comments**
ground velocity (OBS+SN4)	1000 m 200 m (SN-4)	sampling : 100 Hz storage ~ 50 Gb/year acquisition frequency : continuous	- raw and processed (SAC format files) - unrestricted access on raw data - **6 months deployment** - data availability only after instrument recovery	at 3 sites
seabottom water pressure (hydrophones)	- Idem -	sampling : 250 kHz storage ~ 25 Gb/year acquisition frequency : continuous	- unrestricted access on raw data - **6 months deployment** - data availability only after instrument recovery	at 3 sites
seabottom water pressure	- Idem -	sampling : 1 sample/minute storage ~ 0.4 Gb/year acquisition frequency : continuous	- Idem -	at 3 sites
sediment pore pressure	- Idem -	sampling : 1 Hz storage ~ 3 Gb/year acquisition frequency : continuous	- Idem -	at 3 sites
sediment pore water temperature	- Idem -	sampling : 1 sample/minute storage ~ 0.4 Gb/year acquisition frequency : continuous	- Idem -	at 3 sites
CH4 concentration in seabottom water	200 m (SN-4)	Sampling : 1 Hz storage ~ 0.4 Gb/year acquisition frequency : continuous	- Idem -	SN-4 at 1 site
sediment trap and collection of settling part.material	1200	1 sample / month ; acquisition after one year	- raw data - unrestricted access - **6 months deployment** - data availability only after instrument recovery	sediment trap at 1site with funds permitting
Flowmeters	600-1250	Continuous, about 1 sample per month	- raw data - unrestricted access - **6 months deployment** - data availability only after instrument	flowmeters **MARNAUT CRUISE ONLY**

			recovery and analysis	
Osmosamplers	600-1250	Continuous, about 1 sample per month	- raw data - unrestricted access - **6 months deployment** - data availability only after instrument recovery and analysis	osmo-samplers **MARNAUT CRUISE ONLY**
bubbling activity using an acoustic detector of gas bubbles		sampling : 1 sample/minute during 60 minutes 1 sample = 1 acoustic image 3 Mb per sample storage ~ 65 Gb/year acquisition frequency : 2 per day		1 site, funds permitting
Currentmeter	200 m (SN-4)	5 Hz	- unrestricted access on raw data - **6 months deployment** - data availability only after instrument recovery	SN-4 at 1 site
CTD	200 m (SN-4)	1 sample/10 minute	idem	SN-4 at 1 site
Turbidimeter	200 m (SN-4)	1 sample/10 minute	idem	SN-4 at 1 site
oxygen	200 m (SN-4)	1 Hz	idem	SN-4 at 1 site

- A **tabular overview of budgeted person-months and actual person-months** by workpackage (budgeted person –months to be taken from "Effort breakdown" Excel file)

WP number and name		**First period**	**Permanent staff[1] first period Months 1-6**	**Second period**	**Permanent staff[1] second period Months 7-12**
1	Actual person	7			
	Planned total person months : 91				
2	Actual person	13			
	Planned total person months : 168				
3	Actual person	29,5			
	Planned total person months : 128				
4	Actual person	0			
	Planned total person months : 58				
5	Actual person	0			
	Planned total person months : 75				
6	Actual person	3			
	Planned total person months : 47				
TOTAL	**Actual tot**	**71,5**			
	Planned total person months	**567**			

[1] *not charged to the DM*

Dissemination and outreach : please update the table

Type of school material available at the issue of the mission (photos, video, courses,…others)	Description
	TRAINING COURSE PLANNED FOR SCIENTISTS AND ENGINEERS in TURKEY ON DEEP SEAFLOOR OBSERVATORIES : AUGUST 2009
Type of dissemination (through collaborations with aquaria, museum, sciences centres, etc.)	Description **WEB SITE UNDER CONSTRUCTION AT ITU** **www. esonet-marmara-dm.itu.edu.tr**

Part II *(to be filled by each partners)*

ESONET Noe – Demonstration Mission	DM acronym: *MARMARA-DM*
Scientific Area(s):	- Earthquake hazards - Relations between fluids and seismicity - Processess at fluid controlled ecosystems
Technological Area(s):	Lon-term, permanent monitoring of seismicity, sediment pore fluid, fluid geochemistry and gas emission activity
DM Start date:	*April 1st, 2008*
DM duration:	*30*

Note : Only WP1, WP2, WP3 and WP6 have started before September 30, 2008
Hence no management report is provided for WP4 and WP5

WP1 management report

(from April 1st to 30 September 2008)

WORKPACKAGE	*WP1*
Full WP title	*ANALYSIS OF DATA FROM MARNAUT CRUISE*
Period covered	from *September 1st, 2008* to 30/05/2009
Partner organisation full name	*CNRS / CEREGE / Chaire de Géodynamique du Collège de France*
Person in charge for the report (WP Leader)	*Pierre Henry*
Partners involved in the Work	*5, 1, 2, 3*

Period of the reporting: from starting date to 30 September 2008

- **Work Performed** *:*

The work performed under WP1 consist in analyzing the data collected during the MarNaut cruise. During the reporting period, the following work was performed[1] :

- On the analysis of deep sea eco-systems [Ritt et al, *submitted*].
- On the analysis of heat flow data ([Grall, Mastère 2, Université d'Aix-Marseille, Juin 2009])
- On the geochemical analysis of gases [Bourry, C., et al., Free gas and gas hydrates from the Sea of Marmara, Turkey, Chemical Geology (2009), doi:10.1016/ j.chemgeo.2009.03.007]
- On the analysis of Ocean Bottom Seismometers [Tary *et al*, in prep].

In addition, a number of papers presented at scientific meetings:

- P Henry, L Géli, T. Zitter, S. Dupré, M. Tryon, M.N. Cagatay, B. Mercier de Lépinay, X. Le Pichon, A.M.C. Şengör, N. Görûr, B. Natalin, G. Uçarkuş, S. Özeren, S. Bourlange, P. Burnard, D. Völker, and the Marnaut Scientific Party, Gas emissions and active tectonics within the submerged section of the North Anatolian Fault Zone in the Sea of Marmara, Subsurface sediment remobilization and fluid flow in sedimentary basins, Geol. Soc., Burlington House, Piccadilly, London, Oct. 21-22, 2008.
- J Tary, T Bardainne, *L Geli, P Henry, M Yilmazer, M Tryon, B Natalin, N Cagatay, P Burnard, S Bourlange, Micro-seismicity of the submerged section of the North-Anatolian Fault within the Sea of Marmara : results from Ocean Bottom Seismometers, AGU Fall meeting, San Francisco 15-19 Décembre 2008

[1] During the first reporting period, the following papers were published :

- On the acoustic detection of gas emissions [Géli et al, *EPSL*, 274, 34-39, 2008]
- On the relations between faults and cold seeps [Zitter et al, Deep Sea Research, Part 1, 55(4), 552-570, doi:10.1016/j.dsr.2008.01.002, 2008]
- On the analysis of deep sea eco-systems [Lara et al*, Environ. Microbiol*., doi: 10.1111/j.1462-2920.2008.01737.x, Sep 18, 2008].
- On the analysis of heat flow data : [André, Mastère 2, Université de Bretagne Occidentale, Juin 2008]

- *L Geli, P Henry, C Andre, T Zitter, N Cagatay, B Mercier de Lepinay, Marine Heat flow measurements from the submerged section of the North Anatolian Fault, in the Sea of Marmara, AGU Fall meeting, San Francisco 15-19 Décembre 2008
- *M Cagatay, L Belucci, A Polonia, U Sancar, K Eris, L Gasperini, N Gorur, P Henry, T A Zitter, L Geli, M D Tryon, Sedimentological and Geochemical Characteristics of Turbidites Related to Earthquake Activity in the Sea of Marmara, AGU Fall meeting, San Francisco 15-19 Décembre 2008
- T A Zitter, *P Henry, S M Özeren, N M Çağatay, L Géli, B Mercier de Lepinay, L Gasperini, N Sultan, Slope Instabilities Along the North Anatolian Fault System in the Sea of Marmara, AGU Fall meeting, San Francisco 15-19 Décembre 2008
- *P Burnard, S Bourlange, P Henry, L Geli, B Marty, B Natalin, C Sengor, Fluid Sources on the North Anatolian Fault in the Sea of Marmara From He Isotope Measurements, AGU Fall meeting, San Francisco 15-19 Décembre 2008

Ifremer Work (Partner 1)

Ifremer contributed to the interpretation of the different datasets. The OBS data collected during the MarNaut cruises were analyzed by Jean-Baptiste Tary, Ph. D. student. The major result concerns the detection of an earthquake swarm located on the Ganos escarpment, in the north of the Tekirdag Basin, likely to be related to fluids. The gas hydrates samples were analyzed by Cristophe Bourry, Ph. D. Student, who showed the existence of Type II Gas Hydrates below the Western High. Bourry et al [2009] have also shown that gases from the Western High and from the Central High are of thermogenic origin, while gases from the Cinarçik Basin are biogenic. The microbiological samples from the marNaut dives are presently analyzed by Bénédicte Ritt, Ph. D. student. A paper, by Ritt et al should be submitted before the end of October 2009.

INGV work (Partner 4)

INGV contributed to the interpretation of data on molecular and isotopic composition of gas sampled in the Marmara seeps (Western High, Central High, Cinarcik). A first set of data were published (Chemical Geology). INGV proposed a further data elaboration which is needed to improve the interpretation of gas origin and the recognition of secondary post-genetic processes which are important for a complete characterization of the seeps, and their eventual potential of being influenced by seismicity. A second paper is in progress.

CEREGE work (Partner 5)

CEREGE led the Marnaut cruise of RV L'Atalante with Nautile submersible in the Sea of Marmara in 2007 and thus is responsible of the integration of the results from Marnaut cruise in the planning of MarmaraDM (WP1 of the demonstration mission). Marnaut cruise set long term instruments (OBSs, osmosamplers, piezometer) and thus initiated simultaneous monitoring of fluids and microseismicity in the Sea of Marmara. At this date, post-cruise work resulted in two publications on subjects relevant to the MarmaraDM objectives (Geli et al., 2008; Bourry et al., 2009).

The main effort over the reporting period was to pursue the analysis of Marnaut cruise data:

- Integration of Marnaut data (submersible observations, sub-bottom profiler) in GIS database and synchronization with Ifremer database (T. Zitter).
- Interpretation of video observations: mapping cold seeps and submarine landslides (T Zitter).
- OBS data analysis: co-direction of doctoral student (JB Tary) with Ifremer.
- Heat flow data analysis: direction of master project (C Grall)
- Opening and description of sediment cores from Marnaut cruise.

Within the reporting period, results of Marnaut were presented at a Geological Society Meeting in London by Pierre Henry, and 5 presentations were given at the AGU Fall meeting in San Francisco.

- **Rough Estimation of Major Cost**:

Person-Months

Ifremer : xx Ma-Mo
ITU : 0 Ma- Mo
INGV : 0,5 Ma-Mo (~1,8 k€ , personnel costs)
ISMAR : xx Ma-Mo
Cnrs : 4 Ma-Mo (2 permanent ; 2 non permanent)
DEU : 0 Ma-Mo

Other costs :

Ifremer : xx
ITU : 0
ISMAR : 0
INGV: 0
DEU : 0
CNRS :

- *2,5 k€ (travel for scientific exchange with other partners ; participation of PH to AGU)*
- *1 k€ for lab and office consumables*
- *Total : 2.5 k€*

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	
Personnel costs	
Subcontracting	
Travels	
Consumables	
Other costs	
Total Costs	

Table to be completed

WP-1 progress

(from start date to 30 September 2008)

Workpackage objectives and starting point *(max 500 characters)*

Progress towards objectives:

Task WP1.T1: Analyze OBS and Piezometers (Ph. D. Thesis of J. B. Tary started in November 2008, with supervision of Louis Géli, Ifremer, and Pierre Henry, Cnrs)

Contractors involved : ***Ifremer, Cnrs, ITU (including Tubitak) and support from KOERI***

The data from four OBSs deployed for 2,5 months in the eastern Sea of Marmara were analyzed together with land stations data provided by KOERI. OBS analysis was slowed down by technical difficulties regarding earthquake location. Delivery is forceast at T0+24.

Task WP1.T2: Analyze flowmeters and osmo-sampler data from MarNaut

Contractors involved : ***ITU (including SIO), Cnrs***

Seven flowmeters / osmosamplers from the Scripps Institution of Oceanography were deployed during the Marnaut cruise in May/June 2007. The instruments were recovered in June 2008 arrived in april 2009 in La Jolla. Hence, the data have not been analyzed yet.

Task WP1.T3 : Analyze sediment cores, rock and fluid samples, heat flow data

Contractors involved : ***ITU (including SIO), Cnrs, Ifremer, Ismar***

Paper on fluid analysis was published T0+12, by Bourry et al [2009]. Other papers are presently in progress (Ruffine et al, in prep). An important work on heat flow was also achieved by Parner 5 and presented by Pierre Henry in august 2009, during the international symposium organized for the Xth anniversary of the 1999 Koaceli earthquakes.

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

A) ***Deviation : Insert the name of the cause of deviation and explain why this cause has determined deviation. max 500 characters***

Customs delays. Deviation from the project work programme concerns Task WP1-T2. The 7 flowmeters / osmosamplers that were deployed during the MarNaut cruise were recovered in June 2008, due to custom problems.

B) Corrective actions: *insert description of the corrective actions max 500 characters*

Although our Turkish colleagues from ITU have multiplied the interventions to obtain custom clearance, the equipment arrived in Los Angeles on April, 6th, 2009. The delivery is now forecast at T0 + 24.

TABLE 1-1: WP1 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month) IN RED : Update : August 2009*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D1-1	Paper on OBS and piezometer results	1, 5	T0 + 12	T0 + 12	72	14
D1-2	paper on flowmeters and osmosamplers	2, 5	T0 + 14	T0 + 24	18	
D1-3	paper on fluid analysis	5, 2, 1	T0+12	T0 + 12	15	2
D1-4	paper synthesizing results from the MarNaut cruise	5	T0+12	T0 + 6	24	12

TABLE 1-2: WP1 DETAILED MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
M1-1	MarNaut Data integration	T0+24	T0+24
M1-2	Scientific papers	T0+24	T0+24

WP2 management report

(from start date to 30 September 2008)

- **Work Performed** *:*

ITU. ITU participated to the organization of the 2nd planning and coordination meeting of the MarmaraDM Project, held in Ifremer, Brest during 29-30h October, 2008 (see full report, Appendix I). Namık Çağatay PhD student Umut Ulgen attended this meeting.

ITU organized the 3rd planning and coordination meeting held in Istanbul during 9-13 February 2009, with the participation of Louis Geli, Pierre Henry, Luca Gasperini, Namık Çağatay and Naci Görür. Cruise plans including site survey studies, equipment deployment and coring were discussed for the forthcoming cruises during August-October, 2009. Plans for organizing a training course on submarine observations in EMCOL on 18-19 August 2009 were also discussed. A meeting was also held with Department of Navigation, Hydrography and Oceanagraphy (SHOD) for their safety support during the marine suveys. (see Appendix 2, letter to Admiral Iptes, Chief of SHOD, the Hydrographic and Oceanographic Department of the Turkish Navy).

ITU-EMCOL has put a considerable amount of enery in trying to help release the flowmeters/osmosamplers equipment from customs and send back them to SI.

INGV. INGV performed the upgrade of SN-4 observatory adding new sensors to the basic SN-4 configuration. The list of the sensors, manufacturers and models, and sampling rate for the new configuration are summarized in Table 1.

Sensor	Manufacturer & model	Sampling rates
BB seismometer	Guralp CMG-40T	100 Hz
Hydrophone	OAS E-2PD	100 Hz
3-C current	Nobska MAVS-3	5 Hz
CTD	SeaBird SBE-16plus	1 sample/10 min
Turbidity meter	Wet Labs Echo-BBRTD	1 sample/10 min
CH_4 #1	Franatech METS	1 Hz
CH_4 #2	Franatech METS	1 Hz
Oxygen	Aanderaa Optode	1 Hz

Table 1

This upgrade was made in order to execute a multi-parametric monitoring requested by the project objectives (gas seepage and seismicity). SN-4 will be able to assess the temporal relationships between fluid seepage, related environmental effects (e.g., temperature, oxygen variations) and seismic activity. The complete SN-4 is under test phase in all the functionalities including the acoustic communications (even if in air).

Methane sensors have been submitted to special laboratory tests in May 2009, in order to verify their performances in different water conditions (temperature, turbulence, methane concentrations). Since the METS measurement is “diffusion dependent” (i.e., the membrane is sensitive to water flow) it was decided to equip one METS with a pump inducing a constant water flow to the sensor head.

The observatory will be deployed in the selected site in the Marmara Sea by INGV and ISMAR (R/V URANIA cruise scheduled from 22 September to 12 October 2009). The deployment will be done by using a mechanical rope and an acoustic release; the recovery will be based on the use of a recall buoy canister actuated by an acoustic release. To facilitate the recovery procedure the total weight in water is going to be reduced to 1.5 kN installing 8 benthospheres on the frame and adopting new lighter vessels for batteries and electronics. As the lithium battery pack will guarantee 6 months of autonomy, this procedure for recovery should make easier the battery pack replacement for next missions.

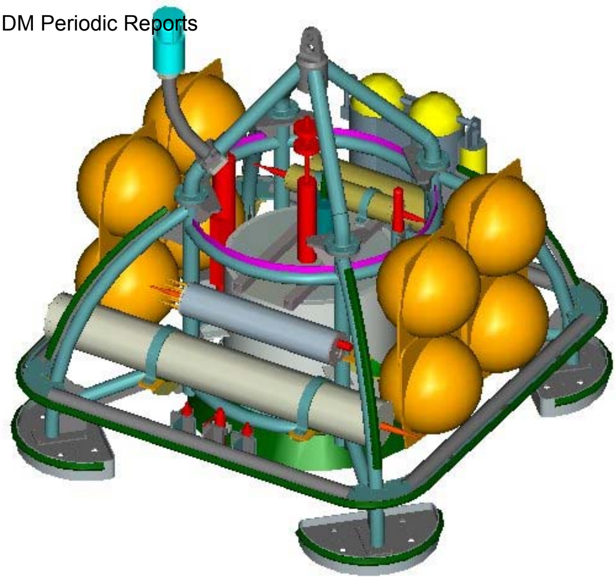

Fig. 1 – SN-4 configuration for Marmara mission

IFREMER. Ifremer started with the preparation of the instruments that will be deployed during the Marmesonet cruise in september 2009. The development of an autonomous seafloor observatory was initiated for the monitoring of bubble emissions, using high frequency (38 kHz) active acoustics. Some improvements were also made on Ifremer OBSs to measure the orientation of the OBSs sensors.

Ifremer also prepared the Urania cruise, during which the piezometers and OBS will deployed in the Sea of Marmara. Ronan Apprioual (Ifremer) visited the vessel in Italy in may 2009. Work had to be done on R/V Urania, in order to weld the appropriate device to deploy the piezometer.

ISMAR. ISMAR spent considerable efforts in preparing the cruise of Urania during which the SN-4 observatory for the Marmara Esonet demo mission will be emplaced. This cruise is now scheduled from September 22 to October 12th, 2009. The work included : 1) practical preparation (e.g. problems with logistics, customs clearance, etc) ; 2) Compilation and submission to the Italian CNR commission (Gruppo coordinamento infrastrutture) of the proposal for the MARMARA2010 expedition. The main purpose of this new expedition will be the recover of SN-4 after 1 year of activity and the completion of the geophysical survey in the SN-4 area as well as the final site casting ; 3) processing and re-analysis of the existing geophysical data (multibeam, chirp sonar, etc..) in the area that will be investigated during the MARMARA2010 cruise (Izmit bay and Cinarcik basin). Ismar participated to the 2nd planning meeting in Istanbul (February, 2009).

CNRS. CNRS/CEREGE was involved in the planning of Marmesonet cruise, Pierre Henry participated to planning and coordination meetings in Brest and Istanbul.

DEU. Günay Çifçi and Mustafa Ergun participated in the organization and attended the first project meeting held in Brest on October 28-29, 2008. Günay Çifçi and Nano Seeber (LDEO) have represented the project Turkish-American project "TAMAM". This project allowed the collection of an unique dataset of high-quality, high resolution multi-channel seismics in the Sea of Marmara. First results of the data and the facilities of the Seismic Laboratory (SeisLab) in DEU-IMST were discussed during the presentations. The difficulties of the selection of the sites also were evaluated because of heavy maritime traffic.

In addition, different technical actions were undertaken : 1) Hakan Sarıtaş participated to the ESONET subsea observatory meeting with industrial companies and SMEs which place during the IEEE OCEANS'09 BREMEN ; 2) Günay Çifçi and Derman Dondurur made a technical meeting with Hydroscience Inc Tech. in Huston for the extension of streamer from 96 channels to 240 channels as 1500m ; 3) Technician Erdal Özcan proceeded to the maintenance and installation of seismic data processing Promax software.

- **Rough Estimation of Major Cost**: *E*

Person-Months

Ifremer : xx Ma-Months
ITU 1,5 Ma-Mo (0,5 non-permanent ; 1 permanent)
INGV : 6 Ma-Mo
ISMAR : xx Ma-Mo
CNRS : 1,5 Ma-Mo (0,5 non pemanent ; 1 permanent)
DEU : 4 Ma-Mo (2 permanent ; 2 non-permanent)

Other costs :

Ifremer :

ITU
- Travel : 2nd project meeting, Brest : participation of Namık Çağatay: 1074,61 €
- Travel : 2nd project meeting, Brest : participation of Umut B. Ülgen: 1069,62 €
- Total: 2144.23 €

INGV
- SN-4 observatory components and sensor tests, Total cost : 20 k€ (EC share : 7.5 k€)

DEU
- Travel : 2nd project meeting, Brest : participation of Günay Çifçi: 2400 €
- Travel : 2nd project meeting, Brest : participation of Mustafa Ergun : 2400 €
- Travel : reporting workshop in Paris : participation of Seda Okay : 950 €
- Participation of Hakan Sarıtaş to IEEE OCEANS'09 BREMEN event: 810 €
- Participation of Günay Çifçi and Derman Dondurur to a technical meeting with Hydroscience Inc Tech. in Houston : 750 €
- Maintenance and installation of Promax software : 500 €
- Lab and office consumables: 1000 €
- Total : 8810 €

CNRS
- Travel : participation of P. Henry to the Brest (oct 08) and Istanbul (feb 09) meetings : 2 k€

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	
Personnel costs	
Subcontracting	
Travels	
Consumables	
Other costs	
Total Costs	

Table to be completed

WP3 management report

(from October 1st, 2008 to 30 May 2009)

WORKPACKAGE	*WP3*
Full WP title	*INTEGRATION OF LAND AND SEAFLOOR SEISMOLOGICAL DATA*
Period covered	f from *September 1st, 2008* to 30/05/2009
Partner organisation full name	*INGV*
Person in charge for the report (WP Leader)	*Paolo Favali*
Partners involved in the Work	*4, 1, 5, 2*

Period of the reporting: from starting date to 30 September 2008

- **Work Performed** *:*

The main work performed during the reporting period under the present WP consisted in merging land and seabottom seismological data. Due to the limited number of OBSs deployed during MarNaut, merging data from land and seabottom stations has proven to be very challenging, if not merely impossible, in absence of a detailed 3D velocity model from the deep offshore domain encompassing the rims of the Sea of Marmara. From this work, we have learned that the only way to merge land and seabottom stations consists in using the combination of two models :

- for the deep levels, the 3D velocity model of Bécel (in press), based on the data collected in 2001 during the Seismarmara Cruise of R/V L'Atalante
- for the uppermost layers (< 2 s-twt), a detailed velocity model based on the velocity model of all MCS data available in the Sea of Marmara. The TAMAM dataset would be ideal for deriving such model, through a collaborative project with LDEO.

Ifremer. Attempts for merging the seismological datasets were mainly performed at Ifremer, in collaboration with KOERI, through the Ph. D. Thesis of J. B. Tary*.*

ITU. Land data from the TUBITAK seismological network were extracted for the duration of the MarNaut deployment, processed and examined (Note : TUBITAK Is ITU's sub-contractor).

- **Rough Estimation of Major Cost**:

Person-Months

Ifremer : 7 Ma-Months (1 permanent ; 6 non-permanent)
ITU : 1,5 Ma-Mo (0,5 permanent ; 1 non permanent)
INGV : 0 Ma-Mo

ISMAR : xx Ma-Mo
CEREGE : xx Ma-Mo
DEU : 0 Ma-Mo

Other costs :

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period
Total person-months	
Personnel costs	
Subcontracting	
Travels	
Consumables	
Other costs	
Total Costs	

Table to be completed

WP-3 progress

(from October 1st, 2008 to 30 May 2009)

Workpackage objectives and starting point *(max 500 characters)*

Progress towards objectives :

Task WP3.T1: Analyze land stations from TUBITAK network

Contractors involved : INGV, Ifremer, Cnrs, ITU (including Tubitak) and support from KOERI

The data from four OBSs deployed during for 2,5 months in the eastern Sea of Marmara were analyzed together with land stations data provided by KOERI and TUBITAK, respectively. Due to the limited number of OBSs deployed during MarNaut, merging data from land and seabottom stations has proven to be very challenging, if not merely impossible, in absence of a detailed 3D velocity model from the deep offshore domain encompassing the rims of the Sea of Marmara. It appears necessary to undertake an huge work to determine the most appropriate velocity model, which consist in combining the 3D velocity model of Bécel (in press), based on deep refraction seismic studies and a shallower model (yet to be built), based on the velocity analysis of the available, 2D, MCS lines.

Task WP3.T2: Analyze OBS data from each site (1 year deployment)

Contractors involved : INGV, Ifremer, Cnrs, ITU (including Tubitak) and support from KOERI

This task will start only after recovery of the OBSs that will be deployed during the Urania Cruise and recovered in march-april 2010.

Task WP3.T3 : Site survey High Res Seismics

Contractors involved : ***Ifremer, DEU***

This task will start only after completion of the Marmesonet Cruise, in march-april 2010.

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

The Marmesonet seismic cruise (leg II) is postponed, from September 2009 to March 2010. The corresponding actions are thus 6 months-delayed.

TABLE 3-1: WP3 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)* *In red : last update august 2009*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D3-1	Report comparing OBS (including SN-4) and land stations	2,4,1	T0+26	T0 + 30	36	7
D3-2	Report on the ambient noise in th Sea of Marmara and recommendation for implementating permanent seabottom station	4,1	T0+26	T0 + 30	12	0
D3-3	High res seismic images at 3 sites	6	T0+18	T0 + 30	72	0

TABLE 3-2: WP3 DETAILED MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date** In red : Last update, August 2009
M3-1	Integration of MarNaut OBSs	T0+6	T0+12 (DONE)
M3-2	Analysis of land data	T0+24	T0+30
M3-3	Analysis and integration of DM data	T0+30	T0+30
M3-4	Reporting	T0+30	T0+30

WP4 management report

(from October 1st, 2008 to 30 May 2009)

WORKPACKAGE	WP4
Full WP title	DATA Integration and modelling
Period covered	from *September 1st, 2008* to 30/05/2009
Partner organisation full name	*ISMAR*
Person in charge for the report (WP Leader)	*Luca Gasperini*
Partners involved in the Work	*All*

Period of the reporting: from October, 1st 2008 to May, 30th, 2009

- **Work Performed** *:*

ITU. ITU staff continued to work on the sediment cores collected in the area, particularly during the MARNAUT cruise. All 18 piston and 5 interface cores were analyzed at 1 cm resolution by multisensor core logger (MSCL) for physical properties. 4 piston and 5 interface cores were opened, described and analyzed at 1 mm resolution for chemical composition and X-ray radiography using Itrax Core Scanner.

Ifremer. Ifremer participated to the WP by modelling the geochemical data collected during the MarNaut cruise. The gas hydratesthat were collected on the Western High at a water depth of 666 m were shown to be of Type II, with a large concentration in ethane. The complete modelling explains why these gas hydrates are stable at such a shallow depth. A paper is presently under way (Rufine et al, 2009). This modelling appears to be of critical importance, as it helps understand the relations between the Thrace Basin and the fault zone below the Western High.

ISMAR. ISMAR carried out several activities towards data integration, mostly related to the emplacement of the SN-4 station, in the area that will be investigated during the MARMARA2010 cruise (Izmit bay and Cinarcik basin). The re-processing and re-analysis of the the existing geophysical data (multibeam, chirp sonar, etc..) consisted mainly in the attempt of determining the actual environment of the SN-4 area in terms of presence of gas in the sediment and seismic character (facies) of the sediment to infer possible geotechnical properties. The presence or the absence of gas in the sediment is of crucial importance to the final success of the Marmara Esonet demo mission, as also discussed in the recent Istanbul 2009 meeting: "*An overview of the research in the Sea of Marmara region over the last 10 years*", on the 10th Anniversary of 17 August 1999 Izmit Earthquake.

CEREGE. CEREGE provided all data available in GIS from Marnaut to partners. Three GIS with comparable contents are currently maintained at ITU, Ifremer and

Cerege. Modeling of heat flow data in the Sea of Marmara has been given a special effort, with the involvement of a masters student at CEREGE. Results have implications on the tectonic history of the basins and on the estimation of fluid fluxes.

DEU. DEU contributed to the TAMAM cruise in the Sea of Marmara, conducted in July 2008 with the R/V *K. Piri Reis* operated by Institute of Marine Sciences and Technology at Dokuz Eylül University in Izmir. This cruise collected more than 2700 km of high-resolution MCS data plus shallow-penetration chirp profiles. Safety issues from the dense ship traffic in the Marmara Sea prevented coverage of the area close to Istanbul and required several deviations in the tracks. Data analysis and interpretation is being shared among the collaborating institutes and involves four Turkish students and one post-doctoral researcher. All five spent between one and three months working at Lamont-Doherty Earth Observatory (LDEO) or the University of Missouri. *A one-week workshop* was held at LDEO attended by three students, four Turkish professors and 3 students, and five American research scientists.

- **Rough Estimation of Major Cost**:

Person-Months

Ifremer : xx Ma-Months
ITU : 14 Ma-Mo (2 permanent ; 12 non permanent)
INGV : 0 Ma-Mo
ISMAR : xx Ma-Mo
CEREGE : 7 Ma-Mo (1 permanent ; 2 non-permanent ; 4 master student)
DEU : 10,5 Ma-Mo (5 permanent ; 5.5 non-permanent)

Travels :

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro) First period**
Total person-months	
Personnel costs	
Subcontracting	
Travels	
Consumables	
Other costs	
Total Costs	

Table to be completed

WP-4 progress

(from October 1st, 2008 to 30 May 2009)

Workpackage objectives and starting point *(max 500 characters)*

The objective of the present WP is to carry out a careful analysis and integration of all multidisciplinary data, in order to test wether the pore fluid properties (geophysical and geochemical) are related to the seismic activity of the Marmara Sea fault zone (Hypoth. 1).

The integration and modelling of the long time series will also enable us to test if : 1) strain rate variations induce pore pressure variations in surface sediments ; and 2) fluids from the seismogenic depth reach -locally and episodically- the sediment surface.

The main deliverables are :

1. validation of the concept of observatory based on all available time-series data (old and new)
2. Selection of the best sites and parameters for seafloor monitoring of seismogenic risk in the Marmara Sea

Progress towards objectives –

The available time series were collected during MarNaut cruise, hence the results are presented in WP1. The work performed under the present WP4 during the reporting period is described above.

TABLE 4-1: WP4 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. (*insert deliverable num.)*	**Deliverable name Workpackage** (*insert deliverable title)*	**Responsible partners of deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)* *In red : last update august 2009*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D4.1	Integration of all available data (including sedimentology)	4	T0+24	T0 + 28	36	
D4.2	GIS including all available data	4	T0+24	T0 + 28	18	
D4.3	Report to test working hypothesis and validate concept of seafloor observatories	4	T0+24	T0 + 30	8	
D4.4	Report on best site selection	4	T0+28	T0 + 30	6	

TABLE 4-2: WP4 DETAILED MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
M4-1	Closure meeting with conclusions	T0+30	T0+30

WP6 management report

(from October 1st, 2008 to 30 May 2009)

WORKPACKAGE	*WP6*
Full WP title	*PUBLIC AND EDUCATION OUTREACH. FUND RISING.*
Period covered	from *September 1st, 2008* to 30/05/2009
Partner organisation full name	*ITU*
Person in charge for the report (WP Leader)	*Namik Çagatay*
Partners involved in the Work	*All partners*

Period of the reporting: October, 1st, 2008 to May 30th, 2009

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MARMARA-DM PROJECT WP6
ACTIVITIES FOR THE FIRST 6 MONTHS

WP 6 : Public and education outreach, coordination at national (Turkish) level and fund raising

COORDINATION (Task WP6.1)

The coordination efforts between different Turkish organizations, such as TPAO (Turkish Petroleum Corporation), TUBITAK (Scientific and Technological Council of Turkey) and MTA (Geological Suvey of Turkey), and possible stakeholders continued for permanent seafloor observartories in the Sea of Marmara. These efforts are explained below.

1. Meeting with TPAO (Turkish Petroleum Corporation; http://www.tpao.gov.tr): TPAO is a possible funding organization in Turkey for seafloor observatories in the Sea of Marmara (SoM), because the Thrace natural gas and oil field extends southward into into SoM, where the MarNaut cruise discovered HC gas and oil seeps and gas hydrates. Namık Çağatay contacted TPAO officially on 9 January 2008 and informed them of the ESONET Marmara-DM project activities and results of the MarNaut cruise (Appendix III). He was then invited to TPAO headquarters in Ankara for a presentation and discussions 19 February 2009. A meeting was held with Halit Alkan Director of the Exploration Department and Chief Geologist Muzaffer Siyako from TPAO (Turkish Petroleum Corporation) for TPAO's collaboration in the project activities. Their official answer in 19 March 2009 was that TPAO had no exploration permits in the SoM, and therefore was not interested in the project collaboration in SoM (Appendix IV), which allows us to contact any other private company.

2. 3rd planning and coordination meeting was held at ITU during 9-13 February 2009, with the participation of Louis Geli, Pierre Henry, Luca Gasperini and Namık Çağatay. Cruise plans, site survey studies, equipment deployment plans were discussed for the forthcoming cruises during August-October, 2009. Plans for organizing a training course on submarine observations in EMCOL on 18-19 August 2009 were also discussed. A meeting was also held with Department of Navigation, Hydrography and Oceanagraphy (SHOD) for their safety support during the marine suveys (see Appendix II).
3. Namık Çağatay was invited on 27 February 2009 by the Dokuz Eylül Üniversitesi, İzmir to present ESONET Marmara-DM and EMSO activities in the Sea of Marmara.
4. On June 20, 2009, we contacted and sought possible project collaborations with private petroleum companies with exploration rights in the SoM and sent them an invitation and an explanatory document about the ESONET Marmara-DM project and its findings regarding the HCs (Apendix V). These companies included:
    a. Merty Enerji Petrol Arama, Eğitim ve Servis Hizmetleri Anonim Şirketi (info@mertyenergy.com)
    b. Toreador Turkey Ltd. (info@toreadorturkey.com)
    c. Thrace Basin Natural Gas Türkiye Corporation (info@thracebasin.com.tr)
5. We have identified the following stakeholders for sea observations for the Marmara Node:
    1. ITU-EMCOL (Eastern Mediterranean Centre for Oceranography and Limnology (http://www.emcol.itu.edu.tr/).
    2. General Directorate of Mineral Research and Exploration (MTA) (http://www.mta.gov.tr).
    3. Petroleum Company (TPAO) (http://www.tpao.gov.tr)
    4. Turkish Navy Office of Navigation, Hydrography and Oceanography (TN-ONHO) (http://www.shodb.gov.tr/english.html)
    5. Turkish Coast Guard Command (http://www.sgk.tsk.tr/en_index.htm)
    6. Kandilli Earth Obsevatory of the Bosphorus Universitiy (KOERI) (http://www.koeri.boun.edu.tr/)
    7. Marine Sciences Institute of the Middle East Technical University (http://www.ims.metu.edu.tr/)
    8. Earth and Marine Sciences Institute of TUBITAK-MAM (http://www.mam.gov.tr/YDBE/index.html)
    9. Marine Sciences and Management Institute of the Dokuz Eylül University (İzmirMiddle East Technical University (http://www.deu.edu.tr/DEUWeb/Icerik/Icerik.php?KOD=74)
    10. Marine Sciences and Management Institute of the Istanbul Univeristy (http://www.istanbul.edu.tr/enstituler/denizbilimleri/turkce/turkish.htm)
    11. Turkish Marine Research Foundation (http://www.tudav.org/new/eng/)
    12. İnönü Vakfı Marine Research Centre (www.ismetinonu.org.tr/)

We invited representative of the above organizations to a meeting at ITÜ on 29 May 2009. After a presentation on the EMSO and ESONET project and their activities at the Marmara node and discussion: A concensus was reached between key stakeholders in this meeting on the following issues: 1) the importance of the EMSO and ESONET projects and multidisciplinary seafloor observatories for the Sea of Marmara; 2) Acting of all stakeholders as a unified front for establishment of the seafloor observatories in the SoM under EMSO and ESONET umbrella, 3) Presentation of a proposal to Turkish Prime Ministry State Planning Organization (main funding organization for science infrastructures) with a purpose to initiate the establishment of multidisciplinary seafloor observatories in the SoM.

6. ITU coordinated the Exchange of Personnel for the Marmara Node during November 2009.

DISSEMINATION OF RESULTS (Task WP6.2)

1. "Sea of Marmara Special Session" of the Geological Congress of Turkey: Joint "*Geohazards in Marine Environments*" and "*Marine Geology*" sessions at the 62.*Geological Congress of Turkey* was held in Ankara during 23-27 April 2008. The session was convened by Namık Çağatay and Naci Görür of ITU. Naci Görür, Luca Gasperini, Sinan Özeren and Namık Çağatay, presented papers related to the ESONET Marmara-DM and related cruises and marine activities (see below for the list of abstracts under publications)

2. Training course and Symposium: A training course on "*Seafloor Observatory Techniques for Marine Geohazard Monitoring*" is being organized at ITU in İstanbul on 18-19 August 2009. This course is intended for engineers and scientists from marine institutes, other related governmental and private organizations are invited to participate.

The training workshop will follow a one-day symposium on "*An overview of the research in the Sea of Marmara region over the last 10 years*", on the 10th Anniversary of 17 August 1999 Izmit Earthquake. Invited scientists will present the results of earthquake research in the region carried out by them and their groups.

3. Publications

Peer-reviewed publication on Marnaut cruise results:

Bourry, C., Chazallon, B., Charlou, J-L, Donval J.P, Ruffine, L., Henry, P., Geli, L., Çagatay, M.N., Sedat, İ, Moreau, M., (2009). Free gas and gas hydrates from the Sea of Marmara, Turkey: Chemical and structural characterization. *Chemical Geology*, doi:10.1016/j.chemgeo.2009.03.007.

Article on the Marmara-DM project in ESONEWS:

Çağatay, M.N., and Geli, L. and Marmara-DM scientists, 2009. L. Marmara-DM project: Recent activities. ESONEWS volume 3, Issue 1.

Peer-reviewed publications unrelated to Marnaut cruise, but important for geohazard and oceanographic studies in the Sea of Marmara:

1. Çağatay, M. N., Eriş, K., Ryan, W.B.F., Sancar, Ü., Polonia, A., Akçer, S. Biltekin, D., Gasperini, L., Görür, N. Lericolais G., Bard, E. 2009. Late Pliestocene-Holocene evolutıon of the northern shelf of the Sea of Marmara. In Press in Marine Geology. doi: 10.1016/j.margeo.2009.06.011.
2. Irvalı, N., Çağatay, M.N. (2008). Late Pleistocene-Holocene history of the Golden Horn Estuary, İstanbul. Geo-Marine Letters, 29:151-160.

Papers presented at scientific meetings:

1. Tryon, M. D., Çağatay, M. N., Henry, P., Zitter, T.A.C., Geli, L. Charlou J.-L. and the Marnaut Scientific Party, Pore fluid chemistry of cold seeps in the Sea of Marmara, AGU Fall meeting, San Francisco, 10-14 December, 2008.
2. Zitter, T.A.C. Henry, P. Özeren, M.S. Cagatay, M.N. Geli, L. Mercier de Lepinay, B. Gasperini, L., Sultan, N.,.2008. Slope Instabilities Along the North Anatolian Fault System in the Sea of Marmara. AGU Fall meeting, San Francisco, 10-14 December, 2008.
3. Çağatay MN, Belucci L, Polonia A, Sancar U, Eriş K, Gasperini, L, Görür, N, P Henry P, Zitter TAC, Geli G, Tryon,T. (2008). Geochemical and Sedimentological Characteristics of the Turbidites Related to Earthquake Activity in the Sea of Marmara. American Geophysical Unon (AGU) Fall Meeting, San Francisco, December 2008.
4. Zitter TAC, Henry P, Özeren MS, Çağatay MN, Geli L, Mercier de Lepinay B., Gasperini L, Sultan, N. (2008). Slope Instabilities Along the North Anatolian Fault System in the Sea of Marmara. American Geophysical Unon (AGU) Fall Meeting, San Francisco, December 2008
5. Géli L, Henry P, André C, Zitter , T, Çağatay N, B. Mercier de Lépinay B (2008). Marine Heat flow measurements from the submerged section of the North Anatolian Fault, in the Sea of Marmara. American Geophysical Unon (AGU) Fall Meeting, San Francisco, December 2008.
6. Çağatay M.N., Çifci, G., Gürbüz, C. 2009. ESONET NoE and EMSO Infrastucture Projects and Their Importance for Geohazard Monitoring in the Sea of Marmara. 62. Geological Congress of Turkey, Ankara 13-17 April 2009. Abstract no.: 8MD-2009-325].
7. Görür, N. and Çağatay, M.N., 2009 Geohazards rooted from the northern margin of the Sea of Marmara since the late Pliestocene. A review of recent results. 62. Geological Congress of Turkey, Ankara 13-17 April 2009. Abstract no.:MD-2009-575.
8. Eriş, K.K. , Beck, C. , Çağatay, N., 2009. Defining Late Quaternary Seismo-türbidites in the Sea of Marmara; Evidence from High-resolution Core and Seismic studies. 62. Geological Congress of Turkey, Ankara 13-17 April 2009. Abstract no.: MD-2009-389.
9. Polonia, A., Gasperini L. et al., 2009. Displaced Sedimentary Features along Middle and Northern strands of the North Anatolian Fault in the Marmara Sea: Implications for Slip Rates, Styles of Deformation and Basin Development. 62.

Geological Congress of Turkey, Ankara 13-17 April 2009. Abstract no.: MD-2009-346.

10. Seeber, L., Sorlien,C., Shillington, D., Dondurur, D, Gürçay,S., Diebold, J., Imren, C., Kurt, H., Steckler, M. Çifçi, G., Demirbağ, E. and Scientific Party of TAMAM08 Cruise, 2009. Basin Growth Along the North Anatolian Continental Transform: The TAMAM08 High-Resolution Multichannel Survey in the Marmara Sea. 62. Geological Congress of Turkey, Ankara 13-17 April 2009. Abstract no.: MD-2009-571.

MARMARA-DM WEB SITE (Task WP6.T5)

A web-site was constructed at ITU : www.esonet-marmara-dm.itu.edu.tr. This web site is both in Turkish and English, includes all news items announcements, workshop presentations and data concerning the project results. These activities are a big step forward achieving the deliverable D6.2 “Web Site” of the Marmara-DM project.

WP6 management report

(from October 1st, 2008 to 30 May 2009)

Period of the reporting: from October, 1st 2008 to May, 30th, 2009

- **Work Performed** *:*

ITU. ITU conducted most activities within this WP (see above, detailed report).

Ifremer. Ifremer prepared documents to help ITU in his task for rising funds in Turkey. Ifremer also participated in ANR proposal (unsucessful) MODALE with CNRS, which purpose was to fund postcruise work of Marmesonet.

CNRS. CEREGE participated in ANR proposal MODALE with Ifremer, which purpose was to fund work at the Sea of Marmara esonet node, notably postcruise work of Marmesonet. This proposal was not successful.

- **Rough Estimation of Major Cost**:.

Person-Months

Ifremer : Ma-Month (L. Géli)
ITU : 8 Ma-Months (2 permanent + 6 non-permanent)
Cnrs : 0.5 Ma-Mo
DEU : 0,5 Ma-Mo
INGV : 0 Ma-Mo
ISMAR : Ma-Mo

Other costs :

ITU

Lab and office consumables: 1900 €
TPAO meeting of Namık Çağatay:217 €
MTA meeting of Namık Çağatay:195 €
62 th Geological Congress (Kurultai) of Turkey participation of Umut B. Ülgen: 145 €
62 th Geological Congress (Kurultai) of Turkey participation of Dursun Acar: 300 €
Total= 2757 €

IFREMER
ISMAR
CNRS
DEU

- **Overview of the Actual Costs**, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro)** **First period**
Total person-months	15,5 Ma-Mo
Personnel costs	37220
Subcontracting	
Travels	8721
Consumables	
Other costs	511
Total Costs	46452 €

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

NO DEVIATION

TABLE 6-1: WP6 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D6-1	Support agreement contract with Turkish Authorities	2	T0+30	T0 + 30	6	2
D6-2	Web Site	2	T0+18	T0 + 18	42	2,5
D6-3	Training Course	2	T0+24	T0 + 24	12	0

TABLE 6-2: WP6 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast delivery date**
M1	Kick-off meeting	T0+1	T0+3
M4	Training course	T0+24	T0+24
M5	Closure meeting with conclusions	T0+30	T0+30

APPENDICES

I. **Full Report of the MarmaraDM 2nd Meeting held at Ifremer Research Center, Brest, on October 28th-29th, 2008**

II. **Letter requesting support vessel from SHOD (Turkish Department for Navigation, Hydrography and Oceanography)**

III. **Letter sent by ITU to TPAO (Turkisk Petroleum Corporation), Halit Halkan, Director of Exploration, on January 9th, 2009**

IV. **Answer of TPAO to ITU, dated March, 19th, 2009**

V. **Letter sent by ITU to Turkish private petroleum companies on ESONET Marmara-DM Project and its findings regarding hydrocarbons in the Sea of Marmara**

APPENDIX I

MarmaraDM 2nd Meeting Report[2]
Ifremer, Brest Research Center, October 29th and 30th, 2008

Contents :

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Sub-Appendixes

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[2] *This is not a verbatim report strico sensu, but a synthesis of the discussions held during the meeting. It also includes new elements that were not known at the time of the meeting.*

[3] *This chapter is an update of the conclusions that resulted from the Marmara-Dm kick-off that was held in Istanbul, on june 18th, 2008 (see meeting report on http://www.cdf.u-3mrs.fr/~henry/marmara/).*

I. General context / Meeting objectives

At present, there are two separate initiatives to implement seafloor observatories in the Sea of Marmara :

- The KOERI (Kandilli Observatory and Earthquake Research Initiative) project. Funded by the Turkish authorities, this project (called MBSO : Marmara Sea Bottom Observatory project) aims at implementing cabled Ocean-Bottom Seismometers, Accelerometers, Hydrophones, Current meters and Temperature meters in the Sea of Marmara, as part of the turkish national network for earthquake and tsunami hazards monitoring that is operated by the KOERI. A total of 5 cabled broad-band Sea-Bottom Observatories (SBO) with broad-band OBSs will be deployed during the spring of 2009.

- The Marmara-DM demonstration mission[4], funded within ESONET-NoE, aims at implementing multi-disciplinary, permanent observatories in the Sea of Marmara, with special focus on fluid and seismicity interactions.

The major objective of the meeting held in Brest on october 29 and 30th, 2008 was to demonstrate that these two initiatives are actually complementary, although they have been initiated separately : the KOERI project has an operational and research finality, while the ESONET-NoE project is research-oriented. The former aims at being integrated into the national Turkish seismic network. The latter aims at testing the hypothesis that the physical and geochemical properties of the fluids change within the fault throughout an earthquake cycle and that these changes can be recorded at the seafloor. If true, this hypothesis would open new perspectives to determine whether water and gas circulation in subseafloor environments can generate detectable signals related to the stress-building process before large earthquakes, an issue of direct, societal importance.

To demonstrate this, the Brest meeting offered a forum for scientific presentations, which attempted to describe fluid and seismicity interactions in the Sea of Marmara and their possible bearing to earthquake hazards monitoring.

Three representatives of the MBSO project participated to the meeting : Gülay Altay, Dogan Kalafat and Mehmet Yilmazer. Cansu Guralp, industrial contractor for the MBSO project, was also present during the first day of the meeting.

The Italian partners of the Marmara-DM project were unfortunately unable to attend the meeting, but sent a note (see Appendix 3). All other partners of the Mamara-DM project were represented.

In addition, two experts involved in the study of the North Anatolian Fault in the Marmara Region kindly accepted to participate :

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[4] *The initial description of MarmaraDM is available at:*
http://www.cdf.u-3mrs.fr/~henry/marmara/public/MarmaraDM_13200.pdf
The initial objectives of MarmaraDM were:
1. To characterize the temporal and spatial relations between fluids and seismic activity in the Sea of Marmara
2. To test the relevance of long-term seafloor, multidisciplinary observatories for an innovative monitoring of earthquake related hazards
3. To propose the technological option (cable, buoys, etc) that is the most adapted for the Sea of Marmara
4. To involve the local authorities in Turkey ; public outreach and education ; fund rising
5. Integration of existing resources at national and EU level

- Michel Bouchon, represented the ***Modalsis*** project funded by the French Agence Nationale de la Recherche. He explained the behavior of the western NAF, from a seismological point of view.
- Nano Seeber represented the US party of the project Turkish-American Marmara Multichannel project « TAMAM » (the Turkish party was represented by Günay Cifçi). This project allowed the collection of an unique dataset of high-quality, high resolution seismic reflection profiles in the Sea of Marmara.

Collaborations with the partners involved in the projects listed above appear to be of critical importance to improve our knowledge of the fault and optimize the selection of the sites for multi-parameter monitoring.

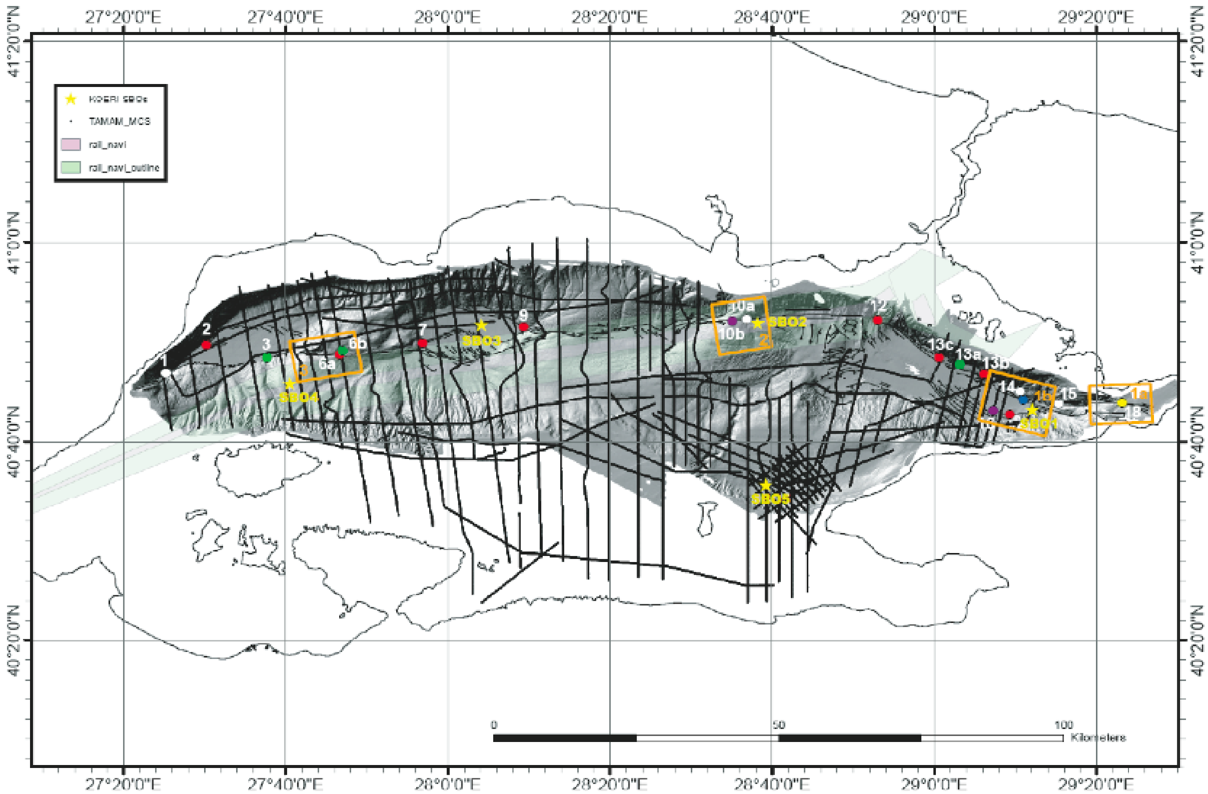

Fig. 1 : Location in the Sea of Marmara of sites explored with the Nautile submersible during Marnaut. White circles are sites with no manifestation of fluid outflow, all other sites have seafloor manifestations (bacterial mats, authigenic carbonates, water and/or gas emissions). Site 18 (yellow dot) is the site of INGV SN-4 deployment in the Gulf of Izmit. Sites 3, 6b and 13a (green) were instrumented during Marnaut. Sites 16, 10b (purple), 6a and 6b should be instrumented during MARMESONET in 2009. Yellow stars are planned locations for KOERI Seafloor Stations. Site surveys will be carried out in boxes 1a, 1b, 2 and 3 outlined in orange (the typical dimensions for sites surveys is 3.6 x 10.8 km^2). A specific survey with AUV could also be planned near site, near Boris Bubbler. Black lines indicate tracks followed during the TAMAM cruise. Light green shaded areas indicate the northeastward and southwestward maritime corridors, which are separated by a light purple area. Note that the TAMAM cruise was unable to survey the Eastern Ridge area, due to heavy maritime traffic.

II. Synthesis of scientific presentations

The full presentations (see list in Appendix 1) can be found at: http://www.cdf.u-3mrs.fr/~henry/marmara/

The major results are summarized in Fig. 1. Fluid emissions in the Sea of Marmara have been successfully mapped and sampled during the MarNaut cruise and a correlation with active faults is clearly established :

- The locked fault segment forming a seismic gap south of Istanbul exhibits relatively less gas emissions than the adjacent segments.
- Gas emissions sites that have been detected in 2000 were still active when revisited 7 years later.
- In the Çınarcık Basin, active gas emissions have been found above a buried transtensional fault zone, which extends westward, 40 to 60 km the zone where 1999 aftershocks were observed.
- Methane of thermogenic origin (based on Carbon isotopes) have been sampled at sites 6 and 10 (Fig. 1) but also traces of thermogenic ethane at Site 16 in the Çınarcık Basin, indicating fluid migration occurs through the syntectonics basins.
    - Mantle helium was detected in gas escaping out of tension gashes at site 2 (Fig. 1), indicating migration of gases from the mantle to the seafloor
    - Gas hydrates discovered on top of the western high (site 6, Fig. 1) exhibit a signature indicating a connection with the Thrace basin hydrocarbon field;
- Gas of dominantly bacterial origin have been sampled in the Çınarcık Basin (site 16, Fig. 1), indicating a dominantly superficial origin.

- The analysis of OBSs data indicates that, in the absence of detailed station corrections, it is almost impossible to merge land and seafloor seismological datasets. This work underlines the critical necessity to improve the 3D-velocity models for integrating the land and seafloor networks.
- The presentation of Michel Bouchon suggests a new hypothesis to explain why no gas escapes have been detected on the locked fault segment located south of Istanbul. This segment could be characterized by low permeabilities within the fault zone, due to a relatively a narrow damage zone. It could have characteristics similar to those of the super-shear segments that ruptured during the Koaceli, 1999 earthquakes sequence.

In conclusion, all the ingredients are present for a fruitful, long-term collaboration between the KOERI/MSBO and the ESONET/MARMARA-DM projects. While seismometers are remote sensors that can monitor seismicity a few kilometers away from the earthquake source, the sensors used for monitoring the fluid properties need to be located precisely, near fluid escapes. Hence, it is critical to have a very good knowledge of the hydrogeological system, a major objective of the Marmara-DM project. In addition :

- The KOERI project is of critical importance for the Marmara-DM project, as it will :

    - provide top-quality, real-time, broad-band seismological data
    - pave the road for cabled, seafloor observatories in the Sea of Marmara

- On the other hand, the Marmara-DM project is also important for the KOERI project, as it will :
    - provide site surveys at two KOERI sites (SBO-1 and SBO-2), including : i) the micro-bathymetric mapping and ii) the fine-scale imagery of the fluid conduits beneath these observatory sites (see chapter III).
    - provide a better understanding of the hydro-geological system and its interaction with seismicity
    - help improve the 3D velocity model for the whole Marmara-Sea (by deploying short-period -4.5 Hz- OBSs during one year) , a critical issue for combining land and seafloor data.

III. Update[5] on the operations at sea scheduled for 2009

III.1 Ship scheduled in 2009 in the Sea of Marmara

a) R/V Le Suroit (Marmesonet cruise). This cruise is scheduled from august 23 (Istanbul) to October 2nd, 2009 (Istanbul). It will consist in 2 parts :

- Part 1 (21 days): EM 300 for the detection of bubble emissions over the whole Marmara Sea. AUV for micro-bathymetry, chirp and EK-60 bubble detection at three sites.
- Part 2 (14 days): High resolution seismics: 3D survey at one site
- Part 3 (5 days): Instrument deployments

b) R/V Urania. The Italian CNR funded 4 weeks of R/V Urania (from Italy, on 22/09/09 to Italy, on 12/10/09) to conduct a high resolution side-scan sonar, chirp and multibeam data prior to the deployment of SN-4, the multi-parameter seafloor observatory developed by INGV. The site selected for SN-4 deployment in located in waters shallower than 200 m, at the entrance of the Gulf of Izmit.

c) R/V Piri Reis: 10 are presently funded in 2009, to conduct high resolution seismic surveys at sites not covered with R/V Le Suroit.

d) 3) R/V Yunus (İU Fisheries Faculty): one week of ship time has been required by ITU to use the Medusa system to decide the best location for SN4 deployment in east Çınarcık Basin or on the Eastern high (Site 10a). This cruise could be funded by MarmaraDM (estimated cost is 1500 €/day).

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[5] *This chapter is an update of the conclusions that resulted from the Marmara-Dm kick-off that was held in Istanbul, on june 18th, 2008 (see meeting report on http://www.cdf.u-3mrs.fr/~henry/marmara/).*

III.2 Priorities on site survey locations

High resolution (< 1 m), microbathymetric surveys will be conducted at three or four sites during the Marmesonet cruise, using the Ifremer AUV (see box coordinates, Table 1) :

- **Box 1a** (Çinarcık Basin) is located where active gas emission sites have been found (in 2000 and 2007), above a buried transtensional zone that extends in the prolongation of the fault that ruptured in 1999. **Box 1b**, located at the entrance of the Gulf of Izmit, will be surveyed with R/V Urania, prior to the deployment of SN-4.

- **Box 2 (Istanbul)** is centered on the Central High, less than 20 km to the SW of Istanbul. This site is located on the "seismic gap", a fault segment that did not rupture since at least 1766. Most manifestations of fluid outflow have been found on top of the anticlinal ridge, south of the main fault trace. There is little evidence for fluid emission along the fault trace itself.

- **Box 3 (Western High)** is centered on the site where gas hydrates have been discovered in 2007 with *R/V L'Atalante*. The box is located on the Western High that is cut by the main fault trace, between the Tekirdag and the Central basins.

- **Box 4 (Tekirdag Ganos)** is centered on site 2, located on a secondary fault at the base of the Ganos slope where strong bubbling of gas with Helium composition indicates a mantle contribution.

1a, 1b, 2 and 3 require detailed HR seismic site surveys.
For the 3D, high-resolution seismic survey with R/V Le Suroi[6]t, the top priority target is Box2, south of Istanbul. Site surveys on the other sites will presumably be conducted with R/V Piri Reis.

The Istanbul site, however, is located near the entrance of Bosphorus Straight in the navigation corridor, where the maritime traffic is known to be particularly intensive. Günay Çifçi mentions that seismic surveying in this area was not possible during the TAMAM cruise. Hence, high resolution seismics may simply not be feasible there. **Additionally, the quality of imagery that may be expected from a HR seismic survey at this site should be assessed before performing 3D acquisition.**

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[6] *The experience of Ifremer-AS concerning 3HR survey is that there is no manoeuvrability of the vessel when the equipment is deployed :*

- *it takes about 4 hours to deploy at sea or to take back on board the streamers and the source arrays minimum/maximum speed : 2/3 knots;*
- *survey parameters :*
    - *vessel speed 4-5 knots (max 6 knots; the swinging booms could not bear higher strength);*
    - *maximum angle of rotation : 10°/minute*
    - *maximum "emergency" depth of the streamers: around 5 meters for the head, around 15-20 meters for the tail (due to tail buoys) ;*

The final quality of the 3D data set relies greatly on the ability to follow, as far as possible, the navigation lines 25 meters apart.

ITU (Namik Çagatay) and DEU (Günay Çifçi/Mustafa Ergün) propose to contact the Turkish maritime authorities to study the feasibility of site surveying at the Istanbul site (see coordinates of Istanbul box in Table 1).

If the HR-3D survey is not feasible in Box2, then a new plan (B) will defined in Box 3 or in Box 4. Box 3 is indeed an alternative to Box 2 as the context of fault-seep relationship is similar: maximum outflow is on top of a ridge some distance from the main fault. We would like to know whether the conduits for gas migration to the seafloor are connected to the fault and at which depth. However, this is not the only alternative.

The decision whether a 3D box should be shot or not relies on the quality of the imagery that may be expected. We want to image gas conduits and sedimentary/tectonic structures, but are not interested by imaging widespread gas masking. There is no point is shooting 3D in fog.

Consequently, it is very important to assess the quality of existing 2D HR lines in or near Box 3 (even if Box 2 is selected, these two sites are comparable). One profile was shown on Chris Sorlien's poster at AGU, Fall Meeting 2008. The quality of the image seems limited by the presence of widespread gas at a shallow level in the sediment.

Box	A (NW)		B (SW)		C (SE)		D (NE)	
	lat	lon	lat	lon	lat	lon	lat	lon
1a	40°47.11’	29°6.88’	40°42.18’	29°5.42’	40°40.55’	29°13.69’	40°45.43’	29°14.96’
1b	40°45.56’	29°19.14’	40°41.76’	29°19.33’	40°41.96’	29°26.86’	40°45.78’	29°26.70’
2	40°53.70’	28°32.50’	40°42.12’	28°33.50’	40°49.70’	28°40.00’	40°54.50’	29°39.00’
3	40°49.95	27°40.42	40°46.00’	27°41.42’	40°47.05’	27°49.41’	40°51.01’	27°48.38’

Table 1 : Coordinates of Boxes defined for site surveys. If 3D high-resolution seismics in Box 2 is not feasible due to heavy maritime traffic, a new survey area could be defined in Box3.

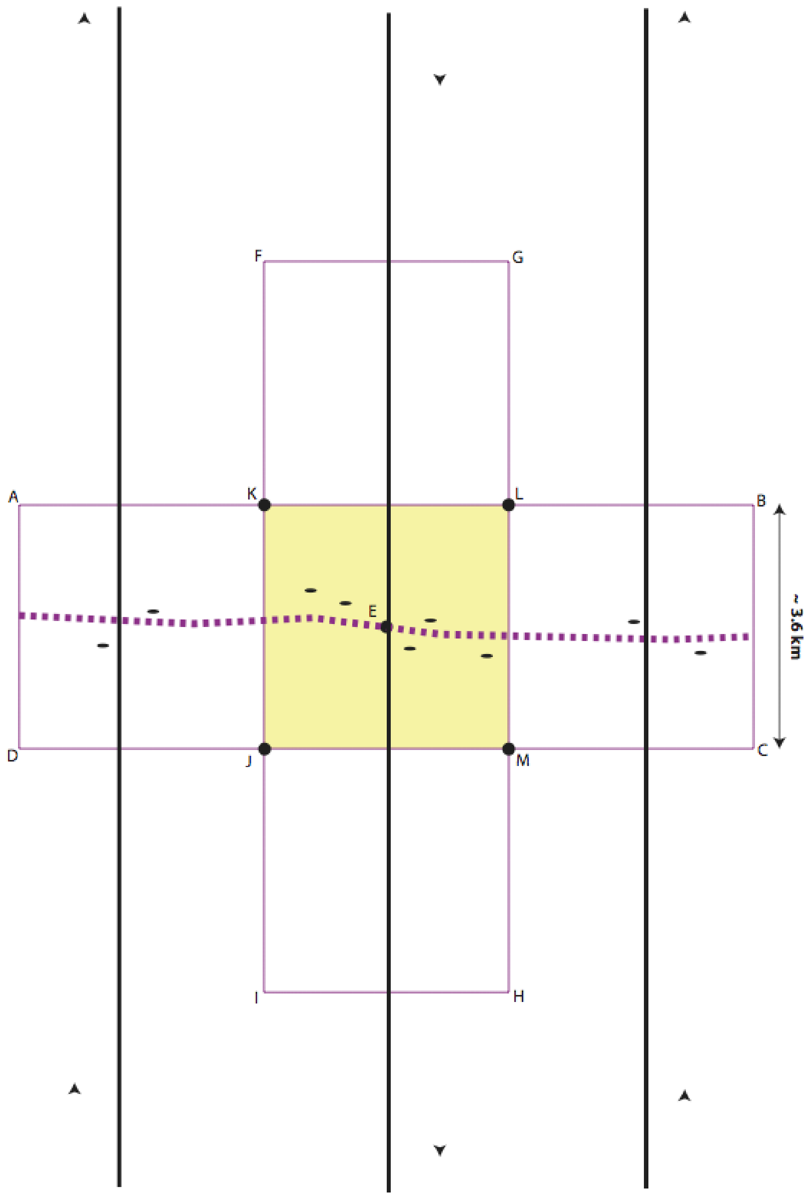

Fig. 2 Typical design of site survey including AUV and HR seismics. Thick dotted line indicates the fault trace on the seafloor.

During Leg I, the AUV will survey the area within a rectangle ABCD (approximate size is ~ 10.8 x 3.6 km^2) to detect gaz escapes (small, black ellipses) and finely map the defomation zone near the fault. Based on the AUV survey and on MARNAUT results, the precise location will be selected for the high res, 3D seismic survey.

During Leg II, three high-resolution, 2D seismic lines (thick, black lines) will be shot across the fault strike to identify the most appropriate location for the high-res, 3D seismic survey, here represented by the area within rectangle FGHI. The width and length of rectangle FGHI will be determined during the cruise, based on the interpretation of the AUV survey results.

III.3 Coordinates of KOERI seafloor observatories

The coordinates of the 5 permanent, cabled SBOs that will be deployed by KOERI are plotted as yellow stars in Fig. 1 and listed in table 1 here below.

At least two KOERI stations are within areas targeted by the Marmara-DM project :

- K-SBO-01 is located in the eastern Cinarçik Basin, near the entrance of the Gulf of Izmit
- K-SBO-02 is located close to the locked segment south of İstanbul, a few kilometers east of the Central High where gas bubbles and carbonate crusts have been discovered during the MarNaut cruise (see dot 10 on Fig. 1).

Hence, it will be possible to conduct high resolution (AUV) bathymetric surveys at these two sites during the Marmesonet cuise of R/V Le Suroit in 2009.

If there is enough shiptime, a limited survey will be also performed at sites K-SBO-03 and K-SBO-04 using AUV micro-bathymetry.

Location	Latitude	Longitude
Cinarcik Basin (K-SBO-01)	40.74199	29.2022
South of Istanbul (K-SBO-02)	40.8645	28.6373
Central Basin (K-SBO-03)	40.8612	28.0684
South of Tekirdağ (K-SBO-04)	40.7643	27.6745
North of Imrali Island (K-SBO-05)	40.5938	28.6545

Table 2 – Currently planned coordinates of the KOERI seafloor observatories (coordinates sent by Mehmet Yilmazer by e-mail dated Nov. 10, 2008).

III.4 Instrument deployment strategy

OBSs. The proposal submitted in July 2008 by Mike Tryon and Leroy-Dorman (SIO) for deploying Scripps OBSs has not been funded. Hence, there will be only 12 autonomous OBSs (from Ifremer), that will be distributed along the fault within the Sea of Marmara.

Piezometers. Piezometers will be deployed in pairs in order to assess whether recorded anomalies are local (and possibly instrumental artifacts) or regional. Hence, we will deploy 2 piezometers per box. The final location of the piezometers within each box will be defined after the site surveys. In Boxes 1a and 1b - Fig. 1- at the entrance of the Gulf of Izmit-, the crustal strain can be monitored with GPS land stations. Additionally, the fault geometry at Box 1a is such that fault slip theoretically results in a change of mean stress and induces volumetric strain in the sediment. Strain events are more likely to be recorded as pressure variations there than on straight fault segments. Sites 1a and 1b could then be well adapted to test the feasibility of using pore pressure variations for monitoring background strain. Furthermore, although gas expulsion is one of the parameters to be monitored, sites with strong gas expulsion (such a 6b and 10b) are not ideal to test this approach because the local dynamics of the two-phase flow system will likely dominate the records.

Autonomous station for acoustic monitoring of gas bubbles. Ifremer will deploy an acoustic device for monitoring gas bubbling activity for a preliminary duration of one month. The system will be deployed with a simple cable, at the beginning of the Marmesonet cruise and recovered one moth later. It will be deployed on a flat area, where bubble gas emissions occur through fractures and ideally are associated with crustal micro-seismicity. A good candidate is site 16 (Fig.1), which fits all requirements.

SN-4. This autonomous station will deployed in Box 1b (site 18 in Fig. 1), at the entrance of the Gulf of Izmit, in water depths < 200 m (see Appendix 3). Sites 1a and 1b could then be well adapted to test the feasibility of using pore pressure variations for monitoring background strain.

HCMRS Radon Sensor. This sensor will be deployed at SN-4 site. Practical modalities have to be discussed between Christos Tsabaris (HCMR) and INGV.

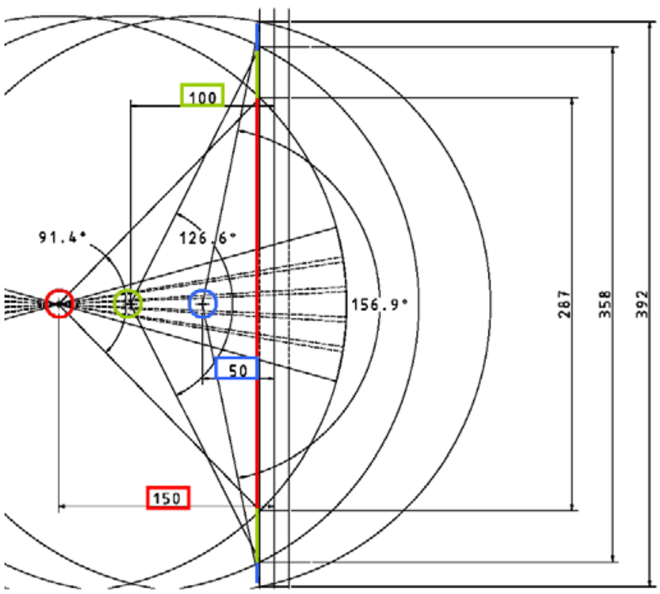

Fig. 3 : Fault segment (colored, thick line) length covered by an acoustic bubble detector equipped with a 38 kHz transponder located at different distances from the fault at a distance of 50, 100 m and 150 m, the fault segment length is 287 m, 358 m and 392 m respectively.

IV. Actions to be taken :

1) Ifremer : require authorization for work in the SoM, via the Ministry of Foreign Affairs

2) ITU : action for support of the Turkish Navy. Determine feasibility of site surveying on Esonet sites 2 (SW Istanbul) and 3 (Eastern high). See box coordinates in Table 1.

3) DEU : require shiptime survey for Esonet sites 1 and 2

4) Ifremer, Ismar, DEU : coordinate ship operations in 2009

5) KOERI & Guralp : Provide cost estimation for deploying one cable to Istanbul seafloor observatory site (Box2, Fig. 1).

6) ITU and all partners : fund rising for deploying a cable, from land to the Istanbul seafloor observatory site.

6) LDEO : provide a few selected lines that could help preparing the lay-out of the site surveys scheduled in 2009. The requested lines that could be very useful at this stage are[7] : Lines 22b, 24c across the locked segment fault SW of Istanbul ; Lines 34 and 30 across the fault segment that joins the Tekirdag and Central Basins, cutting the Western Ridge.

7) All partners are invited to participate to the ESONET Exchange Programme (this was actually done ; proposals were sent on November 21st, 2009).

V. Next meeting :

- Bilateral meetings will be needed in early 2009, for coordinating the marine operations and to examine available data, most particularly the seismic data from the TAMAM cruise (the Marmara-Dm partners and KOERI have thus submitted a significant number of proposals to participate to the Esonet Exchange programme call, which closed on November 21st, 2008).

- EUG meeting in Vienna (April 2009) could be a good opportunity for a general project meeting[8], if needed.

[7] *This selection of lines was discussed during the Marmara-DM meeting in Brest.*
[8] *Idem. This is a mere suggestion that was not discussed in Brest.*

Sub-Appendix 1

Marmara-DM Second Meeting, Brest, October 29-30, 2008
Room : Salle de l'Océan
Agenda

DAY 1 : Science Meeting

Morning Session : Fluids along the Sea of Marmara / Results from the MarNaut cruise

0830-0900 Icebreaker Coffee
0900-0915 L. Géli : Introduction
0915-0935 N. Cagatay : Geological hazards in the Sea of Marmara
0935-1020 P. Henry : General synthesis of MarNaut results
1020-1040 Coffee Break
1040-1140 M. Bouchon : Seismological characteristics and fine scale structure of the North Anatolian Fault
1140-1230 M. Ylmazer/D. Kalafat/G. Altay : KOERI's Cabled Observatory Project : description and technical constraints
1230-1300 Discussion

1300-1400 Lunch

Afternoon session : Related projects

1400-1430 Y. Auffret : Technical options for multi-parameter seafloor observatories
1430-1450 JB Tary : Microseismicity in the Tekirdag Basin : updated results
1450-1510 S. Bourlange/P. Burnard : Updated Helium Isotopes results and geodynamic implications
1510-1530 L. Rufine/C. Bourry / JL Charlou / Gaz hydrates geochemistry : updated results and connexion with the Thrace basin hydrocarbons
1530-1550 C. Pierre : Methane related carbonates from the Marmara sea
1550-1610 Discussion
1610-1630 Coffee break
1630-1730 Gunay Cifçi & Leonardo Seeber : Recent results from the TAMAM Cruise collected with DEU/HR seismics facilities (2 presentations)
1730-1815 Discussion

DAY 2 : Marmesonet 2009 Cruise planning

0900-0915 L. Géli : Marmesonet and ESONET/Marmara-DM general objectives
0915-0945 Patrice Lubin : AUV description and technical constraints
0945-1015 Y. Thomas / S. Ker : Ifremer HR Seismics, description and technical constraints
1015-1030 Coffee Break
1100-1130 C. Saclabrin, N. Lanteri P. Pelleau, R. Apprioual : constraints imposed by instrumentation (discussion)
1130-1230 Discussion on Observatory Sites and Site Surveys strategy

1230-1330 Lunch

1330-1600 Discussion on Finalized cruise plan
1600-1615 Coffee break
1615-1715 L. Géli : MARMARA-DM road map
1715-1745 What's next : task distribution (who does what), data processing, PhD Thesis, personnel exchange, fund rising, etc
1745-1800 Final Conclusions

Sub-Appendix 2
List of participants

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Sub-Appendix 3 - Note Prepared by the Italian partners

SOME NOTES ON SN-4 OBSERVATORY DEPLOYMENT IN THE SEA OF MARMARA (ESONET Demo-Mission project) – October 2008

L. Gasperini, *ISMAR-CNR, Bologna*
P. Favali, G. Marinaro, G. Etiope, *INGV, Roma*

1. Site selection

After several years of geo-marine studies, which include collection and interpretation of high-resolution morhobathymetric maps, chirp-sonar profiles, side-scan sonar images, MCS profiles and tens of well-targeted gravity and piston cores, we can conclude that that the Gulf of Izmit is characterized by the presence of a wide (>10 km) deformation zone across the trace of the NAF system. However, during the last 10,000 years, where accurate stratigraphic constraints are available, we are able to locate some areas where the PDF (principal deformation zone) is extremely narrow and shows an almost pure strike-slip deformation pattern. Due to the presence of piercing- points, we were able to estimate very accurately horizontal and vertical deformation rates along these fault strands during the Holocene (10 mm/y, Polonia et al., 2004).

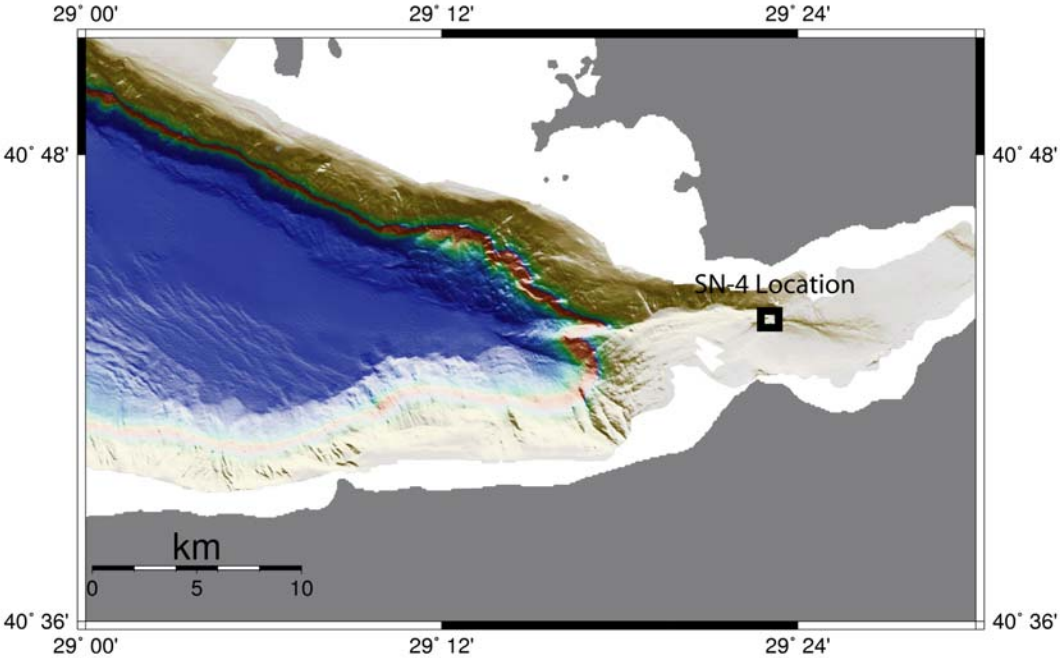


Figure A3-1

The area selected for the SN-4 experiment (Figure 1), in the frame of Marmara ESONET demo-mission project, is one of such areas where the PDZ of the NAF is < of some tens of meters wide, and show interesting characters that could be summarized as follows:

1) it is close to the western end of the surface rupture associated with the the 1999 Izmit earthquake; thus, it is the most probable area where the next earthquake affecting the fault strand towards Istanbul will enucleate;

2) it is an area characterized by gas and fluids emission related to the fault activity, as documented by acoustic images of the water-column and direct observations carried out using ROVs, and thus can be used to establish a correlation between these phenomena and mechanical behaviour of faults; these information could be suddenly used for seismic risk asessments and to define early-warning strategies. This occurrence is also confirmed by the presence of “black patches” at the seafloor observed during MARNAUT cruise (see Le Pichon dive)

3) it is an area characterized by a “focusing” of the NAF principal deformation zone, which is constituted here by a single NAF, strike-slip segment; we measured strike-slip rate during geological time span (10,000 years) along this strand.

4) it is a relatively accessible area, due to the moderate water depth (200 m) and to the vicinity to the coastline. This is an extremely important point when we will eventually decide to go toward a permanent (or semi-permanent) observatory.

2. Site selection constrained by gas seepage variability and detection potential

A main objective of SN-4 observatory is to monitor and assess the temporal relationships between geochemical signals related to fluid expulsion and seismic activity. The signals related to fluid seepage refer to possible variations of the concentration of methane in solution in seawater in contact with gas (methane) sensors, as a result of variable amount of gas discharged from a seabed fault/seep. If the seep typically and constantly releases large amounts of gas (e.g., big bubble plumes), seawater methane concentration in the near-field will be always high and anomalous. In this situation, a gas sensor will operate with and detect always high levels of gas (e.g., hundreds or thousands or more nM CH_4 /L) with frequent oscillations due to the specific seepage behaviour and plume turbulence and dissolution effects: the data record will appear as a series of high and highly variable concentrations. Eventual variations related to seismic activity will be likely masked by this intrinsic oscillations.

For this reason, it is recommended to deploy the monitoring system in correspondence with a weak seep or where there is high potential of seep activation (e.g., a site with gas-charged sediments or with buried gas chimneys shown by acoustic images). In these cases, the gas sensors normally will record zero, near zero or relatively low (e.g., units to tens o nM/L) methane levels and any significant variation of concentration will appear as pulse or peak, easily identifiable in the data record and comparable with seismic data.

3. Site depth constrained by observatory specifications and deployment procedure

The SN-4 observatory was developed in the framework of ORION (Ocean Research by Integrated Observatory Networks) EC project and deployed as node of ASSEM (Array of Sensors for long-term SEabed Monitoring of geohazards) EC project during a joint experiment in the Corinth Gulf (Greece, 400 m w.d.) in 2004. In its first configuration SN-4 was based on an aluminium frame designed for a maximum operative depth of 600 m; its weight is 6.6 kN in air and 3.4 kN in water and its dimensions are 2x2x2 m.
For the Marmara mission the configuration of the observatory has been modified. Other sensors have been added to the previous scientific payload in order to have a better characterisation of the fault site. The new payload and relevant sampling rates are summarised in Table 1.

SENSOR	Mfr. & model	Sampling rate
Seismometer	GURALP CMG-40T	100 Hz
Hydrophone	OAS E-2PD	100 Hz
Current meter	NOBSKA MAVS-3	5Hz
CTD	SeaBird SBE-16plus	1 sample/10min
Turbidity meter	WET LABS Echo-BBRTD	1 sample/10 min
CH_4#1	Franatech METS	1 Hz
CH_4#2	Contros HydroC	1 Hz
oxygen	Aanderaa Oxygen Optode 3830	1 Hz

Table 1 – SN-4 scientific payload

With all these sensors, SN-4 will be able to monitor and assess the temporal relationships between geochemical signals related to fluid expulsion and seismic activity. The station will be deployed using a mechanical rope and an acoustic release like in ASSEM mission, but the recovery procedure will be different to reduce economical and logistic efforts. No ROV will be necessary for the operations because a recall buoy canister actuated by an acoustic release will be installed on the observatory. The maximum depth reachable with this recovery system is **200 m** that is the length of the rope. To facilitate the recovery procedure the total weight in water will be reduced to 1.5 kN installing 8 bentho-spheres on the frame and adopting new lighter vessels for batteries and Electronics (Figure 2). As the Lithium battery pack will guarantee 6 months of autonomy, this procedure for recovery should make the battery pack replacement easier.

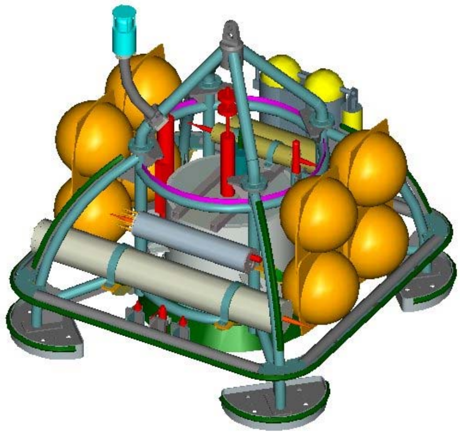


Figure 2 – SN-4 configuration for Marmara mission

Sites deeper than 200 m (but < 600 m) could be considered only if further financing and time, necessary to redesign and rebuilt the deployment/recovery system, will be make available.

References

Polonia, A; Gasperini, L; Amorosi, A; Bonatti, E; Bortoluzzi, G; Cagatay, N; Capotondi, L; Cormier, MH; Gorur, N; McHugh, C; Seeber, L **Title:** Holocene slip rate of the North Anatolian Fault beneath the Sea of Marmara **Source:** EARTH AND PLANETARY SCIENCE LETTERS, 227 (3-4): 411-426 NOV 15 2004

Sub-Appendix 4 :
Timing constraints for AUV and high resolution seismics with R/V Le Suroit

AUV

- Weight: 800kg
- Length: 4.5m
- Payload Capacity: 100kg (in water) with dimension constraints
- Capacity: 12Kwh (Li/ion)
- Autonomy: 80km (without payload, 3 Knots)
- Maximum Depth:
  - AsterX: 2650m
  - IdefX: 1500m (2800m for 2010)
- Speed: 1 –5knots
- Profile follow-up: 35° of slope
- Team: 3 pers without payload post-processing

- Payloads :
  - EK60 70KHz (IXSEA)
  - EK60 200KHz (IXSEA)
  - CTD SBE 49/25/19 (SEABIRD) (SBE -49 always on auv)
  - MultiBeams Sounder EM2000 (KONGSBERG)
  - ADCP 300/600/1200 Khz(RDI)
  - Fluorimeter
  - Sub-BottomProfiler ECHOES (IXSEA)

- Two out of 3 main payloads (multibeam echosounder EM2000, EK60 sounder and Sub-bottom profiler) can work together on the same dive

Pratical specifications on cruise

- Only one container with the auv and all its equipment
- Need only a place for 2-3 computers in a scientific lab
- Time of dive-preparation: 2 hours (mission plan, check-list, launching)
- Time of dive : 10-11 hours(depends on the payload) at ~3 Knots (optimum speed)
- Ship following: 3 knots max with GAPS
- Recovery: ~ 3-4 hours
- End dive Check-list: 1/2 hours
- Batteries charging time: 12 hours

Surveying a 10.6 x 3.8 km^2 area with lines spaced by about 125 m takes about 5 days

High Resolution seismics :

3D-acquisition system :
- Two arrays of sources (1 or 2 airguns per array)
- Two streamers of 48 traces, 25 m apart
- Maximum offset : 380 m
- Source positioning
- Depth controllers
- Ship speed : 4 to 5 knots
- Line spacing : 25 m
- Streamer immersion : 3 m
- Source immersion : 1.5 m
- Shooting rate : 3 s

2D-acquisition system :
- One source array (up to 6 airguns)
- One streamer up to 120 traces (6.25 m)
- Maximum offset : 830 m
- Ship speed : 4 to 5 knots
- Line spacing : 25 m
- Streamer immersion : 3 m
- Source immersion : 1.5 m
- Shooting rate : 3 to 6 s

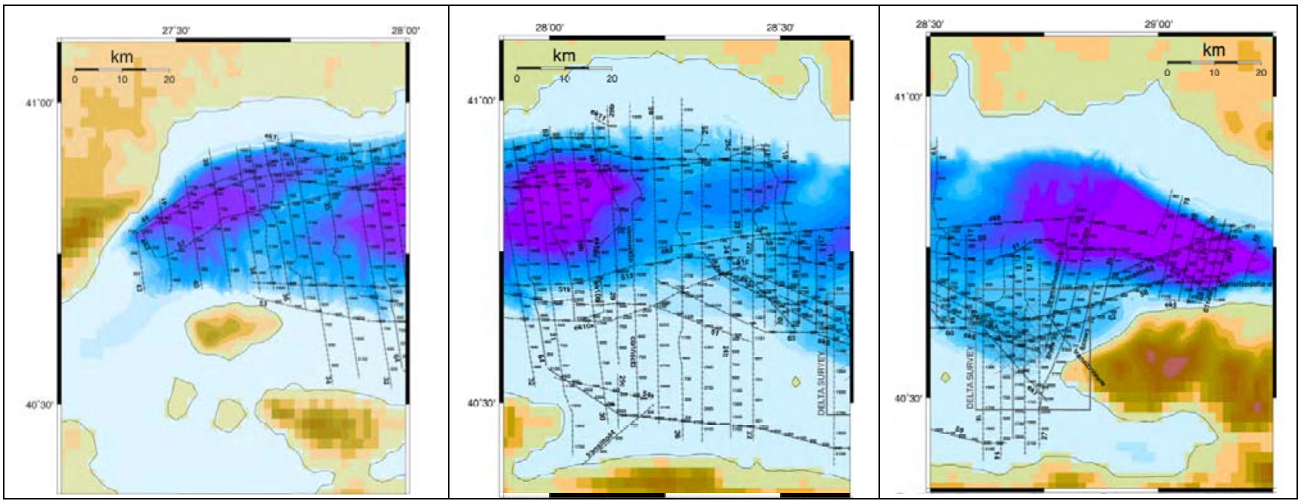
Signal characteristics :
- frequency bandwidth: 30-250 Hz
- vertical resolution ≈1.5-2.0 m
- lateral resolution ≈6 m
- several 100 m of penetration in sediments (typically 500-1000 m)
- target depth including water column : best 200-500 m, reasonable 150-1200 m, hazardous> 1500 m

3D Acquisition strategy :
- distance between sailed lines: 25 m
- vessel speed : ~4-5 5 kts
- min-maximum turning circle ≈30’
- optimization of sailed lines acquisition + in-fill
- optimal size of the survey: 5 x 2 miles (34 km^2)
- 148 nominal sailed lines + ≈37 in-fill lines ≈ 1h45 per sailed line (4.5 1h45 per sailed line (4.5 kts, including giration)
- 13.5 days of 3D-acquisition

- Adding 1 day for :
  - vertical profiles of celerimetry
  - 2D acquisition: regional profiles + accurate velocity estimation

Total : 14.5 days for full coverage of box 5 x 2 miles (34 km^2)

Sub-Appendix 5 :
MAPS OF SEISMIC LINES SHOT DURING TAMAM Cruise, July/August 2008



Bathymetry in the center of the Marmara Sea from multibeam data (Rangin et al., 2001), and other bathymetry and onshore elevation from the GEBCO 1-minute atlas (IOC IHO BODC, 2003). Profile locations indicated with black lines. Every 200th shot is labeled with a black circle and text. Line numbers indicated in largerbold face type. Courtesy John Diebold, LDEO.

APPENDIX II

Letter requesting support vessel from SHOD (Turkish Department for Navigation, Hydrography and Oceanography)

Ifremer

Subject : Formal request for a support vessel

Admiral Mustafa İpteş
Director, SHOD
Dz. K.K. Seyir
Hidrografi ve Osinografi Dairesi
Baskanligi
34805
Çubuklu, Istanbul

Brest, 13 March 2009

Dear Admiral İpteş,

Following our meeting in Istanbul on February 9th 2009, I am pleased to inform you that the "application for consent to conduct marine scientific research" in the Sea of Marmara has been sent today via the usual diplomatic channel (Ministries of Foreign Affairs). This application concerns work to be conducted with R/V Le Suroit, during the Marmesonet cruise, which includes 2 legs:

- during the first Leg (august 24th to September 14th), R/V Le Suroit will deploy an AUV. The horizontal distance from vessel to the underwater vehicle must be less than 0.3 nautic miles.
- during the second leg (september 17th to October 1st, 2009), R/V Le Suroit will tow a seismic streamer (between 450 m and 800 m long).

Please also find enclosed a set of 10 DVDs with all the data that we have from the Sea of Marmara during the Marnaut cruise. The data set is also available at Istanbul Technical University, Professor Namik Çagatay being the contact person.

As mentioned during our meeting in Istanbul, we would greatly appreciate the support of the Coast Guard or any other institution to enforce clearance around R/V Le Suroit and ensure safety of operations. The need for a support vessel is particularly critical for the second leg, during which we plan to conduct one 3D, high-resolution seismic survey, with closely spaced lines (less than 25 m), meaning that the vessel should not deviate from its trajectory.

In advance, please accept my warm thanks for your collaboration and help.

Best regards,

Louis Géli

stitut français de Recherche
ur l'Exploitation de la Mer

ablissement public à caractère
dustriel et commercial

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APPENDIX 3

Letter sent by ITU to TPAO (Turkisk Petroleum Corporation), Halit Halkan, Director of Exploration, on January 9th, 2009

İstanbul Teknik Üniversitesi
Eastern Mediterranean Centre for Oceanography and Limnology
Doğu Akdeniz Oşinografi ve Limnoloji Araştırmaları Merkezi

09.01.2009

TPAO GENEL MÜDÜRLÜĞÜ'NE

Avrupa Komisyonu (EC) 6. Çerçeve Programı tarafından dsteklenen ESONET mükemmelliyet ağı projesi kapsamında Marmara Denizi'nde deprem araştırmalarına yönelik deniz tabanı gözlemleri yapılmaktadır. Ekte bu projenin tanıtımını ve proje kapsamında yapılan çalışmalardan çıkan ön sonuçların bir özetini bulacaksınız.

Bu bilgilerden de görüleceği üzere projenin amacı; Avrupa çapında çok amaçlı deniz tabanı gözlem istasyonu ağı oluşturmaktır. Bu ağ içerisinde deprem tehlikesi nedeniyle Marmara Denizi, diğer 12 deniz alanı ile birlikte önemli bir çalışma alanı seçilmiştir. Projenin başarıya ulaşmasının ancak endüstri ve özellikle de petrol endüstrisi ile yakın bir işbirliği içerisinde mümkün olabileceği öngörülmüştür. Bunun sonucu olarak dünyanın başka deniz alanlarında çok önemli petrol şirketleri ESONET gözlem istasyonlarının kurulması ve işletilmesine katkıda bulunmuştur. Marmara Denizi'nde de bu işbirliğini gerektirecek; gaz hidrat, termojenik doğalgaz çıkışları ve petrol sızıntısı gibi önemli oluşumlar bulunmuştur.

Bu nedenle bir iç denizimiz olan Marmara Denizi'nde ESONET projesi kapsamındaki çalışmalarda öncelikle milli petrol şirketimiz TPAO Genel Müdürlüğü ile işbirliği yapmak ve destek almak ESONET proje yönetim kurulunun da çok arzu ettiği bir husustur. Uygun görüldüğü taktirde TPAO Genel Müdürlüğü'nde projenin tanıtımı ve ön sonuçlarını kapsayan bir sunum gerçekleştirmemiz mümkündür.

Marmara ESONET projesinde TPAO Genel Müdürlüğü ile işbirliği davetimize olumlu yanıt vermeniz dileği ile saygılarımı arzederim.

Prof.Dr. M. Namık Çağatay
EMCOL Müdürü
ESONET İTÜ Yönetim Kurulu
üyesi ve İTÜ Yürütücüsü

Ek: "ESONET projesi ve Marmara
Denizi Çalışmaları" dökümanı

EMCOL, İTÜ Maden Fakültesi, 34469 Maslak, İstanbul
Tel: 90-212-2856211, Fax: 90-212-285

Appendix IV
Answer of TPAO to ITU, dated March, 19th, 2009

Letter stating that the company is not interested in collaboration because they have no exploration rights in the Sea of Marmara

TÜRKİYE PETROLLERİ ANONİM ORTAKLIĞI
Genel Müdürlüğü

1024

19.03.2009*004093

Sayı : B.15.2.TPA.O.10.00.00/
Konu : Proje Çalışmaları hk.

Sayın Prof. Dr. Namık ÇAĞATAY
İTÜ-EMCOL (Doğu Akdeniz Oşinografi ve Limnploji Araştırma Merkezi) Müdürü
İTÜ, Maslak – İSTANBUL

Öncelikle yürütmekte olduğunuz projeleriniz tanıtımına yönelik yapmış olduğunuz sunumunuz için çok teşekkür ederiz. Ortaklığımızda Marmara Denizine yönelik ESONET ve EMSO projelerinde yürütmekte olduğunuz çalışmalarda Ortaklığımızın faaliyet alanında olabileceği düşüncesiyle önermiş olduğunuz işbirliği teklifiniz incelenmiş olup, Marmara Denizi içinde Ortaklığımıza ait bir ruhsatın olmaması nedeniyle, resmi olarak çalışma alanımızın dışında olması ve bu alanların başka şirketlerin ruhsat alanlarına girmesi nedeniyle, istenilen bilgi alışverişi yapılamayacağı düşüncesiyle, proje çalışmalarına katkı koyamayacağımızı bilgilerine arz ederiz.

Halit ALKAN
Arama Daire Başkan
Yardımcısı

Ömer ŞAHİNTÜRK
Arama Daire Başkanı V

Adres: Söğütözü Mah. 2.Cad. No:86 06100 Çankaya/ANKARA http://www.tpao.gov.tr/ **e-posta** : tpao@tpao.gov.tr
PK : 109 06581 Bakanlıklar-Ankara /TÜRKİYE **Tel** : +90 (312) 286 91 00-pbx **Fax** : +90 (312) 286 90 00 – 01

Appendix V

Document sent by ITU to Turkish private petroleum companies explaining ESONET Marmara-DM Project and describing recent findings regarding hydrocarbons in the Sea of Marmara

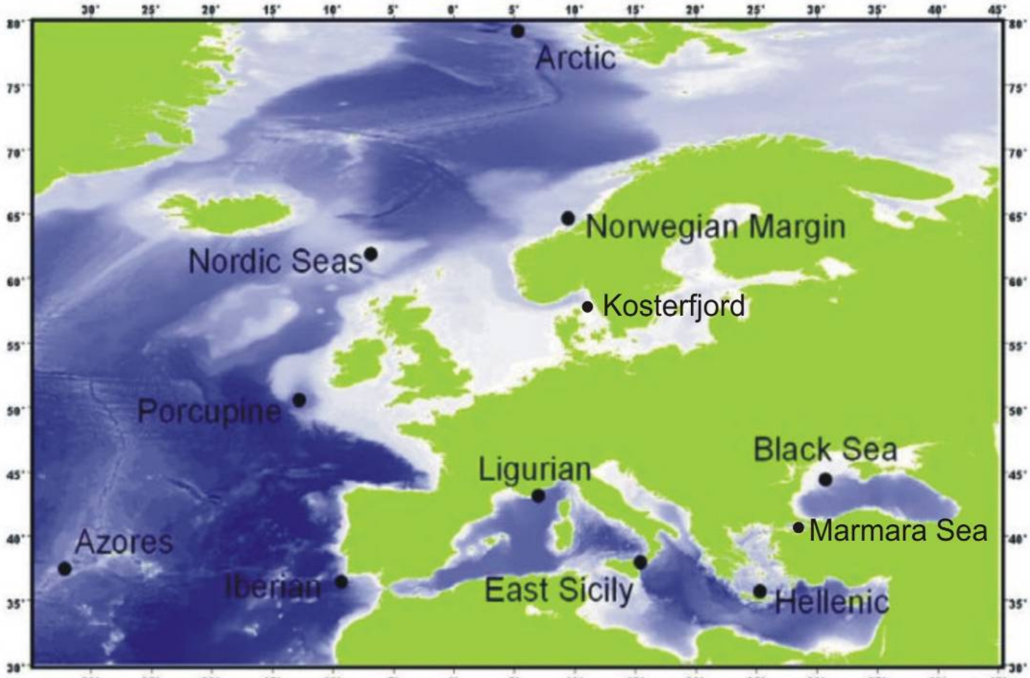
ESONET NoE (European Seas Observatory Network of Excellence) Avrupa Denizleri Gözlem Ağı Mükemmeliyet Projesi ve Marmara Denizi Çalışmaları

ESONET Projesi

ESONET Avrupa Komisyonu (EC) tarafından 6. Çerçeve Programı projesi ile desteklenen bir mükemmelliyet ağı projesidir (http://www.esonet-emso.org/esonet-noe/). Bu projede 14 Ülke 50 değişik kurum tarafından temsil edilmektedir. Türkiye bu projede, İTÜ-EMCOL (İstanbul Teknik Üniversitesi-Eastern Mediterranean Centre for Oceanography and Limnology), Boğaziçi Üniversitesi Kandilli Rasathanesi ve Dokuz Eyül Üniversitesi Deniz Bilimleri ve Teknolojisi Enstitüsü tarafından temsil edilmektedir. İTÜ'den Prof.Dr. Namık Çağatay projenin yönetim kurulu üyesidir. Projenin koordinatörlüğünü Fransız Deniz Araştırmaları Enstitüsü IFREMER'den Dr. Roland Person yapmaktadır. ESONET Projenin AB tarafından sağlanan bütçesi 7,200.000 Euro'dur. Projenin bütçesinin yarısına yakını Avrupa Denizlerinde denizaltı gözlemleri ile ilgili tanıtım "demonstration mission" (DM) projelerine ayrılmıştır.

ESONET projesinin bilimsel amacı Avrupa ölçeğinde Kuzey Buz Denizi'nden Karadeniz'e dek uzanan denizlerde yer-biyosfer-hidrosfer etkileşim süreçleri ile ilgili uzun süreli ve gerçek zamanlı, çok-disiplinli deniz gözlemleri yapacak bir gözlem istasyonu mükemmelliyet ağının oluşturulmasıdır (Şekil 1). Böylece ESONET, uzun süreli bilgiler toplayarak, yerkürenin iç süreçleri, derin deniz biyolojisi, kimyası ve genel olarak oşinografi süreçlerini daha iyi anlamamıza bilimsel ufuklar açacaktır. Bu şekilde ESONET, GMES (Global Monitoring for Environment and Security: Küresel Çevre ve Güvenliğin İzlenmesi, http://www.gmes.info/) tarafından belirtilen "yerinde" ve "uydu" izleme sisteminin deniz ayağını oluşturarak, GMES'e önemli bir katkıda bulunma amacı gütmektedir. Bu tür gözlem istasyonlarının özellikle doğal afetlerin (deprem, deniz-altı yamaç kaymaları ve bunlara bağlı tsunami gibi) izlenmesi açısından ülkemiz için önemi büyüktür.

ABD, Kanada and Japanya gibi ülkelerde deniz ve okyanuslarda doğal afetler, iklim ve çevresel değişim ve biyo-çeşitlilik gibi konularda gerçek zamanlı bilimsel gözlemler yapmak üzere



Şekil 1. ESONET ve EMSO projelerinde seçilen başlıca gözlem alanları.

halihazırda bir çok gözlem istasyon ağları oluşturulmuştur (http://www.neptune.washington.edu, http://www.venus.uvic.ca, http://www.mbari.org/mars, http:// www.jamstec.go.jp/jamstec-e/maritec/donet/). ESONET, diğer bir AB (FP 7) projesi olan EMSO (Avrupa Çok disiplinli Deniz Gözlemleri) ile birlikte Avrupa'da bilimsel kurumlar ile endüstri (özellikle de petrol endüstrisi) arasındaki işbirliğini güçlendireyi amaçlamaktadır. Bu şekilde, deniz tabanı gözlemleri konusunda Avrupa'nın ABD, Kanada, Japonya gibi ülkelerle olan rekabetinde önemli bir görev de üstlenmiştir. Bilimsel işbiriliğinde özellikle petrol endüstisinin projeye katılımı önemli olmuştur. Örneğin Norveç'in Statoilhydro şirketi Barents ve Kuzey Denizi'nde; BP Angola açıklarında, Chevron ve Total Meksika Körfezi ve Kuzey Denizi'ndeki deniz gözlem istasyonlarının kurulması ve işletilmesine maddi ve lojistik destek vermektedir.

Marmara-DM projesi: ESONET Projesinin Türkiye Ayağı Çalışmaları:

ESONET projesi dört yıl süreli olup resmi olarak 1 Mart 2007'de başlamıştır. Proje için Marmara Denizi ve Karadeniz önemli birer gözlem alanı (node) seçilmiştir (Şekil 1). Özellikle Marmara Denizi'nde ESONET projesi kapsamında yapılan ve yapılacak deniz tabanı izleme çalışmaları, beklenen Marmara depremi ile ilgili Kuzey Anadolu Fay (KAF) zonunun davranışı konusunda çok yeni bilgiler sağlamaktadır. Bu hayati önem taşıyan bu konu neeniyle ESONET projesi 500,000 Euro tutarındaki bütçesini Marmara Denizi'ndeki deniz tabanı gözlem çalışmalarına ayırmıştır. Yakın zamanda yapılan çalışmaların sonuçlarını şu sekilde özetleyebiliriz:

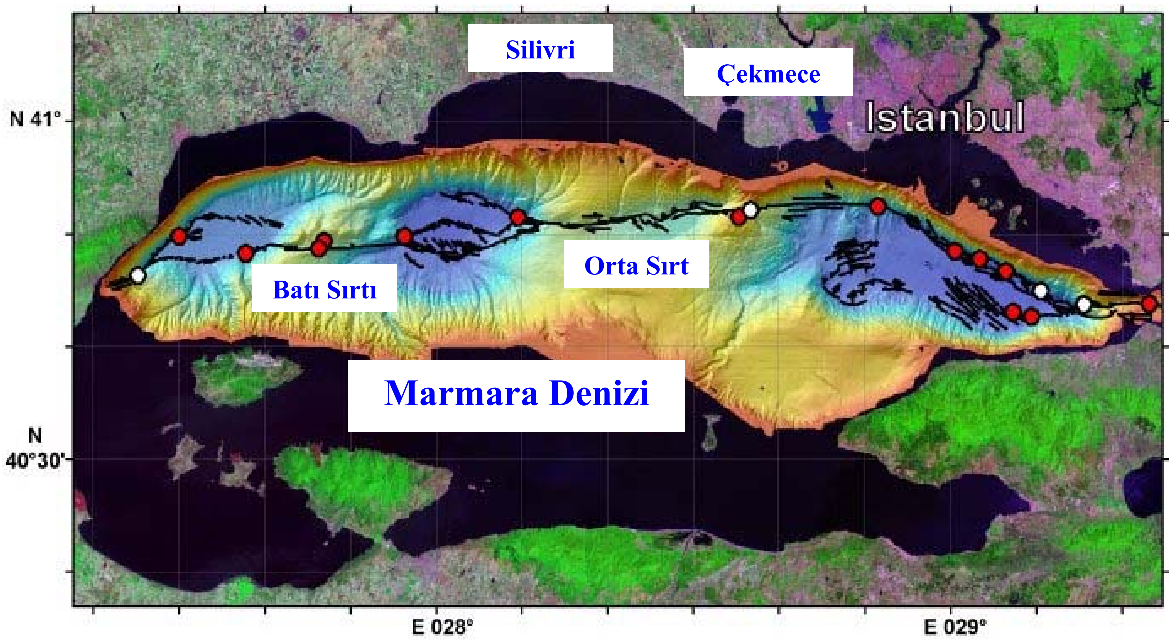
1. Marmara Denizi altında kalan KAF zonu boyunca gaz ve sıvı çıkışları gözlenmiştir. Bunlardan Orta Sırt ve batısında çıkan gazlar derin kökenlidir. Derin kökenli gazlar, Tekirdağ Çukurluğu'nda Ganos Dağı yamacında manto kökenli Helyum-3 ve Batı ve Doğu Sırtları üzerinde çıkan termal metandır. Ayrıca Batı Sırtı üzerinde 660 m su

derinliğinde gaz hidrat bulunmuştur (Şekil 2). Buralardan çıkan hidrokarbon gazların ve gaz hidratın izotop bileşimi Trakya Havzası kökenli olduklarını göstermektedir. Bu konu deprem çalışmalarını ilgilendirdiği kadar petrol endüstrisini de ilgilendirmektedir.

2. Fay boyunca gaz çıkışlarının görülmediği tek bölge, İstanbul'un güneyinden batıda Silivri güneyinde Orta Çukurluğa kadar uzanan ve Orta Sırt üzerinde yeralan fay parçasıdır (Şekil 2). Bu bölgede izlenen gaz çıkışı fay üzerinde olmayıp; fayın güneyinde bir antiklinal (kıvrım) yapısı ile ilgilidir. Bu kesim, uzun süredir mikrosismik etkinliğin çok düşük olduğu ve 1766'dan beri büyük bir depremin oluşmadığı sismik bir boşluğu temsil etmektedir. Tüm bu veriler, büyük olasılıkla bu kesimde Anadolu/Avrasya levha sınırının kilitlenmiş olduğuna işaret etmektedir.
3. Sıvı ve gaz çıkışları ile depremselllik arasında bir ilişkinin bulunduğu çok kuvvetli bir olasılıktır. Bu ilişki, 1999 Kocaeli Depremi sırasında İzmit Körfezi'ndeki gözlemlerle de kanıtlanmıştır.
4. Bu ilişkiyi dikkate alarak, deniz altında fay boyunca çıkan gaz ve sıvıların miktar ve bileşimindeki değişimlerin fay etkinliği ile birlikte uzun süreli, kısa aralıklı ölçümlerle izlenmesi ve araştırılması için denizaltı gözlem istasyonlarına ihtiyaç bulunmaktadır.

Bundan sonra Marmara-ESONET projesi kapsamında yapılması planlanan çalışmaları iki ana başlık altında toplamak mümkündür:

1. Marmara Denizi'nde Batı Sırtı, Orta Sırt, Çınarcık Çukurluğu doğusu ile İzmit Körfezi batısında (Gebze güneyi) olmak üzere üç bölgede 12-18 ay süre ile depremsellik ve gaz-sıvı çıkışları ile ilgili deniz tabanı gözlemlerinin yapılması planlanmaktadır. Bu bölgelerde gözlem ve ölçüm yapılabilecek yerlere nihai olarak 2009 yılında Piri Reis (DEÜ), Urania (CNR-İtalya) ve Le Suroit (Fransız) gemileri ile yapılacak etüdlerden sonra karar verilecektir.



Şekil 2. Marmara Denizi'nde Siyah çizgi halinde gösterilen aktif fay zonu (KAF) boyunca echosounder ile soğuk akışkan çıkışları (cold seep) araştırılmıştır. Bu etüdler sonucu akışkan çıkışlarının olabileceği yerlerde Nautil denizaltısı ile doğrudan gözlemler yapılmıştır. Haritada Nautil gözlemleri sonucu bulunan akışkan çıkışları kırmızı; akışkan çıkışlarının olmadığı yerler beyaz nokta ile gösterilmiştir. Çekmece-Silivri güneyi arasındaki fay parçası üzerinde akışkan çıkışı izlenmemiştir. Büyükçekmece açıklarındaki tek akışkan çıkışı (termal metan) fayın üzerinde değil, güneyinde yer almaktadır. Batı Sırtı üzerinde gaz hidrat bulunmuştur.

2. Gözlemlerin yapılacağı üç istasyonda; gözenek suyu basıncı ölçen piezometre, sıvı çıkışlarını ölçen ve zaman serisi oluşturarak örnekleyen akışkan metre (flowmeter)-ozmometre (Şekil 4) ile küçük depremleri kayıt eden deniz tabanı sismometresi, metan, oksijen, hidrojen sülfür, türbidite, sıcaklık, tuzluluk ve basınç ölçen sensörleri içeren SN-4 istasyonu gibi cihaz ve sistemler kullanılacaktır. Ayrıca İzmit Körfezi batısında bir radon ölçen cihazın yerleştirilmesi düşünülmektedir. Cihazların yerleştirilmesi Le Suroit (Fransız) ve Urania gemileri ile 2009 yaz-sonbahar aylarında yapılacaktır. Gözlem istasyonlardan gerçek zamanlı veri elde etmek ve uzun süreli sorunsuz işletmek için karaya kablo ile bağlanması ve bunun için de ek kaynağa ihtiyaç bulunmaktedır.

Deneme özelliğindeki bu etüdler ile en az 12 ay sürecek gözlemlerin sonuçları analiz edilerek, başlıca şu amaçlara ulaşılmaya çalışılacaktır:

1. Marmara Denizi tabanında özellikle depremle ilişkili en etkili izlemenin yapılabileceği sürekli gözlem istasyonları için uygun yerlerin tesbit edilmesi, ve
2. Depremsellikle ilişkili en uygun parametrelerin saptanması, bunların ölçümü için gerçek zamanlı ve sürekli ölçüm yapabilen gözlem istasyonlarının tasarlanması.

Denizaltı deprem araştırmaları ile ilgili bu tür denemeler ve gözlemler dünyada henüz yeni olup, bu çalışmalarda yurtdışından getirilecek en son teknoloji cihaz ve cihaz sistemleri kullanılacaktır. Tasarlanacak sürekli gözlem istasyonlarından elde edilecek verilerden Marmara depremi ile ilgili ön uyarıcı sinyallerin elde edilmesi hedeflenmektedir. Ancak, bu hedefe ulaşmada henüz çalışmaların başlangıç aşamasında olduğumuzun bilincindeyiz.

Kurulacak sürekli gözlem istasyonları; denizdeki deprem, yamaç kayması ve tsunami gibi doğal afetler yanında; oşinografik, derin deniz ekosistemindeki değişimler, iklim değişimi ve buna bağlı deniz-atmosfer etkileşimi gibi değişik disiplinlerle ilgili önemli bilgiler de sağlıyacaktır.

ESONET Marmara-DM proje çalışmalarından bağımsız olarak Boğaziçi Üniversitesi Kandilli Rasathanesinin ulusal kaynaklarla başlattığı bir proje ile Marmara Denizi tabanında beş ayrı istasyon kurulacaktır. Bu deniz tabanı istasyonları ; üç bileşenli genişbantlı sismometre, ivme, sıcaklık, basınç ve akıntı ölçer sensörleri ile hidrofon içerecektir. Kıyıya fiber optic ve doğru-akım güç kablosu ile bağlanacak isasyonlardan gerçek zamanlı veriler elde edilecektir. Bu deniz-tabanı istasyonların yeni 10 adet kara istasyonu ile birlikte 2009 yılı ilkbaharında işletilmeye başlaması beklenilmektedir.

Denizaltı Gözlemlerinin Petrol Endüstrisi ile İlişkisi

Denizaltı gözlemleri yamaç, şev duraylılığı açısından petrol sondajlarının yapılması ve işletilmesi sırasında petrol platformlarının güvenliği açısından önemlidir. Bu tür sakıncalı bölgelerin mikrosismik etkinliğinin sürekli izlenmesi gerekir. Benzer bir izleme, hidrokarbon rezervuarlarının dört boyutlu (4-D) izlenmesi için de yapılmaktadır. Özellikle sıvı enjeksiyonu sırasında mikrosismik etkinliğin izlenmesi önemlidir. Ayrıca oşinografik ölçümler, HC üretiminden doğacak olası çevre kirliliğinin erken teşhisi ve etkilerinin izlenmesi için de gereklidir. Daha küresel anlamda atmosfere olan fosil-yakıt kökenli karbon diyoksit salımlarıının iklim değişimi ve bunun denizlerdeki etkileri petrol endüstrisinin duyarlılık gösterdiği bir konu olup, bu konudaki araştırmalar petrol şirketleri tarafından desteklemektedir.

Yukarıda belirtilen nedenlerle Fransız Deniz Araştırmaları Enstitüsü IREMER, TOTAL ve EXXON gibi petrol şirketleri ile işbirliği içerisinde offshore petrol arama-işletme etkinliklerinin olduğu bölgelere (Nijerya ve Kuzey Denizi gibi) OBS'ler ve gözenek suyu basıncı ölçen piezometreler yerleştirmiştir. Adı geçen petrol şirketleri bu çalışmaların altyapısını desteklemekte ve verilerinin işlenmesi için lisanüstü burslar vermektedir. Benzer şekilde BP, Aberdeen Üniversitesi (Ocean Lab) ile birlikte Angola açıklarındaki petrol işletim alanında, 1400 m su derinliğmde DELOS (Deep-ocean Environmental Long-term Observatory System) projesi (http://www.delos-project.org) kapsamında iki gözlem istasyonu işletmektedir. Norveç'in STATOILHYDRO şirketi Barents ve Kuzey Denizi'ndeki denizaltı gözlem projelerine bilimsel kurumlarla işbirliği yaparak destek olmuştur (http://www.serpentproject.com). CHEVRON, Meksika körfezi ve Kuzey Deniz'de Britanya sularında ve TOTAL Faroe-Şetland Kanalı civarında derin deniz gözlemleri ve gözlem istasyonlarının kurulması ve işletilmesine katkıda bulunmuştur.

ESONET Demonstration Missions

3rd Periodic Activity Report

The Periodic Activity Report contains an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken.

This document has to be filled in with reference to the DM Implementation plan. This means that Deliverables, Milestones and WPs have to be the same as in the DM Implementation plan.

The Periodic Report contains 2 parts:
- Part I: it is addressed to the coordinator with minimum input from the partners
- Part II: it is addressed to each WP Leader and reports a detailed update of each WP activity at task level.

The report includes a rough justification of the costs incurred and of the resources deployed by each contractor linking them to activities implemented and justifying their necessity.

Finally the report contains information on use and dissemination activities.

- **Reporting period:**
- **From June 1st, 2009 to January, 31st, 2010**

●

•Part I *(to be filled by the DM coordinator)*

DM acronym:	MARMARA-DM
DM title:	Multidisciplinary Seafloor Observatories for Seismogenic Hazards Monitoring in the Marmara Sea
ESONET Site:	MARMARA SEA, Turkey
Scientific Area(s):	- Earthquake hazards - Relations between fluids and seismicity - Processess at fluid controlled ecosystems
Technological Area(s):	Lon-term, permanent monitoring of seismicity, sediment pore fluid, fluid geochemistry and gas emission activity
DM Start date:	*April 1st, 2008*
DM duration:	*30*
Period of the reporting	from June 1st, 2009 to February 31st, 2010

Partner Num.	Partner institution short name	Principal Investigator (PI) for the Demo Mission	WP in charge *(insert WP num. and title)*
1.	IFREMER	Géli, Louis	WP2. Marine Operations with Ifremer facilities WP5. Comparative and feasibility studies
2.	ITU	Çagatay, Namik	WP6. Public Outreach, education, coordination at Turkish level and fund rising
3.	ISMAR	Gasperini, Luca	WP4. Data Integration and modelling
4.	INGV	Favali, Paolo	WP3. Land and Seabottom Integration; WP2. Marine operations with INGV facilities (SN-4 station)
5.	CNRS	Henry, Pierre	WP1. MarNaut data integration
6.	DEU/IMST	Çifçi, Günay	WP2. Marine operations with DEU facilities

Executive summary *(max one page)*
Brief description of the objective of the DM and brief description of the work status

The goal of MARMARA-DM is to contribute to the establishment of optimized permanent seafloor observatory stations for earthquake monitoring in the Marmara Sea (MS), as part of ESONET NoE. Workpackages description and status are:

WP 1 : Analysis of the available time series data and in-situ samples from the Marnaut cruise. This workpackage is almost done. All deliverables have been produced, except D1.2 (paper of fluid flow measurements).

WP 2 : Marine operations. During the reporting period, the most important activities have been conducted under this WP :

- The "Marmesonet" Cruise was conducted by IFREMER with R/V Le Suroit, from november 4th to december 14th, 2009. The cruise was divided in two parts :
  - part 1 for acoustic detection of gas emissions, AUV microbathymetry and seabottom deployment of BOB (acoustic gas bubble detector) ;
  - part 2 for high resolution, 3D seismic survey on the western high.

- The Marmara-2009 cruise of R/V Urania was conducted from september 22 (start in Brindisi) to october 12 (return to Brindisi), under the supervision of Luca Gasperini, ISMAR (partner 4). R/V Urania has deployed SN-4 in the east Ç?narc?k Basin, and performed en-route surveys to map and sample dissoved gas in the water column. All Ifremer instruments (10 OBSs and 5 piezometers) were deployed during the Urania cruise. These instruments will be recovered in march 2010.

WP 3 : Integration of land and seafloor seismological data. The tentative work performed using OBS data from the MarNaut cruise and land data from Turkish institutions (KOERI and TUBITAK) has shown that it is impossible to merge land and seabottom datasets in absence of a detailed 3D velocity model. Hence, this WP can be considered as done at this stage.

WP 4 : Data integration and modeling. Work in progress.

WP 5 : Comparative study and project feasibility. In progress, under supervision of Yves Auffret (Ifremer).

WP 6 : Public and education outreach, coordination at national (Turkish) level and fund raising. An important activity has been undertaken under this Workpackage (see specific report on WP6).

Table 1: Deliverables List
Give the deliverable list and status

Deliverab. n.	Deliverable name LAST UPDATE : AUGUST 2009	WP n.	Due Date	Actual/ Forecast delivery date IN RED: LAST UPDATE, AUGUST 2009	Estimated indicative person months*	3rd period Used indicative person months*	Lead contractor
D1.1	Paper on piezometer and OBS results[a]	1	T0 + 12	T0 + 20	48	1	5
D1.2	Paper on flowmeters/osmo-samplers	1	T0 + 14	T0 + 20	12	4	5
D1.3	Paper on fluid analysis	1	T0+12	DONE	10	6	5
D1.4	Paper synthetizing Marnaut results	1	T0+12	DONE	20	0	5
	TOTAL WP1				90	11	
D2.1	Reports on DEU cruise[b]	2	T0+14	T0 + 20	60	0	6
D2.2	Report on Ifremer (Marmesonet) cruise[b]	2	T0+14	T0 + 24	70	45	1
D2.3	Urania operations and 6 months time series at 3 sites[c,d]	2	T0+23	T0 + 30	36	36	4
	TOTAL WP2				166	81	
D3.1	Report (including integrated database) combining marine and land seismological data	3	T0+26	T0 + 30	32	3	2
D3.2	Report on the ambient noise and recommendation for implementating permanent seabottom station	3	T0+26	T0 + 30	10	2	4
D3.3	High Res Seismic Images at the 3 sites[a]	3	T0+18	T0 + 30	91	2	6
	TOTAL WP3				133	7	
D4.1	Integration of all available data (including sedimentology)	4	T0+24	T0 + 28	36	6	3
D4.2	GIS including all available data	4	T0+24	T0 + 28	18	18,5	5
D4.3	Report to test working hypothesis and validate concept of seafloor observatories	4	T0+24	T0 + 30	8	6	5
D4.4	Report on best site selection	4	T0+28	T0 + 30	6	6	3
	TOTAL WP4				68	36,5	
D5.1	Recommendation Report on the preferred option	5	T0+28	T0 + 30	12	2	1
D5.2	Cost estimation report	5	T0+28	T0 + 30	12	2	1
D5.3	Implementation plan	5	T0+28	T0 + 30	12	2	4
	TOTAL WP5				36	5	
D6.1	Support agreement contract with Turkish authorities	6	T0+30	T0 + 30	8	4,2	2
D6.2	Web Site	6	T0+18	T0 + 18	42	3	2
D6.3	Training course	6	T0+24	DONE. In advance to schedule (august 2009)	24	6	2
	TOTAL WP6				74	13,2	
	TOTAL Ma-Mo				567	153,7	

**the person month must be the same as indicated in Part II- WP progress report (see pag. 10)*
[a] Time in men-month here corresponds to a 3-years Ph. D. Thesis and supervisor's time
[b] Time in men-month includes instrument preparation, cruise preparation and realization, and reporting
[c] Time in men-month includes OBS data reduction and analysis, include earthquakes characterization
[d] Only 6 months time series will be collected from the seafloor

Man-Month DISTRIBUTION BY WP, 3rd reporting period (June 1st, 2009 - January 31st, 2010)															
	WP1		WP2		WP3		WP4		WP5		WP6		TOTAL		
	3rd P.	Total	3rd P.	Total	3rd P.s	Total	3rd P.	Total	3rd P.	Total	3rd P.	Total	Total 3rd	**Total 1s+2ndt +3rd**	**Total Expect.**
ITU	2,5	12	5,5	15	0,5	8	10,5	10	3	10	11,5	36	33,5	65,5	91
DEU	0	0	5,5	60	0,5	72	21	14	0	10	0,2	12	27,2	60,2	168
Ifremer	1	36	20	42	2	16	1	14	2	8	1	12	27	82,8	128
CNRS	4	30	4	7	1	10	3	8	0	0	0,5	3	12,5	32,5	58
INGV	3	4	24	30	1	15	0	12	0	7	0	7	28	47,5	75
ISMAR	0,5	8	12	12	2	12	1	10	0	1	0	4	15,5	22,5	47
Total	11	90	71	166	7	133	36,5	68	5	36	13,2	74	143,7	301	567

Ma-Mo by deliverable				
	PREVISIONAL	USED (1st period)	USED (2nd period)	USED (3rd period)
D1.1	48	10	2	1
D1.2	12	0	0	4
D1.3	10	3	2	6
D1.4	20	10	2,5	0
SUM WP1	90	23	6,5	11
D2.1	60	10	0	0
D2.2	70	20	0	40
D2.3	36	4	24,3	31
SUM WP2	166	34	24,3	71
D3.1	32	2	0	3
D3.2	10	2	3,5	2
D3.3	91	0	0	2
SUM WP3	133	4	3,5	7
D4.1	36		17	6
D4.2	18		17,5	18,5
D4.3	8		0	6
D4.4	6		0	6
SUM WP4	68	0	34,5	36,5
D5.1	12		0	2
D5.2	12		0	2
D5.3	12		0	1
SUM WP5	36	0	0	5
D6.1	8	4	4	4,2
D6.2	42	8	4	3
D6.3	24	4,5	3	6
SUM WP6	74	16,5	11	13,2
TOTAL	567	77,5	79,8	143,7

Part II *(to be filled by each partners)*

ESONET Noe – Demonstration Mission	DM acronym: *MARMARA-DM*
Scientific Area(s):	- Earthquake hazards
	- Relations between fluids and seismicity
	- Processess at fluid controlled ecosystems
Technological Area(s):	Lon-term, permanent monitoring of seismicity, sediment pore fluid, fluid geochemistry and gas emission activity
DM Start date:	*April 1st, 2008*
DM duration:	*30*

WP1 management report

from June 1st, 2009 to February 31st, 2010

WORKPACKAGE	*WP1*
Full WP title	*ANALYSIS OF DATA FROM MARNAUT CRUISE*
Period covered	from *September 1st, 2008* to 30/05/2009
Partner organisation full name	*CNRS / CEREGE / Chaire de Géodynamique du Collège de France*
Person in charge for the report (WP Leader)	*Pierre Henry*
Partners involved in the Work	*5, 1, 2, 3*

WP1: Integrate data collected during MarNaut cruise ; publish scientific results ; produce recommendations for the present demonstration mission	- D1.1 Paper on piezometer and OBS results - D1.2 Paper on flowmeters /osmo-samplers - D1.3 Paper on fluid analysis D1.4 Paper synthezing Marnaut results

Period of reporting: from June 1st, 2009 to February 31st, 2010. *Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.*

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period.*

Analysis of the OBS data from Marnaut identified a cluster of microearthquake below the western edge of Tekirdag Basin, and focal mechanisms were determined. An article was submitted in January 2010 (Tary et al., see D1.1). Piezometer data analyses requires oedometer tests on core samples. These are currently performed at IFREMER.

Hydrocarbon gas analysis showed the presence of thermogenic gasses originating from Thrace Basin source rocks, which are part of the pre-tectonic basement of the Sea-of Marmara Basins. The presence of gases coming from below the recent sedimentary layers is one argument to favor the Western High site for monitoring fluid outflow in relation with crustal deformation.

Analytical data of gas sampled in the Marmara seeps have been elaborated in collaboration with IFREMER researchers. New interpretative models on the origin of gas have been provided and integrated in a work (IFREMER-INGV co-autorship) presently submitted for publication in a peer-reviewed journal.

After an initial delay caused by custom problems during the transfer of the instruments, preliminary results from osmotic flow meter were provided by Mike Tryon (SIO). Variations of water fluxes with time were reccorded. Manuscript submission is expected this fall (Deliverable D1.2). Seven flowmeters / osmosamplers from the Scripps Institution of Oceanography were deployed during the Marnaut cruise in May/June 2007. The instruments were recovered in June 2008 arrived in april 2009 in La Jolla. Hence, the work is still in progress. Preliminary results are :

Tekirdag site : The instrument in the basin (not near the fault scarp) and near OBS shows very slow downflow that slows even more on about Oct 1, 2007. The instrument near the fault scarp on a microbial mat patch indicated slow upflow with a higher flow event starting about Oct 1, 2007 and lasting 5-6 weeks and another smaller and shorter event in early January 2008.

Western High hydrocarbon seep : The instrument in the bubble field indicated no net flow. May just be a lot of rapid oscillations due to gas. The instrument on the large seep with the white flow pattern downslope had low flow for most of the time but there was high flow event that ramped up quickly in early Nov, lasted a couple weeks, then diminished and was over by mid Dec.

Cinarcik north scarp : one instrument had very very slow upflow and the other had moderate flow at first that starting to diminish rapidly about Sep 15, 2007 and then stayed at low flow for the rest of the deployment. Looks like this area may have very widely distributed flow that is quite low but the completely anoxic bottom water keeps the seep black patches from oxidizing so things look a bit more active than it appeared. The copper coils on these two instruments still looked like new when they were recovered so there is no oxygen in this water (the area is known for being anoxic).

Observations made at fluid emission sites and fault outcrops with Nautile during Marnaut cruise will be integrated with AUV microbathymetric data and reflectivity images from Marmesonet cruise (see WP2) and interpreted in the PhD work of Celine Grall (at CEREGE and IFREMER).

The work performed under WP1 consist in analyzing the data collected during the MarNaut cruise. Three papers that have been already published :

- On the acoustic detection of gas emissions [Géli et al, *EPSL*, 274, 34-39, 2008]
- On the relations between faults and cold seeps [Zitter et al, *Deep Sea Research*, Part 1, 55(4), 552-570, doi:10.1016/j.dsr.2008.01.002, 2008]
- On the geochemical analysis of gases [Bourry, C., et al., Chemical Geology, doi:10.1016/j.chemgeo.2009.03.007, 2009]

During the reporting period, the following papers were published or submitted :

- On geohazards in the Sea of Marmara : [Görür, N., Çagatay, M.N., 2009. Geohazards rooted from the northern margin of the Sea of Marmara since the late Pleistocene: a review of recent results. *Natural Hazards. DOI 10.1007/s11069-009-9469-x]*.
- On seafloor observatories in the Sea of Marmara : Çagatay, M.N., Geli, L., Gasperini, L., Henry, P., Gürbüz, C., Görür, N. The Sea of Marmara. *Chapter to be published in a book edited by P. Favali et al.*
- On the analysis of OBS data from the Tekirdag Basin [Tary *et al, Bull. Seism. Soc.*, submitted jan 2010]
- On the analysis of gas hydrates [*Ruffine et al,* submitted]

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Person-Months

Ifremer : 1 Ma-Mo (permanent)
ITU : 2.5 Ma-Mo (2.0 permanent, 0.5 non-permanent)
Cnrs : 4 Ma-Mo (2 permanent ; 2 non permanent)
INGV : 3 Ma-Mo
Ismar : 0,5 ma-Mo
Total : 11 Ma-Mo

Other costs :

Ifremer : 0 k€
CNRS : 0 k€
INGV : 7,2 k€

- *Total : 7,2 k€*

WP2 management report

(from June, 1st, 2009 to January, 31st, 2010)

WORKPACKAGE	*WP2*
Full WP title	*Operations at Sea*
Period covered	from June, 1st, 2009 to January, 31st, 2010
Partner organisation full name	*CNRS / CEREGE / Chaire de Géodynamique du Collège de France*
Person in charge for the report (WP Leader)	*Louis Géli*
Partners involved in the Work	*1, 3, 4, 6*

WP 2 Preparation and completion of the following cruises : -Marmesonet cruise with Le Suroit, with 2 legs for : i) acoustic mapping water column ; 2) high-res bathymetric survey using AUV at 3 sites ; 3) high-res seismic survey at site 1. -DEU cruises with R/V Piri Reis : high-res seismics at sites 2 & 3	-D2.1 Cruise reports for DEU cruises -D2.2 cruise report for Ifremer cruise (Marmesonet) -D2.3 Urania operations and 1-year time series at 3 sites

Period of the reporting: from June 1st, 2009 to February 31st, 2010. *Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.*

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period.*

Note : Title of deliverable D2.3 has been modified so as to include all time spent for Urania opérations, the objectives of which were to deploy instruments in order to collect 6-months time series.

ITU. Several scientists and some engineers (Namik Çagatay, Naci Görür, Remzi Akkök, Sinan Özeren, Caner Imren, Ziyadin Çakir, Umut Ulgen, Dursun Acar, Ümmühan Sancar ve Demet Biltekin) from ITU participated in different legs the cruises. The work involved detailed site surveys (3-D Seismics, Multi Beam Bathymetry, Medusa survey), coring and deployment of monitoring equipment (e.g., OBSs, piezometers, SN-4 station, bubble-meter). Namik Çagatay of ITU acted as the Turkish coordinator, which implied considerable work on practical details, including the obtention of work permits from turkish authorities.

IFREMER. Ifremer spent a considerable effort to prepare and conduct the Marmesonet Cruise of R/V Le Suroit. This work included : cruise planning, equipment transfer, contact with Turkish authorities, instrument (BOB) preparation, etc and cruise achievement. The cruise report is on the Marmara-DM project website.

Ifremer also prepared and participated (Ronan Apprioual, Pascal Pelleau and Louis Géli) to the Urania cruise, during which the piezometers and OBS were deployed.

INGV. INGV completed the upgrade of SN4 observatory adding new sensors to the basic SN-4 configuration. This upgrade was made in order to perform a multiparametric monitoring requested by the project objectives (gas seepage and seismicity). SN-4 was then deployed, as scheduled, in the Marmara Sea site selected for the long-term monitoring.

The deployment operations were successfully performed on October 4th, 2010, in collaboration with ISMAR, from the Italian R/V Urania. Although selected prior of the cruise, the SN4-observatory site has been surveyed before deployment with geophysical imaging techniques and direct observations with a deep towed system, MEDUSA, that provided oceanographic data (CTD), methane content in the water column and visual inspection through a high-resolution video camera. MEDUSA exploration surveys were performed in different sites in order to detect methane anomalies and have direct observations of the seabed where SN-4 was planned to be deployed.

The SN-4 station was then deployed in a narrow rectilinear valley that dissect the Darica basin and mark the North Anatolian Fault trace. The site is characterised by a relatively flat bottom, presence of a CH4 anomalies in seawater, and it is a shelter against fishing nets trowling. After some tests with acoustic transponder we were able to communicate with the SN4 station
verifying its functioning and attitude. A first recovery of the SN-4 station, with data download is scheduled in March 2010.

ISMAR. ISMAR spent considerable efforts in preparing and conducting the cruise of Urania during which the SN-4 observatory for the Marmara Esonet demo mission has be emplaced. This cruise was conducted from September 22 to October 12th, 2009. The work included : 1) practical preparation (e.g. problems with logistics, customs clearance, etc) ; 2) Compilation and submission to the Italian CNR commission (Gruppo coordinamento infrastrutture) of the proposal for the MARMARA2010 expedition. The main purpose of this new expedition will be the recover of SN-4 after 1 year of activity and the completion of the geophysical survey in the SN-4 area as well as the final site casting ; 3) processing and re-analysis of the existing geophysical data (multibeam, chirp sonar, etc..) in the area that will be investigated during the MARMARA2010 cruise (Izmit bay and Cinarcik basin).

CNRS. CNRS/CEREGE was involved in the planning of Marmesonet cruise, Pierre Henry participated to planning and coordination meetings in Brest and Istanbul. Pierre Henry and Céline Grall participated to the Marmesonet Cruise, Leg I (nov 4th – december 14th, 2009).

DEU. DEU organized a preparation meeting at the Institute of Marine Sciences and Technology of Dokuz Eylul University in Izmir between 1 and 6 June 2009.The purpose of the meeting was : I) to help defining the geological targets of the High Resolution seismic 2D/3D survey during the Marmara-DM Survey ; ii) to prepare the methodology of high resolution site surveys prior to the implementation of Seabottom Observatories.

Gunay Cifci visited to Office of Navigation, Hydrography and Oceanography (ONHO) in Istanbul to find out another vessel for the cruise in 2010 (PirESONET cruise) between 31 August-2 September 2009, in case Piri Reis research vessel wouldn't available.

Hakan Saritas participated to both legs of the MARMESONET cruise onboard Le Suroit. Gunay C?fci, Orhan Atg?n and Selin Deniz Akhun participated to Leg II for 3D sesimic survey between 28 November-15 December, Gunay Cifci acted as the Turkish Coordinator.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Person-Months

Ifremer : 20 Ma-Months
ITU 5.5 Ma-Mo (1,2 non-permanent ; 3,8 permanent)
INGV : 24 Ma-Mo
ISMAR : 12 Ma-Mo
CNRS : 4 Ma-Mo (2,5 non pemanent ; 1,5 permanent)
DEU : 5,5 Ma-Mo (4 permanent ; 1,5 non-permanent)
Total : 71 Ma-Mo

Other costs :

Ifremer : 54,715 k€ (expenses related to Marmesonet)
INGV : 90 k€
DEU : 1,606 k€
ISMAR : 15,801 k€
CNRS : 1,9 k€ (Marmesonet travel expenses) + 10 k€ (SOACSY sub-contracting)

Total WP2 Other Costs : 164,02 k€

WP3 management report

(from June 1st, 2009 to january 31st, 2010)

WORKPACKAGE	*WP3*
Full WP title	*INTEGRATION OF LAND AND SEAFLOOR SEISMOLOGICAL DATA*
Period covered	from June *1st, 2009 to January, 31st, 2010*
Partner organisation full name	*INGV*
Person in charge for the report (WP Leader)	*Paolo Favali*
Partners involved in the Work	*4, 1, 5, 2*

WP3 Integrate the marine and land seismological data in order to : ➢ assess the true benefit of deploying seafloor stations in the MS; ➢ assess the ambient noise in the Marmara Sea ; ➢ better identify the active segments of the MS Sea fault system	-D3.1 Report (including data base) combining marine and land seismological data in the Marmara Sea -D3.2 Report on the ambient noise in the MS and recommendation for the implementation of permanent seabottom stations -D3.3 High res seismic images at 3 sites

Period of the reporting: from starting date to 30 September 2008
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period.*

The main work performed during the reporting period under the present WP consisted in merging land and seabottom seismological data. Due to the limited number of OBSs deployed during MarNaut, merging data from land and seabottom stations has proven to be very challenging, if not merely impossible, in absence of a detailed 3D velocity model from the deep offshore domain encompassing the rims of the Sea of Marmara. From this work, we have learned that the only way to merge land and seabottom stations consists in using the combination of two models :

- for the deep levels, the 3D velocity model of Bécel (in press), based on the data collected in 2001 during the Seismarmara Cruise of R/V L'Atalante
- for the uppermost layers (< 2 s-twt), a detailed velocity model based on the velocity model of all MCS data available in the Sea of Marmara. The TAMAM dataset would be ideal for deriving such model, through a collaborative project with LDEO.

Ifremer. Attempts for merging the seismological datasets were mainly performed at Ifremer, in collaboration with KOERI, through the Ph. D. Thesis of J. B. Tary.

ITU. Land data from the TUBITAK seismological network were extracted for the duration of the MarNaut deployment, processed and examined (Note : TUBITAK Is ITU's sub-contractor).

INGV. A preliminary plan has been established between INGV and ITU personnel for a detailed work on integration of land and marine seismological data. An exchange of personnel is foreseen; it is already fixed a visit of an INGV researcher to ITU, after the first seismological data of the SN-4 observatory will be available.

ISMAR. Ismar integrated submarine observations collected during the Urania2009 cruise with results from land-based seismological and geodetic data, in order to define the most suitable location of seafloor observatories at the entrance of the Gulf of Izmit.

Deliverables :

- D3.1. This work has been completed for the MarNaut data and a paper has been submitted to Bull. Seism. Soc. America (Tary et al, 2010).

- D3.2. A report on the ambient noise in the Sea of Marmara is under progress. The inital results show that part of the noise is due to gas escape, in addition to maritime ship traffic. This result opens a new field of research for monitoring gas seepage from the active faults.

- D3.3. During Marmesonet cruise of RV Le Suroit, the western high was surveyed by high resolution 3-D seismics. The results show the 3-D image of the fluid chimneys and the fault geometry. The results of this study can be found in the cruise report.

• **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Person-Months
Ifremer : 2 Ma-Months
ITU : 0,5 Ma-Mo (0,5 permanent)
DEU : 0,5 Ma-Mo
Cnrs/Cerege : 1 Ma-Mo (permanent)
Ismar : 2 Ma-Mo
INGV : 1 Ma-Mo
Total WP3 : 7,5 Ma-Mo

Other costs WP3 : NONE

WP4 management report

(from June 1st, 2009 to january 31st, 2010)

WORKPACKAGE	WP4
Full WP title	DATA Integration and modelling
Period covered	from June 1st, 2009 to january 31st, 2010
Partner organisation full name	*ISMAR*
Person in charge for the report (WP Leader)	*Luca Gasperini*
Partners involved in the Work	*All*

WP4 - Analyze, integrate and model all available data (seismology, geophysics and geochemistry of pore fluids, sedimentology, acoustics) - Test the working hypothesis (according which some of the physical and chemical changes in the properties of the fluids - within the fault zone change can be detected in surface sediments) by interpreting pore fluid pressure and chemistry variations. - Validate the concept of seafloor observatories - Select the best site for permanent seafloor monitoring	-D4.1 Report integrating all available data -D4.2 GIS including all available data -D4.3 Report validating the concept of seafloor observatories -D4.4 Report on best site selection

Period of the reporting: from June 1st, 2009 to january 31st, 2010
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

- **Work Performed** *: A brief description (max 700 char) of the work performed by each contractor during the period.*

  - D4.1 This work is still on-going at CEREGE, ITU, IFREMER and ISMAR. Some work regarding core studies has been done at ITU studying seismoturbidites as past earthquake records. ITU obtained a complete earthquake records from the Izmit Gulf and a publication using the data is under progress. ITU analyzed new cores from Ç?narc?k Basin and Gemlik Gulf using MSCL and XRF core scanning. CEREGE studied some cores from different part of the Sea of Marmara for records of past fluid and seismic activity. XRD analysis of the cores were made and samples collected for dating by radiocarbon analysis. Part of the work at CEREGE was carried out during a ESONET personnel exchange program involving the visit of Namik Çagatay (ITU-EMCOL, Turkey) during 6-11 September 2009.

  - The following scientists took part in the core studies and sampling: Namik Çagatay (ITU), Pierre Henry (CNRS, CEREGE), Tiphaine Zitter ((CNRS, CEREGE), Celine Grall (PhD student, CNRS, CEREGE) and Ioanna Bouloubassi (CNRS, LOCEAN). An important finding is the presence of several layers of authigenic carbonates interbedded with hemipelagic sediment at cold seeps. The authigenic carbonate layers are presumably. the analysis of the carbonate and of biomarkers in the sediment is taking place at UPMC, which was subcontracted for this purpose. A work report prepared by Namik Çagatay was submitted to the WP leader and ESONET Coordination team.

  - A report integrating all available data will be submitted before the end of the Marmara-DM project (Month 30, September 2010).

D4.2 Studies are underway at CEREGE and IFREMER to input all Marmara-DM data into a one single GIS. Regarding this effort Devrim Tezcan visited CEREGE, CNRS, Aix en provence, France during 25 September- 25 October 2009 and input the Marnaut Cruise data into the GIS database. Stephanie Dupré at IFREMER is currently inputing the Marmesonet data into the same GIS.

D4.3 Report validating the concept of seafloor observatories.

Work done regarding this deliverable has already been presented in reports and papers:

1. Görür, N., Çagatay, M.N., 2009. Geohazards rooted from the northern margin of the Sea of Marmara since the late Pleistocene: a review of recent results. Natural Hazards. DOI 10.1007/s11069-009-9469-x.

2. Çagatay, M.N., Geli, L., Gasperini, L., Henry, P., Gürbüz, C., Görür, N. The Sea of Marmara. Chapter to be published in a book edited by P. Favali et al.

3. Gasperini, L., Polonia, A., Bortoluzzi, G., Henry, P., Le Pichon, X., Tryon, M. çagatay, N., Géli, L., How far did the surface rupture of the 1999 Izmit earthquake reach in Sea of Marmara ?, submitted to Earth Plan. Sci. Let., March 2010

The concepts developed so far are being used in a project proposal that is being prepared by ITU for submittal the Turkish Government in May 2010. The project proposal aims to establish permanent seafloor observatoires in the Sea of Marmara by the year 2011-2012.

A detailed report on validating the concept of seafloor observatories in the Sea of Marmara will be finalized by IFREMER.

D4.4 Report on best site selection

Three sites have been selected for seafloor observatories in the Sea of Marmara for earthquake, environmental and oceanographic research and monitoring. The sites selected after the detailed surveys during the Marnaut, Marmesonet and RV Urania-2009 cruises, include: 1) SW Istanbul, where the fault segment has not ruptured since 1766 and has little or no fluid activity, 2) The western high where there is dense fluid activity of deep origin and gas hydrates were discovered. Here the fault cut through the Tertiary gas field and provide the transport pathways for thermal HC gases, and 3) Izmit Gulf where the fault is confined into a single strand where the 1999 earthquake rupture ended. These sites are also interesting for monitoring the Mediterranean deep water in the Sea of Marmara and for environmental monitoring.

Arguments to determine the location o the Seafloor observatory at the entrance of the Gulf of Izmit are developed in the paper by Gasperini et al.

- **Rough Estimation of Major Cost**: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Person-Months
Ifremer : 1 Ma-Months
ITU : 10,5 Ma-Mo (5 permanent ; 5.5 non-permanent)
INGV : 0 Ma-Mo
ISMAR : 1 Ma-Mo
Cnrs/CEREGE : 3 Ma-Mo (1 permanent ; 2 non-permanent ; 4 master student)
DEU : 21 Ma-Mo (10,7 permanent ; 10.3 non-permanent)
Total WP4 : 36,5 Ma-Mo

Other costs :
Cnrs/CEREGE : 0,627 k€ (lab consumables and samples shipment) +4,7 k€ (sample analysis)

WP5 management report

(from June 1st, 2009 to 31 february 2010)

WORKPACKAGE	*WP5*
Full WP title	*PUBLIC AND EDUCATION OUTREACH. FUND RISING.*
Period covered	from June 1st, 2009 to 31 february 2010
Partner organisation full name	*Ifremer*
Person in charge for the report (WP Leader)	*Yves Auffret*
Partners involved in the Work	*1, 2 and All partners*

WP5 -Compare fiber optic cabled observatories vs permanent observatories linked to a sea-surface buoy equipped with energy supply and telecommunications systems. - Provide approximate costs on investments, maintenance and personnel, based on the local situation.	-D5.1 Recommendations report for the preferred option -D5.2 Cost estimation report - D5.3 Implementation plan

D5.1 Recommendations report for the preferred option

Different observatory designs for the Sea of Marmara have been compared and analyzed by IFREMER. On the basis of the detailed analysis summarized below, it is concluded that for earthquake and environmental research and monitoring the seafloor observatories cabled to the shore with a junction box technology is best suited to the Sea of Marmara.

A) Comparison of multidisciplinary observatory vs. specific observatory

Specific observatory:
• Proprietary system, usually oriented for geophysical measurements
• Closed architecture, not suited for the integration of other types of sensors
Multidisciplinary observatory:
• "Internet extension under the sea"
• Open and scalable architecture based on standards (Ethernet, serial interface, clock synchronization…)
• Integration of different types of sensors / instruments including geophysical instrument

B) Sea bottom observatory architectures: Comparison of cabled, buoy-based, and autonomous observatories without power and without data transmission

Cabled observatories (ex: Antares, VENUS & NEPTUNE, Canada)
• Real-time, huge power available >kilowatt, bandwidth >terabyte/day
• Very light cabled observatories without power (ex: DeepSeaNet)
• Real-time, batteries limitation (few watts), bandwidh >gigabyte/day
Buoy-based observatories with a cable between surface and seafloor
• Real-time, few tens of watts, between few KBytes/day and few MBytes/day
• Buoy-based observatories with an acoustic link between surface and seafloor (ex: Samo, Assem,…)
• Real-time, batteries limitation (few watts), limited data transmission: between few KBytes/day and few MBytes/day
• Advantage: free from trawling and ship anchorage hazards
Autonomous observatories without power and without data transmission
No real-time, batteries limitation (few watts), no data transmission, local recording
Main design rules

- Simple as possible, but not simpler
- Internet extension under the sea
- Open and scalable architecture based on standards (Ethernet, serial interface, clock synchronization…)
- Integration of different types of sensors / instruments
- Compatibility and interoperability with existing cabled observatories (Neptune, Venus, Mars, Antares extension…)

D5.2 Cost estimation report

The preliminary cost estimation for some elements of the seafloor observatory in the Sea of Marmara is shown in Table 2. The total cost also including instrumentation and cable deployment is estimated at about 10.4 M€. The operational and maintenance costs are estimated to be around 15% of the capital expenditure (Table 3).

D5.3 Implementation plan

The main cost of the infrastructure is expected to come from the Turkish Government with the main funding organization for science infrastructures is the Turkish Prime Ministry State Planning Department (DPT). The other possible sources are EC, Ifremer, INSU, INGV, ISMAR, national and multinational petroleum companies, MTA, Istanbul Greater City Municipality.

Person-Months

Ifremer : 2 Ma-Months

ITU : 3 Ma-Mo (3 permanent)

Total WP4 : 5 Ma-Mo

Other costs :

NONE

MARS	ALOHA	VENUS	NEPTUNE	Multidisciplinary network in Sea of Marmara
Rx+	Rx+	Rx+	Rx+	Rx+
Rx-	Rx-	Rx-	Rx-	Rx-
PPS-	PPS-			PPS-
PPS+	PPS+			PPS+
Tx+	Tx+	Tx+	Tx+	Tx+
Tx-	Tx-	Tx-	Tx-	Tx-
400V	400V	360+	V+	V+
400R	400R	360-	V-	V-
48V	48V			
48R	48R			

Table 1. Cabled network connector pinout comparison

Description	Engineering	Qty (equipment)	Estimated price (equipment)	Estimated total
Data management center & web (equipment + software)	350K€	3	150K€	800K€
Shore station construction	30K€	3X40k€	120K€	150K€
Shore station equipment	50K€	3	50K€	200K€
Cable	100K€	2*25Km + 5 km	20€/m	1200K€
Cable deployment	100	2 x 100 K€ + 50 K€	250K€	350 K€
Node	200K€	3	350K€	1250K€
Node deployment	250K€			250K€
Junction box	200K€	5	300K€	1700K€
Junction box deployment	300K€			300K€
Instrumentation	800K€	5	500	3300 K€
Instrumentation deployment	15 days x 60 K€	3 stations	900	900K€
Grand Total				10,400K€

Table 2. Preliminary cost estimation of the seafloor observatories for the Sea of Marmara

Description	Per year	Estimated total
Training	20K€	20K€
On site operation maintenance	4 days per site / year (4 sites)	960K€
Equipment maintenance	15% of equipment cost (instruments + cable + shore) station	750K€
Personnel cost (3 engineers, 3 technicians)	(3 techs+ 3 engineers)*12 months*1,5K€	108K€
		1838K€

Table 3. Indicative annual operating costs & training

WP6 management report

(from June 1st, 2009 to 31 January 2010)

WORKPACKAGE	*WP6*
Full WP title	*PUBLIC AND EDUCATION OUTREACH. FUND RISING.*
Period covered	from June 1st, 2009 to 31 January 2010
Partner organisation full name	*ITU*
Person in charge for the report (WP Leader)	*Namik Çagatay*
Partners involved in the Work	*All partners*

WP 6.Public outreach, education and fund raising	**ITU**-DEU	- Disseminate results among Turkish authorities and policy makers - Propose a coordination structure and managing scheme for the implementation of the seafloor observatory. - Disseminate results among the scientific community and the public (thorugh web site, training courses and public seminars)	· D6.1 Support agreement contract with Turkish authorities · D6.2 Web Site · D6.3 Training course

Period of the reporting: from June 1st, 2009 to 31 January 2010
Provide a justification of the major costs incurred and resources deployed, linking them to activities implemented and explaining their necessity.

WP 6 : Public and education outreach, coordination at national (Turkish) level and fund raising

D6.1 Support agreement contract with Turkish authorities

ITU is preparing a science infrastucture project proposal to be submitted to the Turkish Government (DPT) in May 2010 for the establishment of seafloor observatoires in the Sea of Marmara. The meetings with Istanbul Municipality, petroleum companies, insurance companies are underway for thier contribution to the operational and maintenance expenses.

Regarding the public and education outreach, coordination at national (Turkish) level and fund raising the following activities were performed:

1. The coordination efforts between different Turkish organizations continued during this period. Istanbul Governorship, Istanbul Municipality, TPAO (Turkish Petroleum Corporation), TUBITAK (Scientific and Technological Council of Turkey) and MTA (Geological Suvey of Turkey) participated in the ESONET training course and Earthquake Symposium organized at ITU during 17-19 August 2009. The State Minister for Science and Technology, Prof. Mehmet Aydin, presented the opening speech at the Symposium and was informed about the ESONET and EMSO activities at the Marmara Node.
2. 4rd planning and coordination meeting was held at ITU during 19 August 2009, with the participation of Louis Geli, Pierre Henry, Luca Gasperini, Namik Çagatay, Yves Aufrett, Carla Scalabrin, Sinan Özeren and Günay Çifci. Cruise plans, site survey studies, equipment deployment plans were discussed for the forthcoming cruises of RV Urania and Le Suroit September-December 2009.
3. A project proposal “Permanent Multidisciplinary Seafloor Observatories in the Sea of Marmara” is being currently prepared for submitting in May 2010 to the Turkish State Planning Organization (DPT) for funding.
4. An invitation letter was written to MTA on 15 December 2009 for their collaboration in the DPT project proposal. MTA is acquiring new research vessels and ROVs that are important for the operation and maintenance of the observatories. A separate invitation to MTA was made for personnel training in marine surveys and technology involving MTA-ITU-IFREMER collaboration.

Peer-reviewed publications on the Sea of Marmara Node:

1. Çagatay, M. N., Eriş, K., Ryan, W.B.F., Sancar, Ü., Polonia, A., Akçer, S. Biltekin, D., Gasperini, L., Görür, N. Lericolais G., Bard, E. 2009. Late Pliestocene-Holocene evolut?on of the northern shelf of the Sea of Marmara. Marine Geology, 265: 87-100.

2. Görür, N., Çagatay, M.N., 2009. Geohazards rooted from the northern margin of the Sea of Marmara since the late Pleistocene: a review of recent results. Natural Hazards. DOI 10.1007/s11069-009-9469-x.

3. Bourry, C., Chazallon, B., Charlou, J-L, Donval J.P, Ruffine, L., Henry, P., Geli, L., Çagatay, M.N., Sedat, I. Moreau, M., (2009). Free gas and gas hydrates from the Sea of Marmara, Turkey: Chemical and structural characterization. Chemical Geology, 264, 197–206 .

Book Chapters:

4. Çagatay, Balkis,N., Sancar, Ü., Çakir, Z. et al... (2009). Sediment Geochemistry Atlas of the Sea of Marmara and its importance in pollution and ecological studies. In: Özerler, M. and Sayin, E. (eds.), The Role of Climatic and Anthropogenic Changes in Marine Ecosytems, Ecosystems’07, Izmir – Turkey, pp. 165-182.

5. Çagatay, M.N., Geli, L., Gasperini, L., Henry, P., Gürbüz, C., Görür, N. The Sea of Marmara. Chapter to be published in a book edited by P. Favali et al.

D6.2 Marmara-DM Website

The Marmara-DM web-site (www.esonet-marmara-dm.itu.edu.tr) now includes the abstracts and presentations of the 17-19 August ESONET trainingCourse and Earthquake Symposium. A data server is established for the input of Marmara-DM cruise and lab data. Links were made from the Web Page to the data server for easy access of the Marmara-DM partners.

Person-Months

Ifremer : 1 Ma-Month
ITU : 11,5 Ma-Months (3 permanent)
Cnrs : 0.5 Ma-Mo
DEU : 0,2 Ma-Mo
INGV : 0 Ma-Mo
ISMAR : 0,0 Ma-Mo
Total : 13,2 Ma-Mo

Other costs :

APENDICES

Eastern Mediterranean Centre for Oceanography and Limnology
Doğu Akdeniz Oşinografi ve Limnoloji Araştırmaları Merkezi
İstanbul Teknik Üniversitesi

15 Aralık 2009

MTA Genel Müdürlüğü
Ankara

Bildiğiniz gibi Avrupa Birliği 7. Çerçeve Programı, *EMSO:* "*European Multidisciplinary Seafloor Observatory* (*Avrupa Çok Disiplinli Deniztabanı Gözlemevi*)" Bilim Altyapısı projesi kapsamında Marmara Denizi önemli bir gözlem alanı olarak seçilmiştir. MTA Genel Müdürlüğü'nün de katıldığı İTÜ'de 29 Mayıs 2009 tarihinde yapılan toplantıda EMSO projesinin Marmara Denizi ayağını oluşturmak için bir karar alınmıştır.

Bu bağlamda Marmara Denizi'nde doğal afet (deprem, sualtı heyelanı, tsunami), çevresel değişim ve oşinografi gibi çok disiplinli konularda sürekli gözlemler yapacak ulusal bir bilim araştırma altyapısı proje önerisinin hazırlanarak Mayıs 2009'da Devlet Planlama Teşkilatına (DPT) sunulması planlanmıştır.

Bu ulusal projenin önerisinin hazırlanmasında ve kabul gördüğü taktirde uygulanmasında MTA Genel Müdürlüğü'nün kurumsal olarak eleman ve altyapısı ile ektin olarak yeralması için gereğini saygılarımla arz ederim.

Prof.Dr. Namık ÇAĞATAY
EMCOL Müdürü ve EMSO projesi
Yönetim Kurulu Üyesi

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Eastern Mediterranean Centre for Oceanography and Limnology
Doğu Akdeniz Oşinografi ve Limnoloji Araştırmaları Merkezi
İstanbul Teknik Üniversitesi

15 Aralık 2009

MTA Genel Müdürlüğü
Ankara

Bilindiği gibi, Avrupa Birliği Çerçeve Programı *ESONET "Eurpean Sea Observations Network of Excellence"* ve *EMSO: "European Multidisciplinary Seafloor Observatory" Bilim Altyapı* projeleri ülkemizi çevreleyen Marmara Denizi, Karadeniz ve Akdeniz'i de önemli araştırma alanı olarak seçmiştir. Denizlerde gözlem ve araştırmalar yapmak yeni teknolojiler ve bu teknolojilerin kullanımını gerekmektedir. Bu bağlamda 3-D sismik, multi-beam batimetri, yüksek çözünürlü fiziksel ve jeokimyasal karot analizleri, sensör teknolojisi, gözlem istasyonlarının kurulması, bakımı ve işletilmesi gibi konularda eleman eğitimi ülkemiz için acil bir önem taşımaktadır

Değişik deniz araştırmaları konularında eleman eğitiminin ESONET ve EMSO projelerinin ortağı olan kurumlarla işbirliği anlaşmaları çerçevesinde yapılması mümkündür. Bu çerçevede IFREMER (Fransa), ISMAR (Bologna, İtalya) ve INGV (Roma, İtalya) gibi kurumlarda elemanlarınızın değişik disiplinlerde eğitimi olumlu karşılanmaktadır. Benzer şekilde İTÜ-EMCOL'de; deprem, iklim, çevresel değişim gibi konulardaki deniz ve göl araştırmaları, yüksek çözünürlü karot analizleri ve uygulamaları konularında elemanlarınızın bizzat projelerimizde yeralıp, laboratuvarlarımızı kullanarak eğitilmesi mümkündür.

Eleman eğitimi konusunda bu işbirliği olanaklarını bilgilerinize saygılarımla arz ederim.

Prof.Dr. Namık ÇAĞATAY
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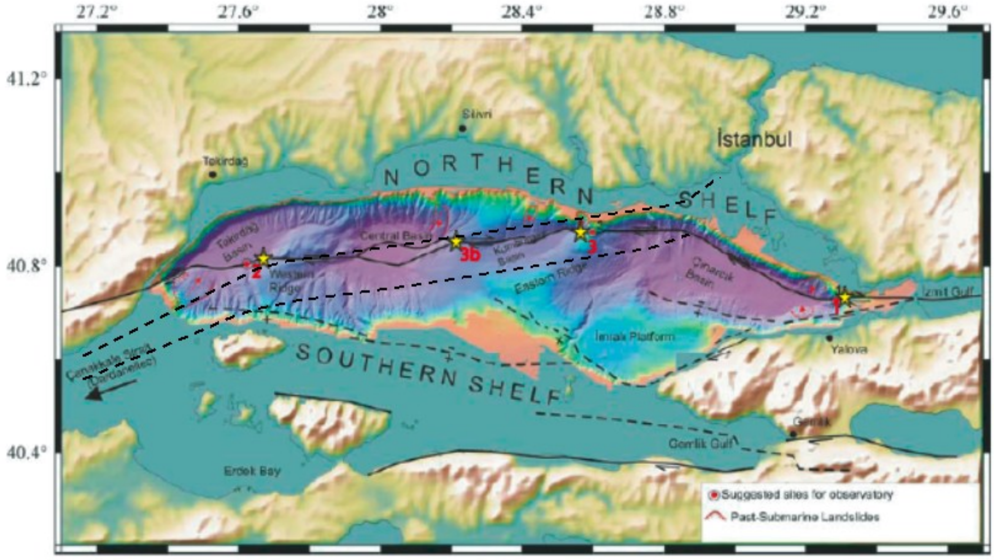
IFREMER
Acoustic and Seismic Department
Y. Thomas and B. Marsset

Marmara-DM cruise preparation

3DHigh Resolution Seismic acquisition



June 2009

Introduction

The purpose of this short note is to help defining the geological targets of the High Resolution seismic 3D survey during the Marmara-DM survey (R/V Le Suroît, september 2009, leg 2). We use the opportunity of existing 2D HR data on the area recorded in 2008 on board the R/V K. Piri Reis by the Dokuz Eylül University (DEU, Izmir, Turkey). We are grateful to Dr Günay Çifçi from the Marine Seismic Laboratory SeisLab of DEU and to Dr. Michael S. Steckler from the Lamont-Doherty Earth Observatory (Columbia University, NY, USA) who gave us access to raw seismic data from 4 profiles of the TAMAM cruise (Turkish-American MArmara Multichannel).

These sections were selected during the meeting held at the Dokuz Eylül University (Izmir), 2d-5th of June, with the main following attendees:

- DEU (Izmir): Prof. Dr. Gunay ÇIFÇI, Doc. Dr. Derman DONDURUR, Res. Assist. Dr. Seda OKAY, Res. Assist. Savas GURCAY, Geop. Eng. Selin Deniz AKHUN
- IFREMER (Brest) : Dr. Louis GELI, Dr. Bruno MARSSET, Geop. Eng. Yannick THOMAS
- videoconference from CEREGE (Aix-en-Provence): Dr. Pierre Henry

The TAMAM profiles have been analysed using Ifremer's standard QC software, mainly:

- processing of GPS vessel data, computation of sources and receiver positions (offset of first trace fixed to 43 meters);
- SEGY pre-processing (source delay correction 32 ms, band-pass filter 30-300 Hz);
- binning 6.25 meters, stack (1510 m/s for water column, and Vrms gradient of 150 m/s s^{-1} within sediments), Stolt migration;

Reference to TAMAM data:

Steckler M. S., Çifçi G. et al. (2008), High Resolution Multichannel Imaging of Basin Growth Along a Continental Transform: The Marmara Sea Along the North Anatolian Fault in NW Turkey, EOS Trans. AGU, 89(53), Fall Meet. Suppl., Abstract T21A-1921.

The Marmara-DM cruise is funded by the European Esonet-Noe project (European Commission in the framework program FP6).

Main observations

See figures:
- time migrated sections are displayed using AGC (100 ms window);
- corridor limit stand for the northern boundary of the Marmara maritime corridor;

The area selected during the meeting is located in the western part of the Sea of Marmara. The area is centered on the western ridge, between the Tekirdag and Central basins, it includes the North Anatolian Fault.

One of the major constraints regarding seismic acquisition in the Marmara Sea is the intense maritime traffic between the Bosphore and the Dardanelles straits.

One of the major geological interest is the area close to the North Anatolian Fault (NAF) where evidence of gas hydrates and fluid escapes have been observed during previous scientific cruises (See Marnaut cruise report, 2007 - P. Henry from CEREGE Aix-en-Provence, A. M. Celal Şengör and M. Namik Çagatay from ITU Istanbul)

Proposed area for 3D High Resolution seismic survey of 3.6 x 10 km² is oriented ESE-WNW along the NAF, parallel to the corridor lines; the southern part of the area may penetrate 1000 meters within the maritime corridor if feasible.

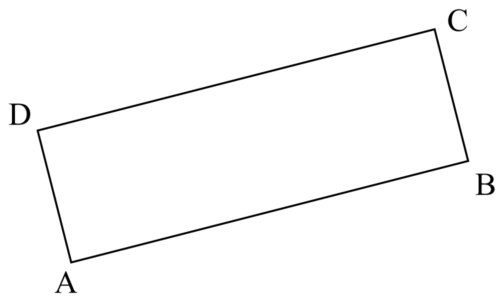
Main observations from the TAMAM seismic lines within the 3D box:

Southern side of the "NAF valley":
- western to central parts: evidence of amplitude anomalies and possibly pockmarks; upper sediment cover with good Signal to Noise ratio: 100-200 ms; underlying sediments: highly folded layers, poor SN ratio; half part of this area is located within the navigation corridor ;
- eastern part:: no more "NAF valley", rather slope of the central basin with no sedimentary penetration;

Nothern side of the "NAF valley":
- western part: outcrop of highly folded sediments (zero penetration);
- central and eastern parts: upper sediment cover increases between the two local tops of the ridge; upper sediment cover with good Signal to Noise ratio: 100-400 ms;

Main targets within the 3D box may be:
- amplitude anomalies and structures within the upper sedimentary cover;
- morphology of the sedimentary "basement" (top of the highly folded sediments);

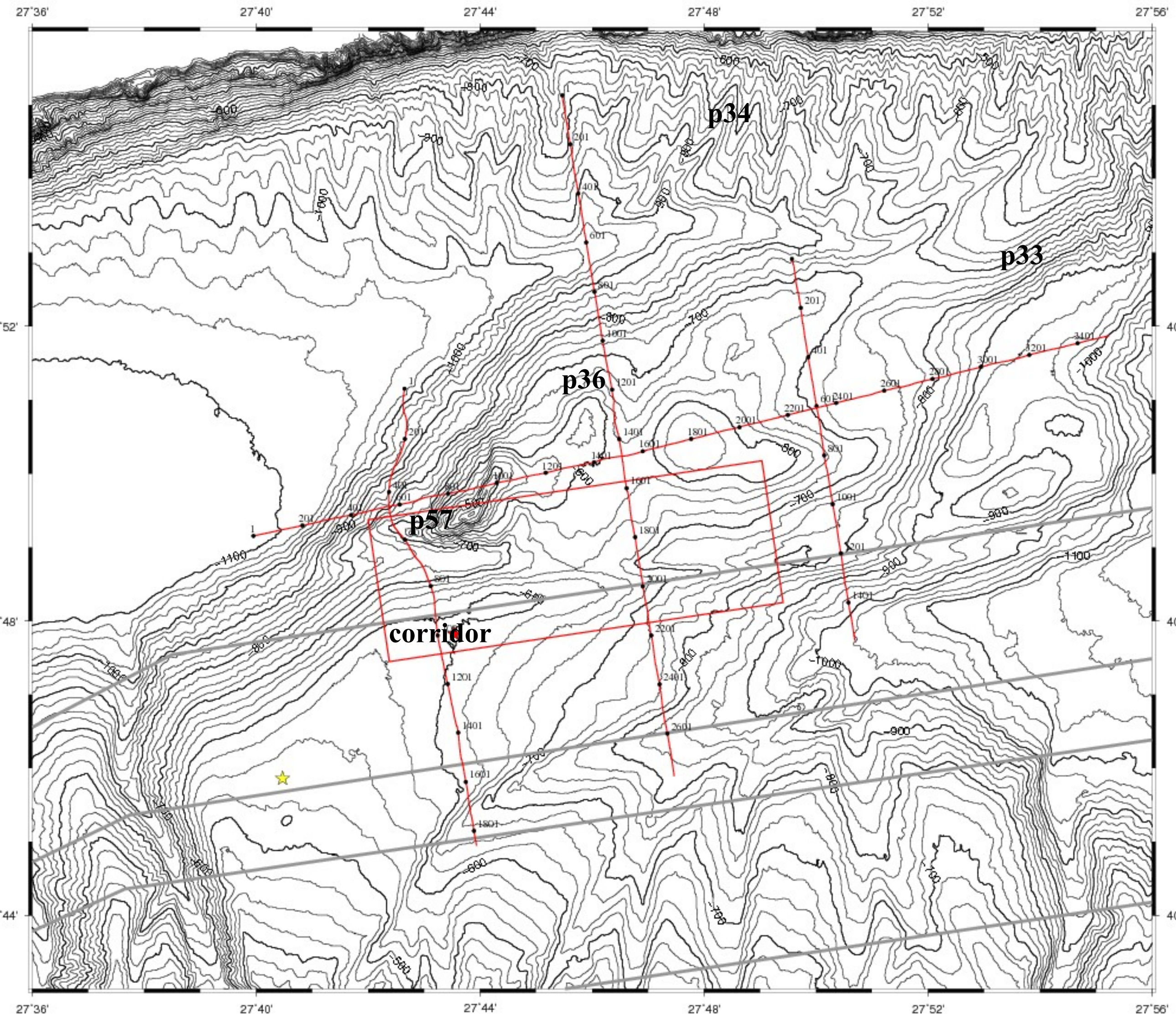
3D box coordinates



WGS84 coordinates:

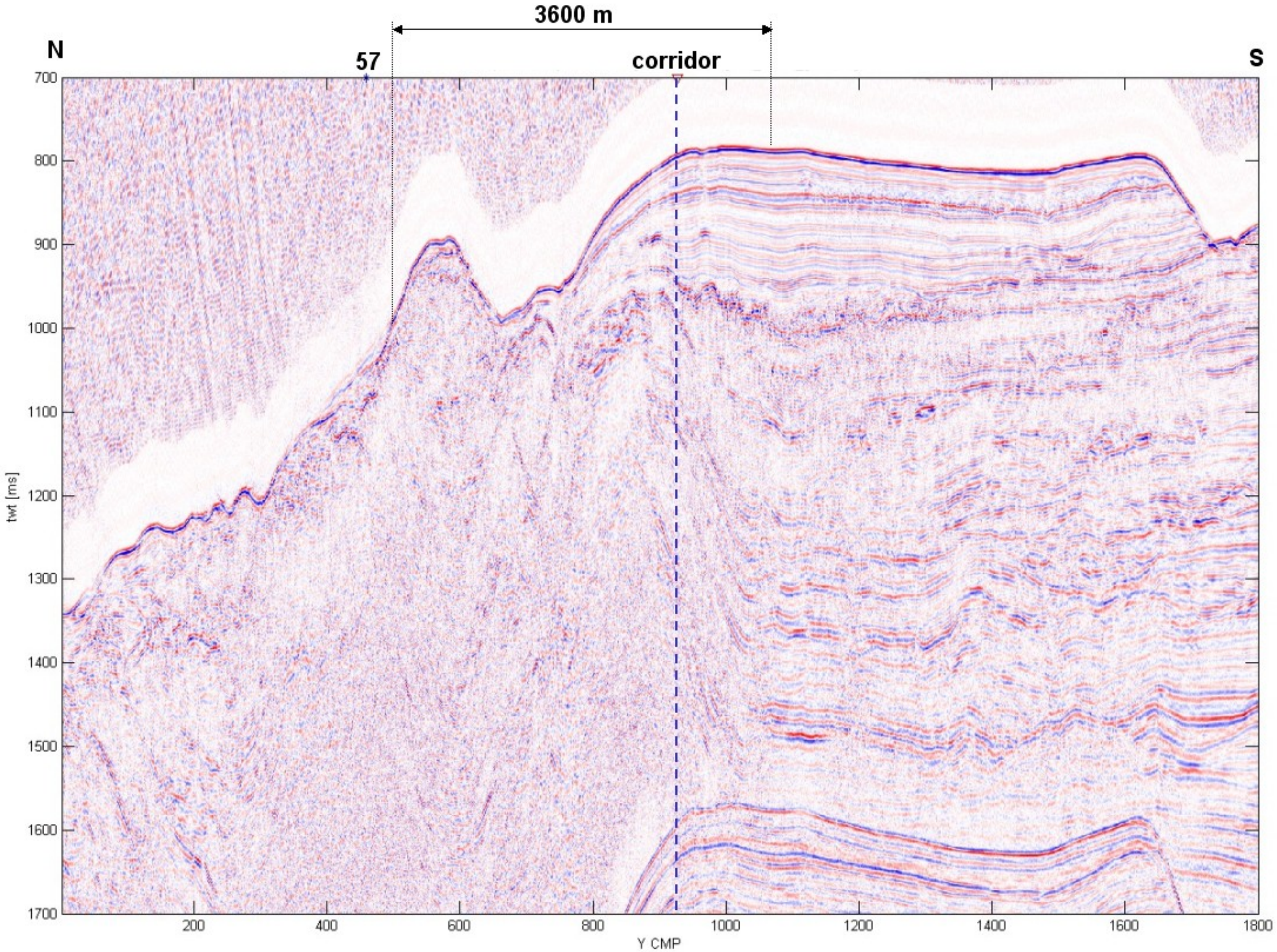
A)	27°42.381	40°47.447
B)	27°49.414	40°48.251
C)	27°49.033	40°50.175
D)	27°42.000	40°49.371

Size: 9999 x 3600 m²
Box parallel to the corridor (heading 81.44°)
Magnetic declination (june 2009) : +4.4°



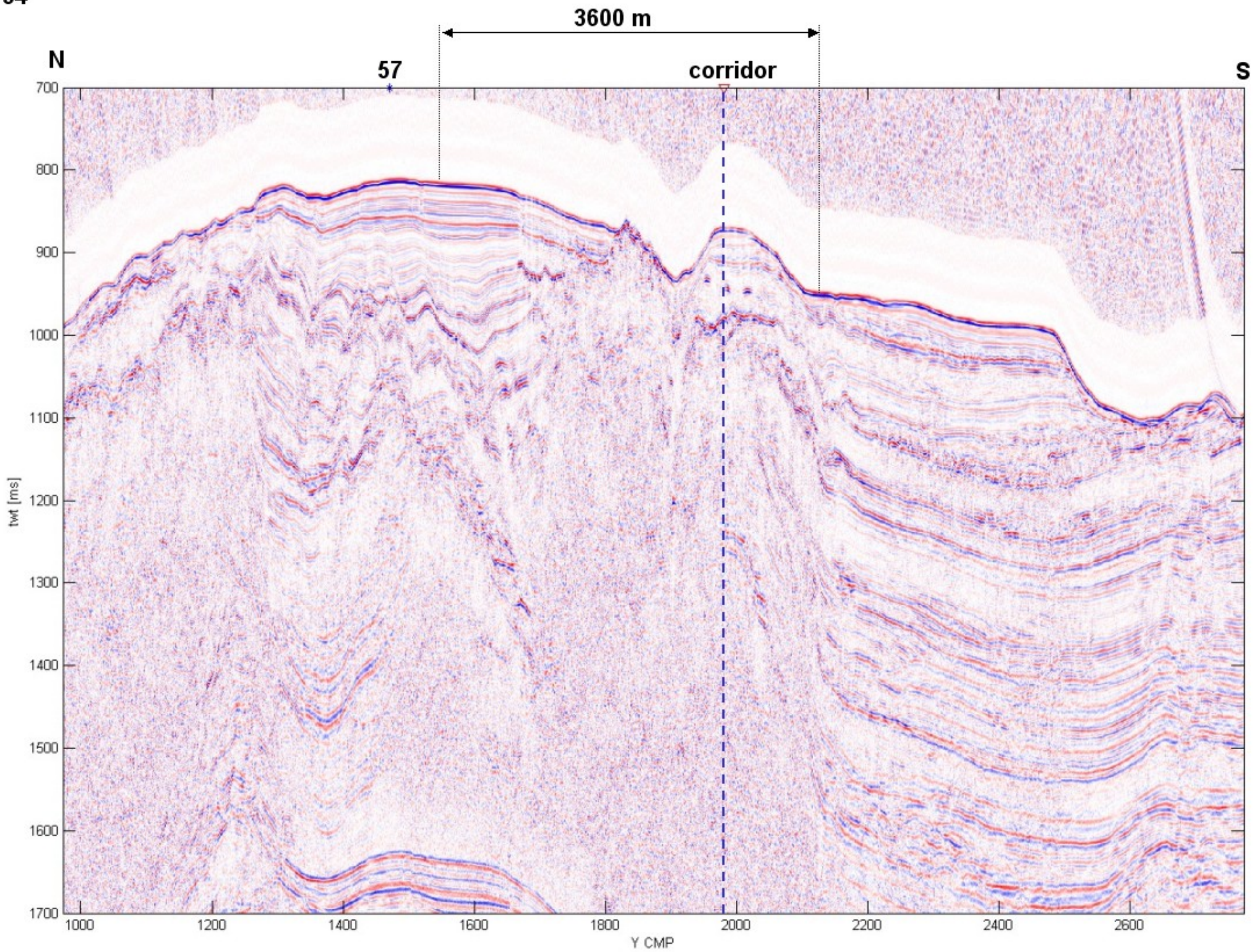
Proposed 3D HR box location (10 x 3.6 km²), southern part 1 km within maritime corridor;
Location of Tamam sections, CMP numbers (Dokuz Eylül Universitesi, Izmir - Lamont)
Yellow star: Koeri observatory location; red star: MD04-2741/MD01-2430 coring site

Profile 36



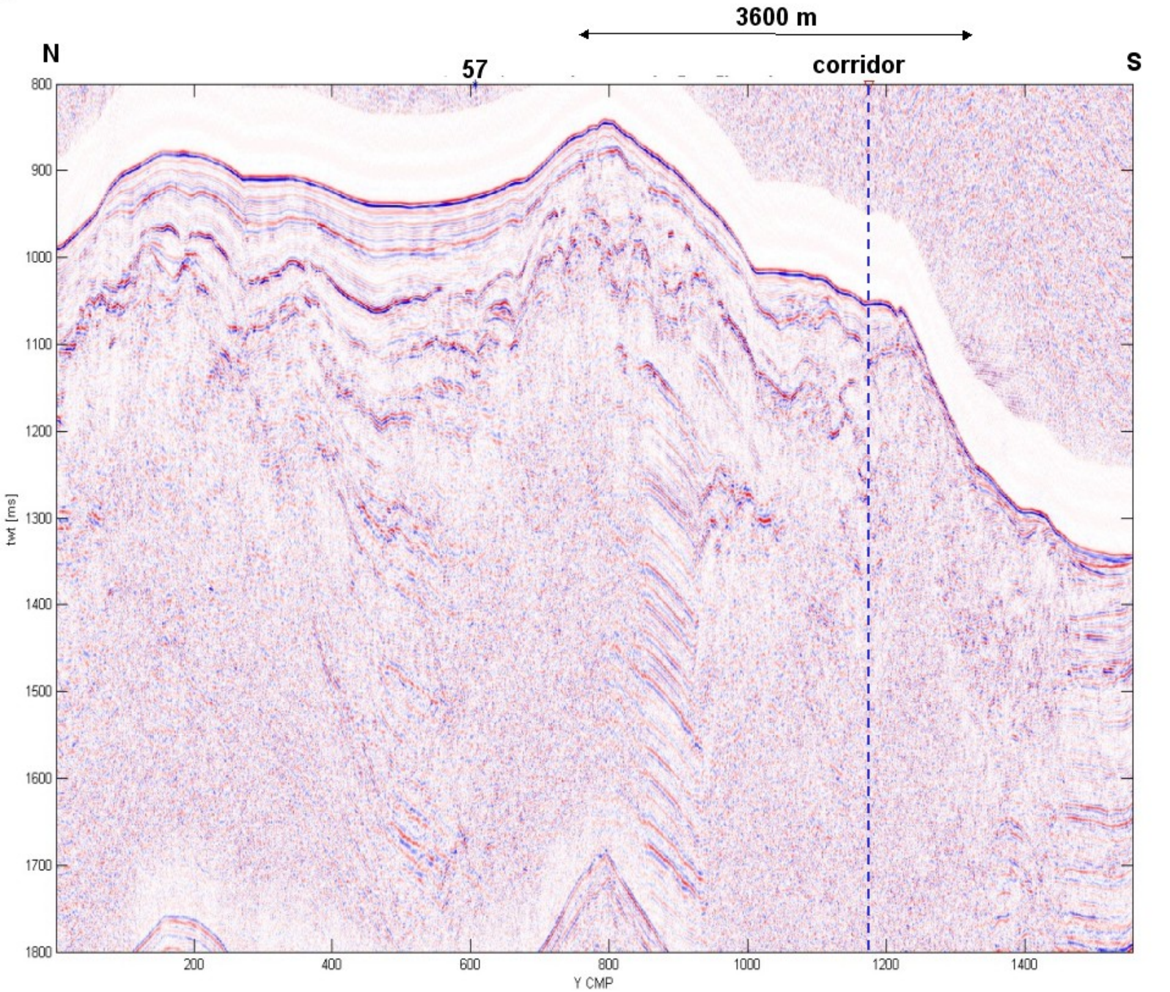
TAMAM data from Dokuz Eylül Universitesi (Turkey) and Lamont-Doherty Earth Observatory of Columbia University (USA)

Profile 34

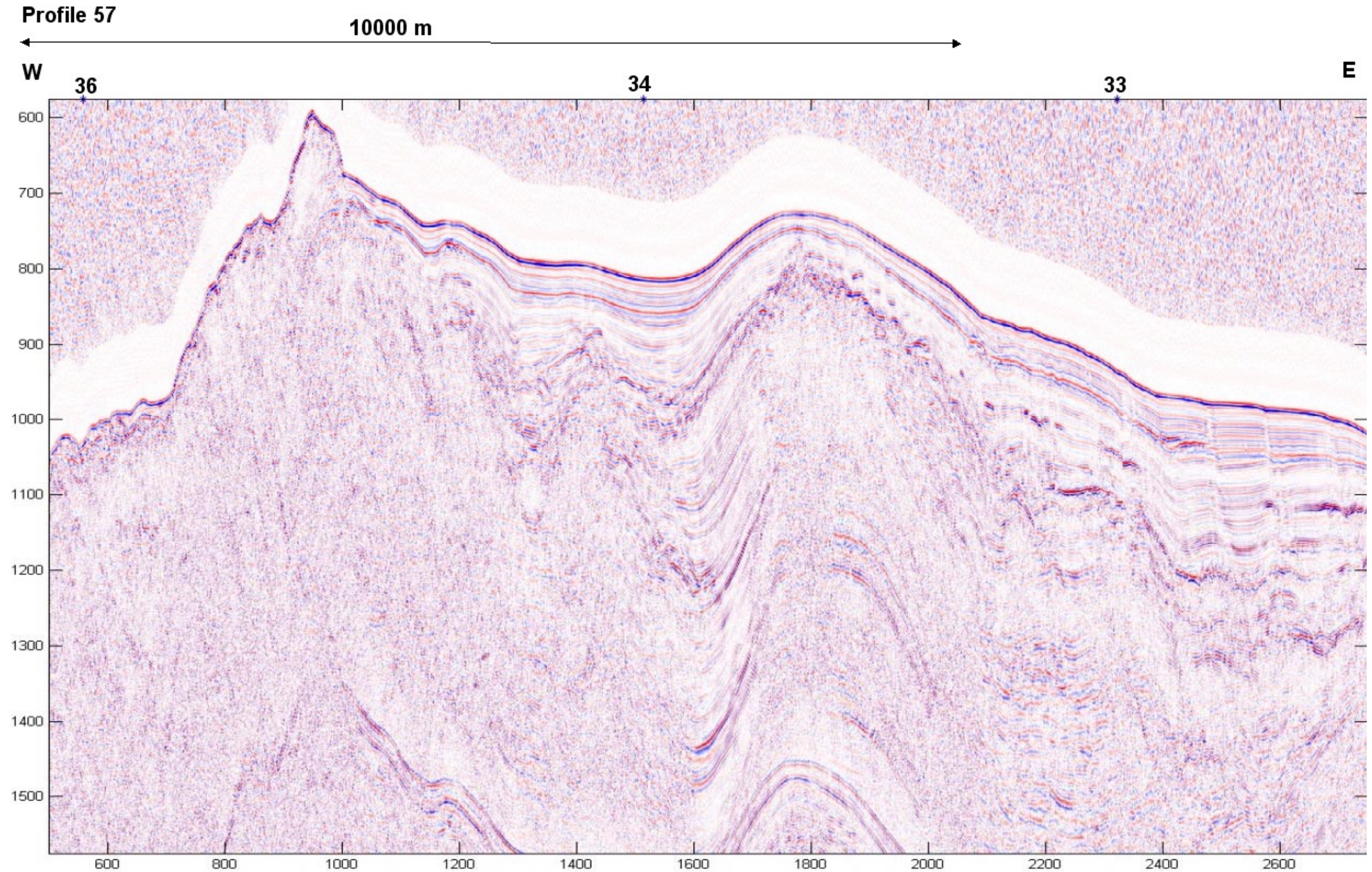


TAMAM data from Dokuz Eylül Universitesi (Turkey) and Lamont-Doherty Earth Observatory of Columbia University (USA)

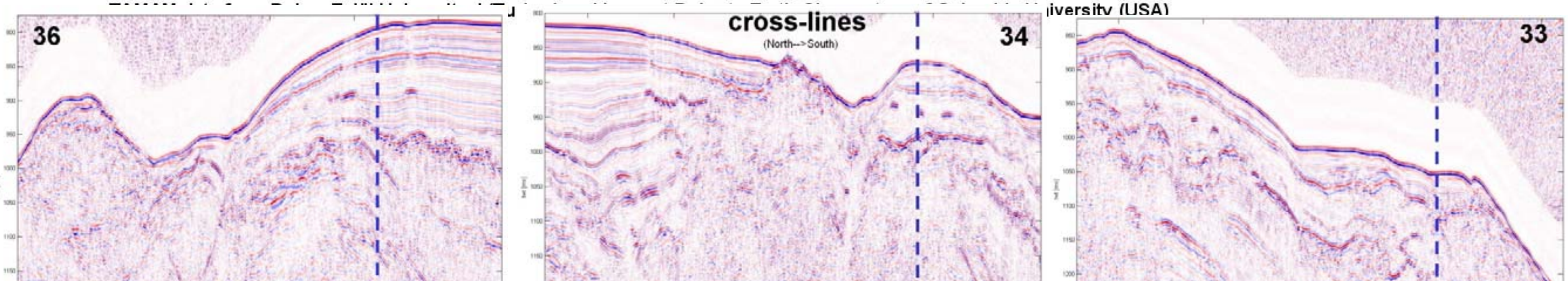
Profile 33

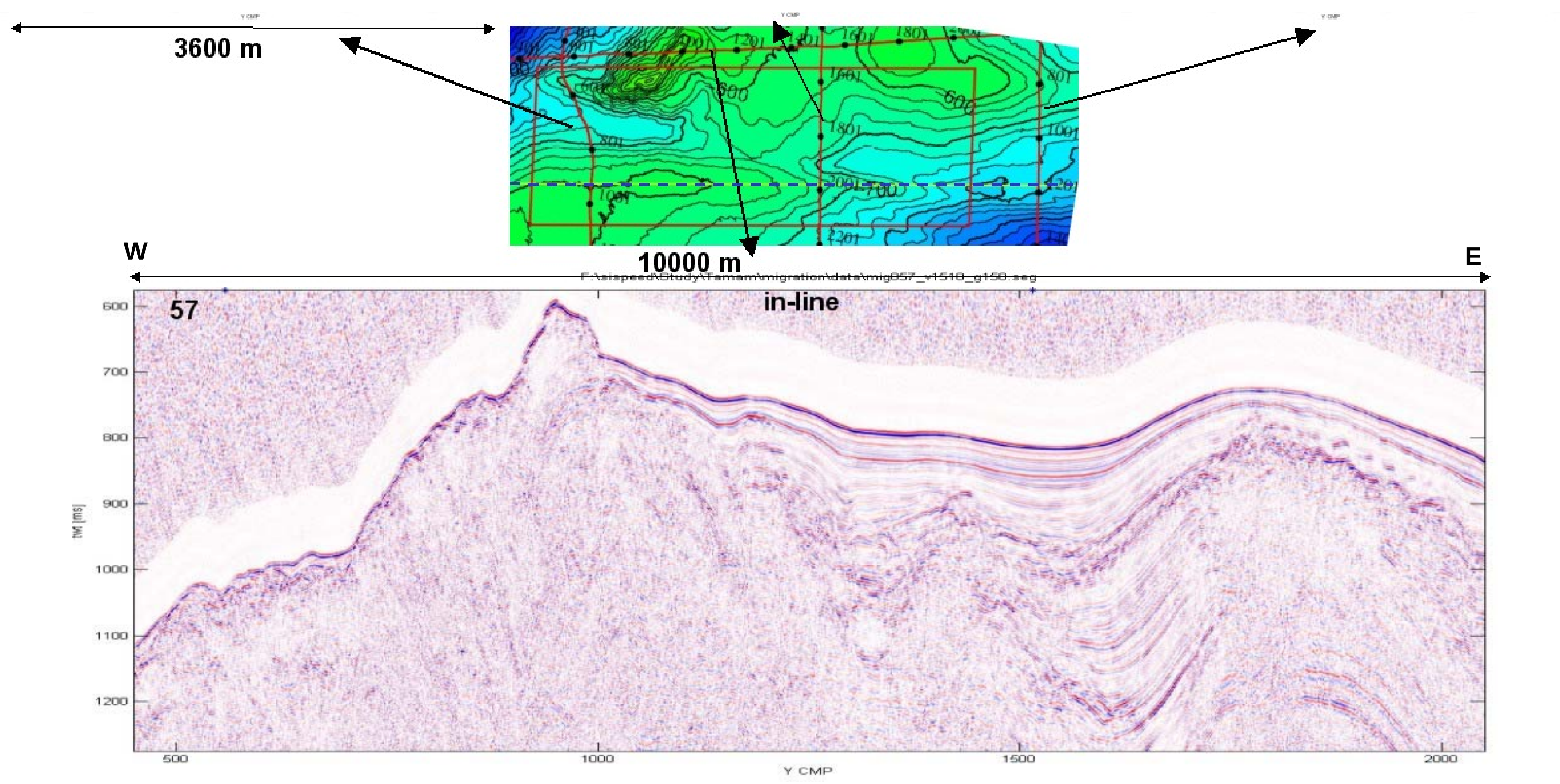


TAMAM data from Dokuz Eylül Universitesi (Turkey) and Lamont-Doherty Earth Observatory of Columbia University (USA)



TAMAM data from Dokuz Eylül Universitesi (Turkey) and Lamont-Doherty Earth Observatory of Columbia University (USA)





3600 m
W
10000 m
E
57
in-line
600
700
800
900
1000
1100
1200
TWT [ms]
500
1000
1500
2000
Y CMP

Minutes of "EMSO Introduction and Consensus meeting" of the Turkish Marine Organizations held at ITU during 29 May 2009

EMSO (European Multidisciplinary Seafloor Observatory) Projesi Tanıtım Toplantısı Tutanağı

EMSO projesi tanıtım toplantısı İTÜ Maden Fakültesi Yönetim Kurulu Salonunda 29 Mayıs 2009 Cuma günü saat 10:30 da başlamıştır. Toplantıya isim listesi ekte verilen katılımcılar katılmıştır (Ek-1).

Toplantı, EMSO projesinin İTÜ Yürütücüsü Prof.Dr. Namık Çağatay'ın sunumu ile başlamıştır. Sunumda EMSO projesinin Avrupa Birliği'nin ESFRI (European Strategy Forum on Research Infrastructures) yol haritası listesinde yeralan bir bilim altyapı projesi olarak, hazırlık aşamasındaki amacının Avrupa Çok-disiplinli Deniztabanı Gözlem Ağının yönetimsel, hukuksal ve finansal altyapısını oluşturmak olduğunu belirtilmiştir. EMSO projesi 8 iş paketinden oluşmaktadır. Bunlar sırası ile 1) EMSO Proje yönetimi, 2) Yönetim Çalışması, 3) Yasal Çalışma, 4) Finans çalışması, 5) İşletme planı, 6) Lojistik çalışması, 7) Strateji belirleme çalışması, ve 8) Teknik çalışma'dır. Bu projenin gözlem bölgeleri arasında Marmara Denizi, Karadeniz ve Akdeniz'nin bulunması nedeniyle Türkiye için önemi anlatılmış ve Marmara Denizi bölgesel ayağının oluşturulması için gerekli öneriler sunulmuştur.

Toplantının ikinci kısmında karşılıklı görüş alış-verişi sonucunda aşağıdaki kararlar alınmıştır:

1. EMSO Avrupa Bilim Altyapısı projesi; ülkemizin bir iç denizi olan Marmara Denizi'ni bölgesel bir gözlem alanı seçmiş olması nedeniyle önemlidir. Zira Marmara Denizi'nde deprem ve tsunami gibi doğal afetler, Ege Denizi ve Karadeniz arasındaki oşinografik su kütlesi hareketleri ile tanker kazaları ve bunlar sonucu oluşacak kirliliğin gerçek zamanlı, sürekli ve uzun süreli izlenmesi çok önemlidir.

2. EMSO'nun Marmara Denizi Bölgesel Altyapısının oluşturulması süreci, ulusal bir proje olarak ele alınmalıdır. Bu bağlamda Türkiye'deki ilgili bilimsel kurumlar bir konsorsiyum oluşturmalı ve altyapı çalışmaları ulusal bir politika çerçevesinde bilimsel kurum temsilcilerinin yeraldığı bir kurul tarafından yürütülmelidir.

3. Bu tür bir ulusal projenin birinci derecede kaynağı, bu proje için niyet mektubu vermiş Başbakanlık Devlet Planlama Teşkilatıdır (DPT). Bu nedenle 2010'da DPT'ye sunulmak üzere, amaçları, kapsamı ve sürdürülebilirliği iyi açıklanmış, İTÜ Rektörlüğü desteğinde bir altyapı proje önerisi hazırlanmalıdır.

4. Dünyadaki benzer örnekleri dikkate alınarak, Deniz Tabanı Gözlem İstasyonu verilerine ihtiyacı olan pertrol endüstrisi ve sigorta şirketleri ile işbirliği ve mali kaynak yaratma olanakları araştırılmalıdır.

5. Proje ilgi alanı bakımından İBB, Marmara Belediyeler Birliği, İstanbul Valiliği İstanbul Özel İdaresi, Afet İşleri Genel Müdürlüğü gibi kamu kurumlarını ilgilendirmektedir. Bu nedenle bu kurumlarla gerekli işbirliği yapılmalıdır.
6. Projenin yeni teknoloji geliştirme ve uygulama potansiyeli bulunmaktadır. Bu nedenle teknokentler ve KOBİ'lerle işbirliği olanakları araştırılmalıır.
7. Denizaltı gözlem istasyonlarının oluşturulmasında yasal mevzuat için D.K.K. SHOD, Sahil Güvenlik Komutanlığı, Kıyı Emniyeti ve Gemi Kurtarma Genel Müdürlüğü gibi kurumlara danışılacaktır.

Ek 1:

EMSO Toplantısı Katılım Listesi

İTÜ, 29 Mayıs 2009

İsim	**Kurum**	**Telefon**	**e-posta**
Prof.Dr.Mehmet Karaca	İTÜ Araştırmadan Sorumlu Rektör Yard.	212 285 33 31	karaca@itu.edu.tr
Prof.Dr. Namık Çağatay	İTÜ EMCOL Müdürü	212 285 62 11	cagatay@itu.edu.tr
Prof.Dr. Naci Görür	İTÜ EMCOL Projeler Koordinatörü	212 286 06 88	gorur@itu.edu.tr
Prof.Dr.Bayram Öztürk	TÜDAV	424 07 72- 514 03 88/16404	ozturkb@istanbul.edu.tr
Prof.Dr.Hüseyin Avni Benli	D.E.Ü. Deniz Bilimleri ve Teknolojisi Enst. Müdürü	232 278 51 12	huseyin.benli@deu.edu.tr
Doç.Dr.Semih Ergintav	TÜBİTAK MAM, YDBE	216 677 28 50	semih.ergintav@mam.gov.tr
Dilek Günaydın	Sahil Güvenlik Marmara ve Boğazlar Bölge K.lığı	242 97 10	
Aylin Ergin	Kıyı Emniyeti Genel Müdürlüğü	292 52 80/ 639	aylin.ergin@kegm.gov.tr
Hilal Burcu Çalışır	Kıyı Emniyeti Genel Müdürlüğü	252 22 94	bcalisir@kegm.gov.tr
Barbaros Şimşek	MTA Genel Müdürlüğü, Dnz. Araş. Koordiatörlüğü	0 312 287 34 30 / 1651	barbarossimsek@mta.gov.tr
Dr. Özden İleri	MTA Genel Müdürlüğü, Dnz.Araş. Koordinatörlüğü	0 312 287 34 30 / 1419	ozden@mta.gov.tr

Project contract no. 036851

ESONET

European Seas Observatory Network

Instrument: **Network of Excellence (NoE)**

Thematic Priority: **1.1.6.3 – Climate Change and Ecosystems**

Sub Priority: **III – Global Change and Ecosystems**

ESONET WP4 - Demonstration Missions

MARMARA-DM

FINAL REPORT

Start date of project: **1st March 2007** Duration: **48 months**

Revision [draft]

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	X

Table of Content

1. General information

1.1 Partnership (institutions, people, e-mails, addresses), duration (start/end dates)

DM acronym:	MARMARA-DM
DM title:	Multidisciplinary Seafloor Observatories for Seismogenic Hazards Monitoring in the Marmara Sea
ESONET Site:	MARMARA SEA, Turkey
Scientific Area(s):	- Earthquake hazards - Relations between fluids and seismicity - Processess at fluid controlled ecosystems
Technological Area(s):	Long-term, permanent monitoring of seismicity, sediment pore fluid, fluid geochemistry and gas emission activity
DM Start and End date:	from April1st, 2008 to September 30st, 2010
DM duration:	*30 months*

Partners Contact

Partner Num.	Partner Institution Name	Principal Investigator (PI) for the Demo Mission	PI coordinates (Address, Email, Telephone, fax..)
1.	IFREMER	Géli, Louis (Coordinator)	IFREMER Marine Geosciences Department BP 70, 29280 Plouzané, France T. 33 (0) 2 98 22 42 27 / F. 33 (0) 2 98 22 45 49 E-mail : geli@ifremer.fr
2.	ITU	Çağatay, Namık (Prof.)	Istanbul Technical University Faculty of Mines Geology Department Maslak 34469 Istanbul, Turkey T. +90-2122856211 / F. +90-2122856080 Email : cagatay@itu.edu.tr
3.	ISMAR	Gasperini, Luca	ISMAR (Istituto di Scienze Marine), Sezione di Geologia Marina, CNR, Via Gobetti, 101, Bologna, Bo 40129 Italy T. +39 041 2404761 / F. +39 041 5204126 : luca.gasperini@bo.ismar.cnr.it
4.	INGV	Favali, Paolo	Istituto Nazionale di Geofisica e Vulcanologia (INGV), Via di Vigna Murata, 605 - 00143 Roma (Italy) T. +39-06-51860-341 / F. +39-06-51860-338 E-mail : paolofa@ingv.it
5.	CNRS	Henry, Pierre	CNRS/ CEREGE - College de France Europole de l'Arbois, Bat Trocadero BP 80, 13545 Aix en Provence Cedex 04 T. +33 (0)4 42 50 74 04 / F. +33 (0)4 42 50 74 01 E-mail : henry@cdf.u-3mrs.fr
6.	DEU/IMST	Çifçi, Günay (Prof.)	Institute of Marine Sciences and Technology Dokuz Eylul University Izmir, 35340 Turkey GSM: +90 - 532 513 59 16 Phone: +90 - 232 - 278 55 65 ext. 126 Fax: +90 - 232- 278 50 82

1.2 Work Packages activities and tasks short description (as indicated in the implementation plan)

WP	WP/Activity name	Leader Institution	Tasks short description	Related Deliverables
1	MarNaut data integration	**CNRS**	Integrate data collected during MarNaut cruise ; publish scientific results ; produce recommendations for the present demonstration mission	- D1.1 Paper on piezometer and OBS results - D1.2 Paper on flowmeters /osmo-samplers - D1.3 Paper on fluid analysis - D1.4 Paper synthezing Marnaut results
2	Marine Operations	**Ifremer**/DEU/ISMAR/ITU	Preparation and completion of the following cruises : - Marmesonet cruise with Le Suroit, with 2 legs for : i) acoustic mapping water column ; 2) high-res bathymetric survey using AUV at 3 sites ; 3) high-res seismic survey at site 1. - DEU cruises with R/V Piri Reis : high-res seismics at sites 2 & 3 - Urania cruise with R/V Uranina for SN-4 operations.	- D2.1 Cruise reports for DEU cruises - D2.2 cruise report for Ifremer cruise (Marmesonet) - D2.3 1-year time series at 3 sites
3	Land and seabottom integration	**INGV**/ITU-TUBITAK/Ifremer	Integrate the marine and land seismological data in order to : ➢ assess the true benefit of deploying seafloor stations in the MS; ➢ assess the ambient noise in the Marmara Sea ; ➢ better identify the active segments of the MS Sea fault system	- D3.1 Report (including data base) combining marine and land seismological data in the Marmara Sea - D3.2 Report on the ambient noise in the MS and recommendation for the implementation of permanent seabottom stations - D3.3 High res seismic images at 3 sites
4	Data integration and modelling	**ISMAR**/CNRS/ITU/Ifremer/INGV	- Analyze, integrate and model all available data (seismology, geophysics and geochemistry of pore fluids, sedimentology, acoustics) - Test the working hypothesis (according which some of the physical and chemical changes in the properties of the fluids within the fault zone change can be detected in surface sediments) by interpreting pore fluid pressure and chemistry variations. - Validate the concept of seafloor observatories - Select the best site for permanent seafloor monitoring	- D4.1 Report integrating all available data - D4.2 GIS including all available data - D4.3 Report validating the concept of seafloor observatories - D4.4 Report on best site selection
5	Comparative feasibility study	**Ifremer**/ITU	- Compare fiber optic cabled observatories vs permanent observatories linked to a sea-surface buoy equipped with energy supply and telecommunications systems. - Provide approximate costs on investments, maintenance and personnel, based on the local situation.	- D5.1 Recommendations report for the preferred option - D5.2 Cost estimation report - D5.3 Implementation plan
6	Public outreach, education and fund raising	**ITU**-DEU	- Disseminate results among Turkish authorities and policy makers - Propose a coordination structure and managing scheme for the implementation of the seafloor observatory. - Disseminate results among the scientific community and the public (thorugh web site, training courses and public seminars)	- D6.1 Support agreement contract with Turkish authorities - D6.2 Web Site - D6.3 Training course

1.3 Deliverables description

Deliverables have all been achieved and accessible on the data repository system of the Marmara-Dm project websit : http://www.esonet.marmara-dm.itu.edu.tr/

Deliverable N°	Deliverable name	Lead contractor
	WP1	
D1.1	Report on piezometer and OBS results[a] *Including Tary et al, Bull. Seism. Soc. Am.*, Vol. 101, No. 2, doi: 10.1785/0120100014, 2011	5
D1.2	Report on Fluid flux rates through the Marmara seafloor : Results from flowmeters and osmo-samplers *Including paper by Tryon et al, submitted to Marine Geology on March 2011*	5
D1.3	Report on the origin of fluids escaping from the Marmara seafloor Including paperss by Bourry *et al*, *Chem. Geol.*, doi: 10.1016/j.chemgeo.2009.03.007, 2009 and Tryon et al., Geochem. Geophys. Geosyst., 11, Q0AD03, DOI: 10.1029/2010gc003177, 2010	5
D1.4	Paper synthetizing Marnaut results *Géli et al, Earth Plan. Sci. Let.,* 274, 34–39, doi:10.1016/j.epsl.2008.06.047, *2008*	5
	WP2	
D2.1	Cruise report of DEU (PirMarmara) Cruise with R/V Piri Reis (June 2010)	6
D2.2a	Cruise Report on Ifremer (Marmesonet) cruise, Leg I (Oct. 4th – Oct. 25, 2009)	1
D2.2b	Cruise Report on Ifremer (Marmesonet) cruise, Leg I (Oct. 28th – Dec. 14, 2009)	1
D2.3	Cruise reports of SN4-related operations : i) Marmara 2009 Cruise with R/V Urania (october 2009); ii) Recovery and redeployment operations with R/V Yunuz (march 2010) ; Marmara 2010 Cruise with R/V Urania (october 2010). Including brief, preliminary report on SN-4 time series (6 months)	4
	WP3	
D3.1	Report combining marine and land seismological datasets	1
D3.2	Report on the ambient noise and recommendation for implementing permanent seabottom stations	4
D3.3	3D, High Res Seismic Images at Western High Site	6
	WP4	
D4.1	Report on data repository system integrating all available data	3
D4.2	GIS including all available data	5
D4.3	Report to test working hypothesis and validate concept of seafloor observatories	5
D4.4	Report on best site selection	3
	WP5	
D5.1	Recommendation Report on the preferred option	1
D5.2	Cost estimation report	1
D5.3	Implementation plan	4
	WP6	
D6.1	Support agreement contract with Turkish authorities	2
D6.2	Web Site	2
D6.3	Training course	2

1.4 Milestones description

Milestone Number	Milestone description	Actual date
1	Kick-off meeting	Ifremer, October 29th and 30th, 2008
2	Ifremer Cruise (Marmesonet)	4th Nov. – 14th Dec. 2009
3	DEU Cruises (High Res Seismics with R/V Piri Reis)	4th-16th June 2010
4	Training Course	18th-19th August, 2009
5	Closure meetings with conclusions	Brest, 2nd-5th Feb., 2010 & Brest, 1st-3rd, March, 2011

2. Introduction (scope and context)

The goal of the present demonstration mission (MARMARA-DM) is to contribute to the establishment of optimized permanent seafloor observatory stations for earthquake monitoring in the Sea of Marmara (SoM), as part of ESONET NoE. The SoM offers the ideal location for seafloor seismogenic observations directed towards risk assessment, because of the following reasons:

1. The deformation rates (20 mm/y) are very high compared to any other marine sites in Europe, resulting in active submarine processes that are measurable on short time scales
2. More than 15 millions people are under the threat of seismogenic hazard in the whole Marmara Region. Hence, the continuous seafloor monitoring would have high societal impact
3. Numerous fluid vents and related features have been discovered along the SoM fault system. The SoM is thus a unique area to test hypothesis on the relations between strike-slip deformation, seismic activity, fluid flow and gas expulsion within the active fault zone.
4. Logistics are favored by the proximity to the coastlines (only 5 to 30 km), which make cost-effective and realistic the establishment of permanent seafloor observatories.

The specific objectives of the present demonstration mission are:

1. To characterize the temporal and spatial relations between fluid expulsion, fluid chemistry and seismic activity in the SoM,
2. To test the relevance of permanent seafloor observatories for an innovative monitoring of earthquake related hazards, appropriate to the Marmara Sea specific environment
3. To conduct a feasibility study to optimize the submarine infrastructure options (fiber optic cable, buoys with a wireless meshed network, autonomous mobile stations with Wireless messenger). This study will also ensure standardization and integration with other initiatives world wide (Europe through Esonet, but also with Neptune)
4. To ensure the sustainability by involving the national and local authorities, and coordinate national (Turkish) and international efforts towards a optimized, permanent seafloor monitoring for the geohazard risk assessment and mitigation in the SoM.

3. Work Description

3.1 Work Description at work package level

WP 1 : Analysis of the available time series data and in-situ samples from the Marnaut cruise.

D1.1 Report on piezometer and OBS results from the MarNaut cruise. The piezometer deployed during the MarNaut cruise presented unexplained features that could be interpreted as artifacts. Therefore, deliverable D1.1 is based on OBS data. We present **two case studies** from the Sea of Marmara :

- The **first case study** concerns the relation between the micro-seismicity and other observations we had from the seafloor (anlysis of in-situ sampled fluid sampling and detailed micro-bathymetry (based on AUV data collected in 2009 during the Marmesonet cruise). This work clearly shows that *tectonic strain below the western slope of the Tekirdag Basin contributes to maintain a high permeability in faults zones, and that the fault network provides conduits for deep-seated fluids to rise up to the seafloor [Tary et al, Bull. Seism. Soc. Am.*, Vol. 101, No. 2, doi: 10.1785/0120100014, 2011*]*.

- The **second case study**, is focused on the detailed analysis of non-seismic micro-events recorded with Ocean Bottom Seismometers and hypothetically attributed to degassing episodes from the upper sediment layers. Our analysis unambiguously confirms our hypothesis and provide insights on how gas is expelled from the uppermost sediment layers: the recorded micro-events are related to natural degassing from the seafloor and to the building and collapsing process of gas chimneys near the subsurface.

D1.2 Report on Fluid flux rates through the Marmara seafloor: results from flowmeters and osmo-samplers. The objective of the 2007 MarNaut project was to quantify the level of activity of venting sites near the fault, and the source of the fluids emitted, with the goal of understanding the processes involved and setting a baseline for long-term studies of the relationship between seismic activity and fluid migration/expulsion processes. Sites for flow meter and fluid sampler deployment and coring included basin bounding transtensional faults and strike-slip faults cutting through the topographic highs. Significant fluid flow appears to be primarily an episodic phenomenon at all sites with background rates on the order of mm/yr to cm/yr except at or very near rare focused vents. Basin bounding faults expel primarily shallow sourced fluid with a strong influence of brackish Pleistocene Lake Marmara water. Expulsion sites where the main fault crosses topographic highs are more complex with evidence for deep-sourced fluids including thermogenic gas. One site on the Western High displayed two mound structures that appear to be chemoherms atop a deep-seated fluid conduit. The fluids being expelled are brines with an exotic fluid chemistry along with thermogenic gas and oil [*Tryon et al, submitted to Marine Geology on March 2011].*

D1.3 **Report on the origin of fluids escaping from the Marmara seafloor.** Gas hydrates were sampled during the MARNAUT cruise (May–June 2007) on the Western High, and three gas-bubble samples were recovered on the Western High, the Central High and in the Çinarcik Basin. Methane is the major component of hydrates (66.1%), but heavier gases such as C2, C3, and i-C4 are also present in relatively high concentration. The methane contained within gas hydrate is clearly thermogenic, with a geochemical signature similar to the one found for the natural gas from K-Marmara-af field in the Thrace Basin. Gas bubbles from Central High show also a thermogenic origin, whereas those from the Çinarcik Basin have a primarily microbial origin. UV-Raman spectroscopy reveals structure II for gas hydrates. Hydrate composition is in good agreement with equilibrium calculations, which confirm the genetic link between the gas hydrate and gas bubbles at Western High and the K-Marmara-af offshore gas field located north of the Western High. The base of the structure II hydrate stability field is at about 100 m depth below the seafloor at the Western High site, whereas in the Çinarcik Basin, P–T conditions at the seafloor correspond to the uppermost range for structure I hydrate formation from microbial gas. References : [Bourry *et al*, *Chem. Geol.*, doi: 10.1016/j.chemgeo.2009.03.007, 2009] and [Tryon et al, (2010), Pore fluid in the North Anatolian Fault in the Sea of Marmara : a diversity of sources and processes, *Geochem. Geophys. Geosystems*, **10 (11)**, doi : 10.1029/2010GC003].

D1.4 Paper synthetizing Marnaut results. The submerged section of the North Anatolian fault within the Marmara Sea was investigated during the MarNaut cruise, using acoustic techniques and submersible dives. Most gas emissions in the water column were found near the surface expression of known active faults. Gas emissions are unevenly distributed. The linear fault segment crossing the Central High and forming a seismic gap – as it has not ruptured since 1766, based on historical seismicity, exhibits relatively less gas emissions than the adjacent segments. In the eastern Sea of Marmara, active gas emissions are also found above a buried transtensional fault zone, which displayed micro-seismic activity after the 1999 events. Remarkably, this zone of gas emission extends westward all along the southern edge of Cinarcik basin, well beyond the zone where 1999 aftershocks were observed. The long term monitoring of gas seeps could hence be highly valuable for the understanding of the evolution of the fluid-fault coupling processes during the earthquake cycle within the Marmara Sea [*Géli et al, Earth Plan. Sci. Let.,* 274, 34–39, doi:10.1016/j.epsl.2008.06.047, *2008]*.

WP 2: Marine operations. A total of 6 cruises were conducted during the Marmara-Dm Demonstration Mission:

1. Marmara-2009 cruise with R/V Urania (sept 23 – oct 12, 2009), during which the INGV-SN4 station was first deployed, together with 10 OBS and 5 piezometers from Ifremer (D2.3).
2. Marmesonet cruise of R/V Le Suroit, Leg I (from november 4th to november 25th, 2009), mainly dedicated to: i) the high resolution bathymetry at potential sites of interest for future permanent instrumentation using the Autonomous Unmanned Vehicle (AUV) *Asterx* of Ifremer/Insu; ii) e.g. the systematic mapping of the gas emissions sites on the Marmara seafloor (e.g.) Fig. 3.1); iii) the deployment of the Bubble Observatory Module (BOB) in the Çinarçik basin (D2.2a).
3. Marmesonet cruise of R/V Le Suroit, Leg II (from november 28th november to december 14th, 2009), for 3D, High Resolution Seismic imagery (e. g. Fig. 3.3) of the fluid conduits below the observatory site planned at the Western High (D2.2b).
4. Yunuz-2010 cruise with R/V Yunuz for: i)recovering and redeploying SN4, after a 6 months long deployment; ii) recovering Ifremer instruments (10 OBS and 5 piezometers) and 2 Geomar instruments which were previously deployed during the Marmesonet Cruise of R/V Le Suroit (D2.3).
5. The Pirmarmara cruise was conducted from June 2 to June 12, 2010, on board R/V K. Piri Reis from Dokuz Eylül University (DEU, Izmir, Turkey), to record 2D long offset seismic profiles using a 1500 m long streamer (240 traces) in the HR-3D box, in order to provide better velocity constrains and improve the 3D seismic imaging. The recent upgrade of DEU High Resolution seismic equipment, which now include a 1500 meters length streamer (240 traces), will certainly ease to constrain velocities for deep horizons.
6. Marmara-2010 cruise with R/V Urania (sept 29-oct 18, 2010), during which SN4 was finally recovered (e.g. Fig. 3.3 and D2.3), after the second, 6-months deployment.

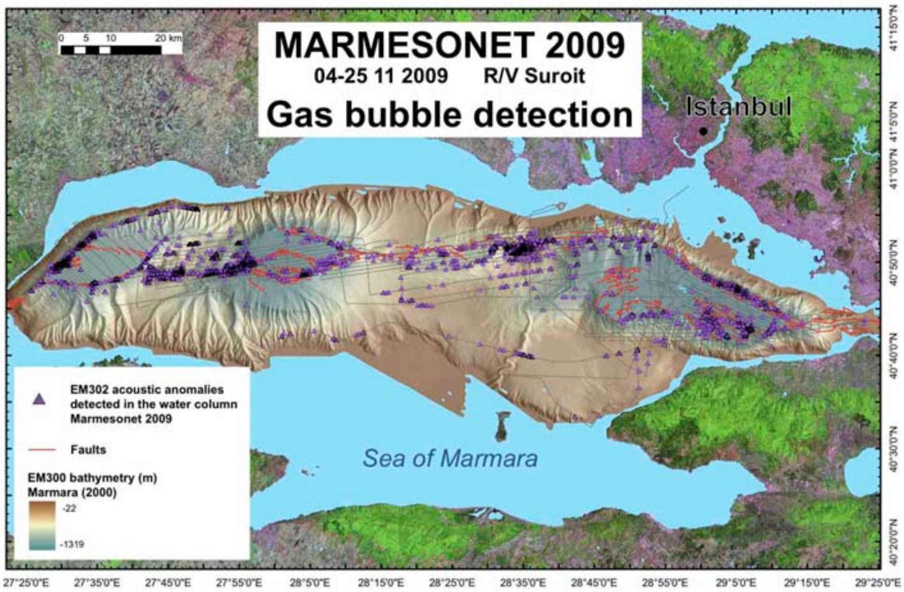


Fig. 3.1 Geographical distribution of acoustically detected gas emissions sites in the Sea of Marmara. Acoustic detection was performed using multibeam echo-sounder of R/V ME Suroit during Marmesonet cruise, Leg I.

WP 3 : Integration of land and seafloor seismological data.

D3.1 Report combining marine and land seismological datasets. The present delivrable was addressed during Jean-Baptiste Tary's *PhD* work (defended on march 15th, 2011). Part of this work is subject to a publication in press: Tary *et al* (2011), Sea-bottom observations from the western escarpment of the Sea of Marmara, *Bull. Seism. Soc. Am*., in press (april 2011). *Available at:* http://wwz.ifremer.fr/drogm/Presentation-GM/Pages-perso/Louis-Geli/Publications. Because the basins of the Sea of Marmara are filled with more than 5 km of Plio-Quaternary soft ("slow") sediments, the velocity structure of the offshore domain is drastically different from the one onshore. **Therefore, merging land and sea-bottom datasets has proven to be very challenging, if not hopeless**. To improve the real-time, absolute locations of hypocenters near the submerged fault zone and enhance the search for seismic tremors [*Bouchon et al.,* 2011], specific networks of permanent, cabled sea-bottom seismometers are required. Each network should be consistent *per se*, and allow the high-resolution characterization of earthquakes below the Sea of Marmara. In addition, it is of critical importance to create an high-resolution, 3D velocity model. This could be achieved by performing velocity analysis using the numerous multi-channel that cover the Sea of Marmara.

D3.2 Report on the ambient noise and recommendation for implementing permanent seabottom stations. This delivrable was addressed during by Jean-Baptiste Tary's *PhD* work (see reference in above paragraph) and by the INGV group who worked on the data recorded with SN-4. The analysis on the ambient noise was focused on the detailed study of non-seismic events recorded with the Ocean Bottom Seismometers. High resolution, seismic data collected with the sediment penetrator (3.5 kHz) during the Marmesonet cruises of R/V Le Suroit (from October 4th to December 14th, 2009 clearly indicate that gas occurrence is ubiquitous in the sub- surface sediments covering the Marmara seafloor. Therefore, we propose that the recorded micro-events are related to natural degassing from the seafloor and to the building and collapsing process of gas chimneys near the subsurface. The Broad-Band OBS data recorded in the Gulf of Izmit with SN-4 indicate that these non-seismic degassing events are correlated to a long duration (~3 hours) phase observed on the vertical component, preceded by long period (~ 30 s) signals recorded on the horizontal component. We propose that this phase is likely related to the progressive build-up of mounds due to gas migration and outbursts from the seafloor. Our study clearly shows that OBSs represent powerful tools to study natural degassing processes from the seafloor.

For permanent, multi-disciplinary seafloor observatories for earthquake monitoring in the Sea of Marmara, we thus recommend specific networks of Broad-Band OBSs (see D2.2) and multi-parameters approaches in order to understand the background noise. For each measured parameter, the background variability must be assessed. Data processing and research on the physics of the phenomena should be intimately related.

D3.3 Three-D, High Res Seismic Images at Western High Site. The second leg of the Marmesonet cruise (november 28th to december 14th, 2009), was dedicated to 3D, High Resolution Seismic imagery of the fluid conduits below the observatory site planned at the Western High, where oil and gas seeps from the Thrace Basin were found at the seafloor, together with gas hydrates. This site is considered to be a priority, as we may there expect gas emissions resulting from pressure increases in the gas reservoirs. To image the connections between the fluid migration conduits and the main fault system, the acquisition system consisted in 2 seismic streamers, 25 meters apart, equipped with 48 traces each, spaced by 6,25 m; the sources consisted of 2 lines of 3 mini-GI (24/24 cu-inch) airguns each, firing alternatively in flip-flop mode every 3 s (6 s spacing for the same line). An area of 3,6 x 10 km2 was covered during 11 days of acquisition. A total of 119 lines were successfully shot, providing data of exceptional quality. Along with HR-3D seismics, chirp and multibeam bathymetry (Simrad EM-302) data were collected

The fluid conduits associated to gas seeps visible at the seafloor were successfully imaged, down to about 500 to 800 ms-twt below seafloor. The present deliverable includes images obtained using pseudo-3D migration (in 2 passes, along and across line, with constant velocity of 1500 m/s) and two reports on advanced processing.

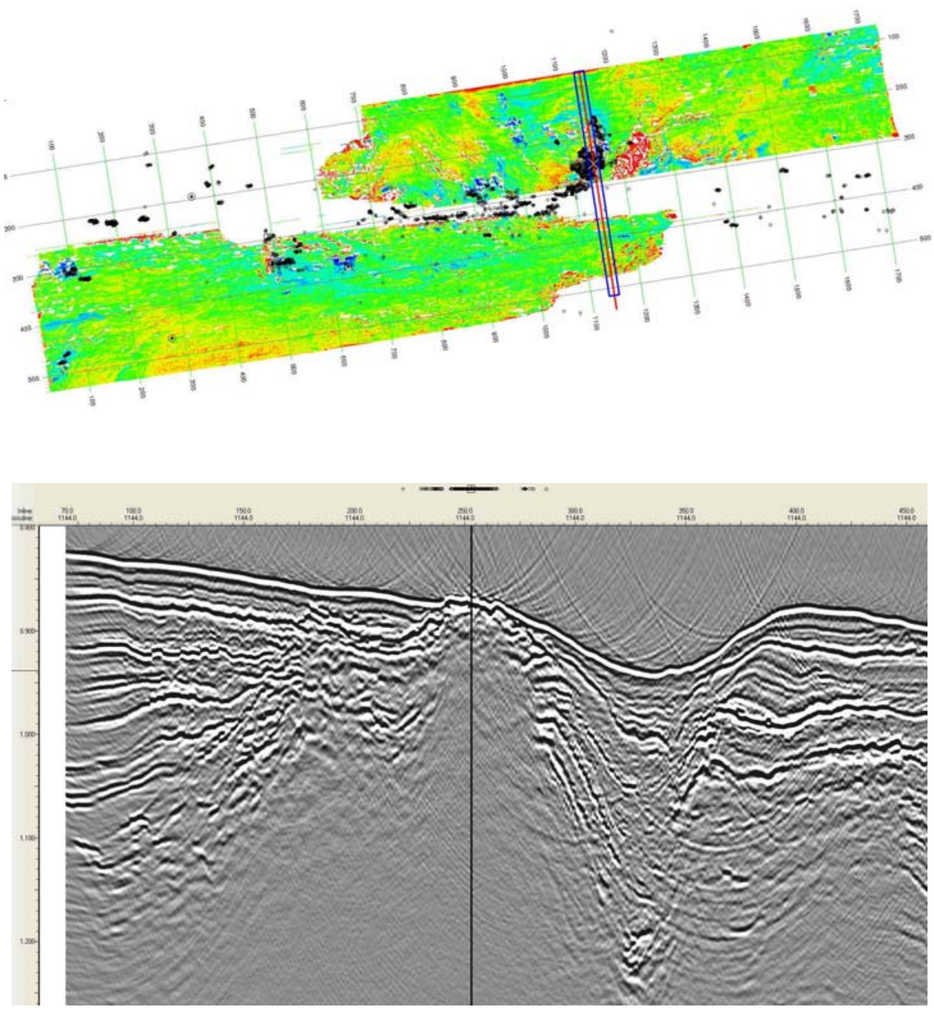


Fig. 3.3: After D3.3 (Thomas et al). Top figure : Map of seismic amplitudes of the H1 reflector (red : maximum ; blue : minimum) in the box covered with High-Res 3D seismics. The covered area is about 3,6 x 10 km2. Bin size within box is 6,25 m. Distance between grid lines is 625 m. Bottom figure : Cross line, across the mud volcano where gas and oil seeps were found, together with outcropping gas hydrates.

WP 4 : Data integration and modeling.

D4.1 Report on integration of all available data in a data repository system. All data collected during the Marmara-DM project were deposited on ITU-EMCOL Network Attached Storage (NAS). NAS is a solution for safe and platform independent file storage over Internet. According to Wikipedia, "NAS is a file-level computer data storage connected to a computer network providing data access to heterogeneous network clients". The characteristics of ITU-EMCOL NAS and the connexion procedures (in terms of both SSH and FTP protocols) are given in Deliverable 4.1. Each MARMARA-DM member has been notified about his or her username or password. Further instructions about data repository can also be found in the Marmara_DM web page (http://www.esonet.marmara-dm.itu.edu.tr/) EMCOL-NAS section.

D4.2 GIS including all available data collected during the Marmara-DM project. The GIS data is presently stored both in IFREMER and ITU's servers. ITU Eastern Mediterranean Centre for Oceanography and Limnology (EMCOL) has dedicated a Network Attached System (NAS) to share all available and classified data between partners of the project (D4.1). The copy of GIS files will be stored in this restricted system and be available among only allowed users via ftp (ftp://160.75.30.57) and ssh (ssh server 160.75.30.57). Usernames and their passwords have been already sent to the project partners. Other users should apply to the project coordinator Dr. Louis Geli (Louis.Geli@ifremer.fr) or Umut B. Ülgen (ulgenum@itu.edu.tr) to get their login details.

D4.3 Report to test working hypothesis and validate concept of seafloor observatories. Marmara-DM was driven by the 3 following hypothesis: H1): *Physical and chemical properties of the fluids and deformation within the fault zone change systematically with time throughout an earthquake cycle, and some of these changes, or their consequences, can be recorded at the seafloor; H2) Strain rate variations induce pore pressure variations in subsurface sediments; H3) Fluids from the seismogenic depth reach (locally and episodically) the sediment surface.* The objective of D4.3 was to assess the results of the Marmara-DM with respect to this hypothesis testing approach, and conclude on future observatory planning.

Hypothesis H1 does little more than stating that seafloor observatories can record signals linked to seismogenic zone processes. Marmara-DM demonstrated the possibility to monitor variations of fluid fluxes and composition, and defined sites where coupling with strain in the NAF seismogenic zone is hypothesized. As formulated, (H1) refers primarily to variations over the time scale of the earthquake cycle. However, this time scale may be considered long even for an observatory project, and it is also unclear whether progressive changes –resulting for example from interseismic loading and fault healing at depth– can be recorded at the seafloor and resolved among the shorter term variations that could result from a variety of processes occurring near the seafloor, or from transient events affecting the crust. Setting aside the fluid component, results obtained from a re-analysis of foreshock data from the Izmit 1999 earthquake [*Bouchon et al., 2011*] lead to consider that seismometers set close to an active fault could be used to detect the nucleation of large earthquakes. Hence, the objectives of setting an offshore observatory in the SoM should be extended to include the improvement of the predictability of earthquakes in the Istanbul area.

D4.4 Report on best site selection. The detection of transient crustal events now appears as a scientific objective *per se.* The identification of seismic tremors and low frequency earthquakes –and of their relation with episodic "silent" slip– has been progressing very rapidly, first at subduction zones [e.g. *Shelly et al., 2006*], and now at strike-slip faults [*Nadeau and Dolenc, 2009; Bouchon et al., 2011*]. These progresses lead to consider the identification of slipping zones on the edges of seismic gaps or at the upper/lower limits of the seismogenic zone, as the next objectives to be achieved in the SoM. Work performed on Marmara-DM data met difficulties in the precise determination of the depth of offshore earthquakes and in the identification of tremors from noise analysis in the marine environment. Emphasis could now be given to focused, small-scale networks and to the identification of repeating earthquakes. Best targets for this approach are microseismically active zones that also appear as hypothetical nucleation sites for a rupture on the Istanbul-Silivri segment:

1. The Istanbul-Silivri segment: although there is little microseismic activity, the eastern end of the seismic gap (toward Cinarcik Basin) should, however, be monitored. Furthermore, South of Istanbul,

intense bubbling is observed on a structural high, 1 km south of the main fault trace, while no evidence of fluid expulsion is found on the fault itself. Here, it would be of critical importance to monitor micro-seismic activity and strain with a view to determine if the fault segment is locked or creeping.

2. Western High and Central Basin. The westward termination of the Ganos 1912 earthquake rupture is still debated [*Ambraseis, 2002; Armijo et al., 2005*] and the whole segment extending from the Tekirdag basin to the Central Basin appears microseismically active, but repeating earthquakes were recognized in the Central Basin area. Ideally, a monitoring network should span the Central Basin and the gas hydrates area on the western high. The gas hydrate site is remarkable as the only site next to the main fault where a relatively deep source is recognized for both interstitial water and hydrocarbons.
3. Entrance of Izmit Gulf. This site is near the western end of the rupture associated with the 1999 Izmit earthquake. The fault trace is well defined at the seafloor, and the fault slipped at depths in 1999 but little evidence for seafloor rupture was found at this site, leading to hypothesize it may slip again and rupture the seafloor during future earthquake occurrences [*Gasperini et al., 2011*]. It is thus one area where the next earthquake affecting the fault strand towards Istanbul may nucleate. It is also a relatively accessible area, at shallow depth (200 m) and less than 5 km from the coastline. An extension toward the Cinarcik basin where active microseismicity was triggered after Izmit 1999 earthquake [e.g. *Karabulut et al., 2002*] and fluid emission are observed may also be considered.

WP 5: Comparative study and project feasibility.

D5.1 Recommendation Report on the preferred option. Based on the conclusions of the Marmara-DM project, two different designs are recommended for the future, cabled multi-disciplinary seafloor observatories. At sites 1 and 2 (Istanbul-Silivri fault segment and Western High), the shore station will be cabled to one node, itself connected to four junctions boxes : one on each side of the fault (JBN and JBS), one to the east (JBE) and one to the west (JBW). Junction boxes should allow the connexion of up to 12 instrument packages each (Table 1). Clusters of seismometers connected at each junction box will allow the ultra-precise characterization of earthquakes near the fault zone, using array-based methods for hypocenter determination. At the entrance of the Gulf of Izmit (site 3), deploying a node is not necessary, due to the short distance to the shore station (< 2 km). We propose to deploy one single junction box, with, at least, one OBS, 3 distance meters, one BOB, one methane sensor, one piezometer and one CTD.

D5.2 Cost estimation report. Elements for cost estimations are given as examples in the tables here below. Note that this table only includes 5 junction boxes : two (JBN and JBS) at sites 1 and 2 respectively and one at site 3. The cost of adding 2 junction boxes and instrument packages (JBE and JBS) at sites 1 and 2 can be easily determined.

Description	Engineering	Estimated price per equipment	Qty of equipments	Estimated total
Data management center & web (equipment + software)	350K€	150K€	3	800K€
Construction of shore station	30K€	40K€	3	150K€
Shore station equipment	50K€	50K€	3	200K€
Cable	100K€	20€/m	2*25Km + 5	1200K€
Cable deployment	100	(2x)1000 k€ +(1x) 500 k€	3	3500
Node	200K€	350K€	3	1250K€
Node deployment	250K€			250K€
Junction box	200K€	300K€	5	1700K€
Junction box deployment	300K€			300K€
Instrumentation	800K€	500K€	5	3300K€
Instrumentation deployment	3 days per site	60K€ / day	15 days	900K€
				13050K€

Table 3.2 Cost of investments for multi-parameter observatories including 2 junction boxes only at deep sites (Western high and Istabul-Siliviri) and one junction box at shallow site (entrance of Izmit Gulf). Each JB is connected to the instrument package listed in Table 3.1.

Description	Per year	Estimated total
Training	20K€	20K€
On site operation maintenance	4 days per site / year (4 sites)	960K€
Equipment maintenance	15% of equipment cost (instruments + cable + shore) station	750K€
Personnel cost (3 engineers, 3 technicians)	(3 techs+ 3 engineers)*12 months*1,5K€	108K€
		1838K€

Table 3.3 Indicative annual maintenance and training costs for the equipment and investment listed in Tables 3.1 and 3.2.

D5.3 Implementation plan. The conclusions of the Marmara-DM project were used to build a full implementation plan, submitted to two funding agencies as 2 different proposals, respectively MARQUAKE and MARDEP:

- the MARQUAKE Proposal was submitted on november, 16th, 2010, to the FP7 Cooperation Work Programme 2011for Environment, Sub-Activity 6.1.3 « Natural Hazards », Area 6.1.3.1 « Hazard assessment, triggering factors and forecasting », Topic ENV.2011.1.3.1-1 « Towards real-time earthquake risk reduction ». Partners re : Ifremer (coodinator), ITU, AFAD, Ismar-CNR, CNRS and DEU. This proposal (see appendix in deliverable D5.3) received a mark of 10 out of

15, the negociation phase is still pending.

- The MARDEP Proposal will be submitted in june 2011 to the Disaster and Emergency Management Presidency (AFAD) of the Republic of Turkey (see Deliverable 6.1).

WP 6: Public and education outreach, coordination at national (Turkish) level and fund raising.

D6.1 Support agreement contract with Turkish authorities. The major effort to fulfill this deliverable was the preparation of a project proposal "*MARDEP project: Marmara Seafloor Observatory Infrastructure for Earthquake and Environmental Research and Modeling*" by June 2010 to obtain funding for the establishment of the permanent seafloor observatories in the Sea of Marmara. The proposal was prepared by consensus among the main Turkish Marine institutions after two important meetings in İstanbul. However, the submittal of the proposal was delayed the next call in 2011, which appeared to be the most opportune period because of the political reasons. We will submit the *MARDEP Project* proposal for funding to the Prime Ministry of Turkey State Planning Department's (DPT) next call that will be either April or June 2011. The proposal will then be evaluated, and the final decision will be made by the DPT sometime during June to September 2011, depending on the time of the call. This deliverable will be fully realized if and when the Mardep proposal is funded. The chances of funding have increased by the support letters provided by Turkish and European institutions and public organizations.

During the 30 months of the Marmara-DM project several activities were carried out for fund rising within WP6. First we increased the visibility of the ESONET and EMSO projects' activities in the Sea of Marmara by special presentations in scientific meetings and by organizing an ESONET training course and a symposium in August 2009. Second, we held meetings of Turkish institutions of marine and geohazard studies to reach a consensus for the preparation of *MARDEP*. *MARDEP* is designed as a national project with participation of all concerned marine institutions, as well as the Turkish Geological Survey (MTA), Undersecretariat for Maritime Affairs, Department of Hydrography Navigation Oceanography (SHOD), Istanbul Metropolitan Municipality (IBB), and Coast Guards General Command in the meetings. The Istanbul Metropolitan Municipality will be a user of the MARDEP project (see Annex 2). MTA (Mineral Research and Exploration General Directorate: Turkish Geological Survey) also strongly supports the project (Annex 3). If funded, we plan the completion of the infrastructure by 2014, and thereafter start its operation as regional department of the EMSO science infrastructure. In Turkey there are 11 stakeholders in the MARDEP proposal including the MTA (Turkish Geological Survey), Istanbul Municipality, and all Marine Sciences Institutes. The European partners include: IFREMER, CNRS, INGV and ISMAR, (French EMSO and Italian EMSO) all providing support letters (Annexes 4 and 5). Furthermore the ESONET and EMSO partners of the Marmara node applied to a recent EC FP 7 call: ENV.2011.1.3.1-1: Towards real-time earthquake risk reduction with a proposal: "MARQUAKE: Earthquake Predictability in the Sea of Marmara areas" in November, 2010.

D6.2 Web Site. **www.esonet.marmara-dm.itu.edu.tr** **Note** : A window in turkish may open, asking for a certificate (İTÜ Güvenlik Sertifikası). In which case, just click on the cross in the upper-right corner to close the window.

D6.3 Training course. The Marmara-DSM Training Course was given in Istanbul, on august 18-19, 1999, on "Seafloor Observation Techniques for Marine Geohazard Monitoring".

3.2 Work done by each partner

The project was a full success mainly because all partners contributed far beyond their initial commitment. Each partner conducted the task he was initially assigned and provided valuable input to improve the observatory design and implementation strategy for multi-parameter, cabled observatories in the Sea of Marmara. The main contribution of each partner is listed hereafter.

3.2.1 Partner 1 : IFREMER.

Project coordination. This task consisted in reporting (on a 6-months basis), organizing project meetings, interfacing with the ESONET administration, scientific animation, etc.

Marmesonet cruises (D2.2a and D2.2b). Ifremer organized and conducted the two Marmesonet Cruises with R/V Le Suroit :

- Leg I (november 4th to november 25th, 2009) was mainly dedicated to: i) the high resolution bathymetry at potential sites of interest for future permanent instrumentation using the Autonomous Unmanned Vehicle (AUV) *Asterx* of Ifremer/Insu; ii) the systematic mapping of the gas emissions sites on the Marmara seafloor; iii) the deployment of the Bubble Observatory Module (BOB) in the Çinarçik basin.
- Leg II (november 28th to december 14th, 2009), for 3D, High Resolution Seismic imagery of the fluid conduits below the observatory site planned at the Western High.

Observatory design, comparative study and project feasibility (WP5). Considerable work was conducted under this work package, namely: i) to design the future multi-parameter observatories; ii) to estimate costs; ii) and to prepare implementation plans. This work was used to build a full implementation plan (D5.3 and D6.1), submitted to two funding agencies as 2 different proposals, respectively MARQUAKE and MARDEP (see D5.3 and D6.1).

Project GIS (D4.2). Ifremer coordinated the work to finalize the Project Geographical System which now includes all meta-data and part of the data collected during the Marmara-DM Project. The full dataset is available on the project data repository system, hosted by the ITU's server (D4.1).

Contribution on OBS data. Ifremer contributed to D1.1 (Report on piezometer and OBS results from MarNaut cruise, D3.1 (Report combining marine and land seismological datasets) and D3.2 (Report on the ambient noise and recommendation for implementing permanent seabottom stations), mainly through the *PhD* Thesis of Jean-Baptiste Tary.

Participation to observatory concept validation (D4.3). Ifremer contributed to almost all workpackages, particularly for validating the concept of permanent, cabled, multi-parameter observatories for earthquake predictability in the Sea of Marmara.

3.2.2 Partner 2 : ITU.

Coordinating Marine Operations (WP2; D2.1 and D2.2). ITU organized, coordinated and actively participated in the all the cruises, and contributed to the cruise reports Namik Çagatay of ITU acted as the Turkish coordinator, which implied considerable work on practical details, particularly for logistics, administration, customs and autorizations, etc. ITU therefore contributed to deliverables D2.1-D2.2.: Cruises and cruise reports.

Integration of all available data and development of data repository system (D4.1). ITU (Umut Ülgen and Cengiz Zabci) contributed to integration of all Marmara-DM project data, and developed the project data repository system. It consists of a server system called 'EMCOL-NAS' (Network Attached System) presently hosted by ITU. It can be reached by an ftp connection for uploading and and receiving data by the partners.

Contribution to the GIS Project (D4.2). Cengiz Zabci participated in the finalization of the GIS system, which includes all data collected during the Marmara-DM project. Earlier, Devrim Tezcan developed a GIS system and incorporated some cruise data into the system.

Report on best site selection (D4.4). This task has been completed as a result of site surveys carried out during several Marmara-DM cruises in the Sea of Marmara. Three main sites have been selected for observatories. The specifics of these sites have been reported in the MARDEP proposal prepared by ITU with help from IFREMER, CEREGE, ISMAR, DEU-IMST, INGV.

Comparative feasibility studies (WP5; D5.1, D5.2, 5.3). ITU contributed deliverables related to the comparative feasibility studies of establishing permanent multidisciplinary seafloor observatories in the Sea of Marmara. These involve recommendation for a cabled observatory option with node and junction box technology (D5.1), cost estimation (D.5.2) and an implementation plan (D.5.3). All these deliverables were incorporated into the MARDEP project proposal prepared under the leadership of ITU (see below).

Support agreement contract with Turkish authorities (D6.1). ITU built up a Turkish consortium and prepared a project proposal entitled "MARDEP": Marmara Seafloor Observatory Infrastructure for Earthquake and Environmental Research and Modeling, to obtain funding from Turkish Governement for the establishment of permanent seafloor observatories in the Sea of Marmara. The 'MARDEP' project proposal will be presented to the Prime Ministry of Turkey State Planning Department (DPT) in June 2011, for funding.

Public outreach - Project website (D6.2): Umut Ülgen and Cengiz Zabci of ITU created the Marmara-DM Project website (http://www.esonet.marmara-dm.itu.edu.tr/).

Public outreach - Training course (D6.3) : ITU organized and hosted a short course on "*Seafloor Observation Techniques for Marine Geohazard Monitoring"* during 17-19 August 2009. About 40 engineers and scientists participated in the short course from Turkey and Europe. ITU also organized a one-day symposium on "*An overview of the research in the Sea of Marmara region over the last 10 years*" on the 10th Anniversary of 17 August 1999 İzmit Earthquake. The workshop and symposium were important public outreach events, as well having scientific importance.

3.2.3 Partner 3 : ISMAR

Organizing and conducting URANIA Cruises, 2009 and 2010 (WP2). ISMAR spent considerable efforts in two cruises of R/V Urania and one cruise of R/V Yunuz which were critical for the Marmara demo mission :

- during the Marmara-2009 cruise (September 22 to October 12th, 2009), SN4 was deployed at the entrance of the Gulf of Izmit, together with 10 OBSs and 5 piezometers of Ifremer covering the whole Sea of Marmara. In addition, new geophysical and geological data were collected from the eastern part of the Sea of Marmara.
- During the R/V Yunuz cruise in march 2010, all instruments were recovered, and SN-4 was redeployed
- during the Marmara-2010 cruise (September 25th to October 15th, 2010), SN-4 was eventually recovered and new geophysical and sedimentological data were collected.

For each cruise, the work conducted by ISMAR included : 1) Compilation and submission to the Italian CNR commission (Gruppo coordinamento infrastrutture) of the proposal for the MARMARA 2009 and 2010 expeditions; 2) Practical preparation (e.g. problems with logistics, customs clearance, etc); 3) processing and re-analysis of the existing geophysical data (multibeam, chirp sonar, etc..) in the area of SN-4 deployment (Izmit bay and Cinarcik basin).

Integration of the geological data at site 3 (entrance of Izmit Gulf).

3.2.4 Partner 4 : INGV

Preparation, deployment and recovery of SN-4. INGV completed the upgrade of SN4 observatory adding new sensors to the basic SN-4 configuration. This upgrade was made in order to perform a multiparametric monitoring requested by the project objectives (gas seepage and seismicity). SN-4 was then deployed, as scheduled, in the Marmara Sea site selected for the long-term monitoring.

The first deployment operations were successfully performed on October 4th, 2009, in collaboration with ISMAR, who coordinated the operations of R/V Urania. Although selected prior of the cruise, the SN4-observatory site has been surveyed before deployment with geophysical imaging techniques and direct observations with a deep towed system, MEDUSA, that provided oceanographic data (CTD), methane content in the water column and visual inspection through a high-resolution video camera. MEDUSA exploration surveys were performed in different sites in order to detect methane anomalies and have direct observations of the seabed where SN-4 was planned to be deployed.

Recovery and redeployment of SN-4 (D2.2). INGV successfully recovered, re-conditionned and immediately redeployed SN-4 with R/V Yunuz in march 2010. SN-4 was eventually recovered in October 2010 with Urania, shortly after the official end of the Marmara-DM project, in order to collect a full year of data (Note : the R/V Yunuz, used for the second SN-4 deployment, had not dynamic positioning system and the capability to keep the position during the operations, so it was not possible to deploy SN-4 in the same site of the previous period, which was in a protected area inside a canyon. SN-4 station was therefore deployed in a narrow rectilinear valley that dissect the Darica basin and mark the North Anatolian Fault trace).

Data reduction and processing and preliminary interpretation of SN-4 (D2.3). Regarding the first mission, SN-4 station successfully recorded data from all sensors except current meter (10.5 Gbyte of data from methane and oxygen sensors, CTD, transmissometer and broad-band seismometer). The interpretation work of these data is presently under progress at INGV, mobilizing a group of 5 persons. During the first SN-4 monitoring mission, there were no significant earthquakes (M>3.4) within 100 km. SN-4 however revealed local microseismicity not recorded by land stations (Turkish network). Preliminary analysis shows an apparent correlation between non-seismic signals recorded on the Broad-Band seismometer and variations in bottom water temperature drop, methane concentration and turbidity. All data converge towards an hypothesis of episodic degassing from sediments in the SN-4 near field. Waiting for detailed and complete data elaboration and interpretation, we can anticipate that the SN-4 mission in Marmara Sea represented the longest monitoring of temperature + gas + seismicity at seabed, ever done. The success of the Marmara-DM project is thus now far beyond the initial expectations.

3.2.5 Partner 5 : CNRS

Coordination of WP1 (Marnaut data integration). Pierre Henry (CNRS) coordinated the Marnaut cruise which was conducted in 2007 with R/V L'Atalante and manned submersible Nautile. The data and samples acquired during Marnaut cruise were included in the Marmara-DM data set. These included processing of echo-sounder data, analysis of interstitial water and gas composition and deployments of flow meters, piezometers and of a mini OBS network. Analysis of these data was in great part funded by Marmara-DM as WP1 and conducted under the scientific supervision of Pierre Henry. 4 articles included in delivrables D1.1, D1.3 and D1.4 were published and one article, included in delivrable D1.2, is submitted.

GIS including all available data (D4.2). Data available to the CEREGE group were included in a GIS by Tiphaine Zitter. These included data from Marnaut (L'Atalante and Nautile), MarmaraVT (Marion-Dusfresne), Marmara 1 (Le Suroît), and part of the data from Marmarascarps (L'Atalante and ROV Victor) cruise. After Marmesonet cruise, the GIS was transferred to Ifremer for standardization and integration of Mamesonet data (AUV and Shipboard multibeam, sediment sounder).

Testing working hypotheses and validating concept of observatory (D4.3). Marmara-DM was driven by the following hypothesis: H1) *Physical and chemical properties of the fluids and deformation within the fault zone change systematically with time throughout an earthquake cycle, and some of these changes, or their consequences, can be recorded at the seafloor; H2) Strain rate variations induce pore pressure variations in* *subsurface sediments; H3) Fluids from the seismogenic depth reach (locally and episodically) the sediment surface.* Pierre Henry (CNRS) supervised the work to assess the results of the Marmara-DM with respect to this hypothesis testing approach, and to conclude on future observatory planning.

3.2.6 Partner 6 : DEU

Pirmarmara Cruise of Piri Reis (WP2, D2.1). The main contribution of DEU consisted in organizing and conducting the Pirmara Cruise of R/V Piri Reis, from June 4th to June 14th, 2011, to collect additional high resolution seismic data at the implementation sites of the future multidisciplinary seafloor observatories. Günay Çifçi was the coordinator of the PirMarmara Cruise, Bruno Marsset and Yannick Thomas from Ifremer and Dr. Seda Okay and also 12 researchers participated to the cruise. High Resolution (HR) seismic profiles were collected over the 3D box covered during the Marmesonet Cruise (Leg II) with a 1500-m long streamer having 240 traces, recently acquired by DEU, to provide velocity constrains and hence to improve 3D seismic imaging.

The second leg of the PirMarmara cruise aimed to complete the former 2D HR acquisition close to Istanbul, mainly in the Çınarcık basin. The Central High, Central Basin and Çınarcık Basin (area 4) where the Tamam data set recorded in 2008 on board R/V Piri Reis was completed. The southern shelf of the Marmara Sea (areas 1 and 3), with the investigation of the Messinian unconformity.

Processing of TAMAM data (WP2, D2.1 and D2.2b). The TAMAM cruise was carried out in june 2008 with R/V Piri Reis, in collaboration between DEU and Lamont Doherty Earth Observatory (LDEO). Although the TAMAM cruise is not part of MARMARA-DM, DEU spent considerable efforts in seismic data processing. This work helped the interpretation of the TAMAM lines, which, indirectly, helped the planning of the MARMARA-DM operations, most particularly the planning of the Marmesonet HR-3D seismic survey conducted with Le Suroit in december 2009 on the Western High (gas hydrates sites).

Interpretation of HR-3D seismic survey at site 3 (D3.3). Hakan Saritas (DEU) spent 10 months at Ifremer research center in Brest, from August 2010 to June 2011 to work on the interpretation of the HR-3D seismic seismic data, using Kingdom Suite for the seafloor imagery maps and drawing of first inperpretation of superficial horizons of 3D-cube in time domain and simultaneously comparison with chirp data of MarmEsonet data. This work also constitutes his Phd thesis and includes processing of long offset HR 2D seismic data provide by DEU new streamer and 3D time migration using the updated velocity model.

Burcu Barin and Orhan Atgin visited IFREMER during 17 October-17 November 2010 and worked with Bruno Marset and Yannick Thomas on PirMarmara data. The main objective of the visits was, the fundamentals of 3D high resolution Marine Seismic Acquisition, Quality Control and 3D High Resolution Seismic Data Pre-Processing and Quality Control. During the visits, the QC sequence for 2D HR DEU seismic equipment was adopted which derives from the one developed by using Matlab for its DEU seismic equipment. Also they have started to study on the data for their MSc Thesis in Sea of Marmara using PirMarmara data.

Gunay Cifci, Seda Okay, Burcu Barin, Orhan Atgin, have visited IFREMER Brest between last week of February and beginning of March for the 4th call Exchange of personel. The aim of the visit is, to work on the Marmara-DM project to evaluate the first results of MarmEsonet and PirMarmara data combining both data sets.

3.3 Input to and from ESONET Work Packages

The Marmara-DM demonstration mission greatly benefited from the input of ESONET WP1, WP3 and WP5. For WP1 (Programme for Exchange and Training of personnel, within ESONET Work Package 1) the exchanges performed during Marmara-DM are listed in the table hereafter:

Institutions concerned FROM	Institutions concerned FROM	Name of scientist	Date	Objective and Marmara-DM Work Package
ITU	Ifremer	Cengiz Cabzi	Jan-feb 2011	Completion of Project GIS (WP6)
ITU	Ifremer	Namik Cagatay Umut B. Ülgen Dursun Acar	Jan-Feb 2010	- Work on seafloor observatory design (WP5) - Work on GIS, Project database and project web page (WP4). - Training on sediment coring and preparation of cores for analyses (WP1).
ITU	CNRS-CEREGE	Namik Cagatay	September 2009	Work on core samples and integration of all data (WP4)
		Umut B. Ülgen Dursun Acar	December 2010	Work on core samples and integration of all data (WP4)
		Devrim Tezcan	January 2011	Work on GIS database for the Sea of Marmara and transfer the available data obtained during various cruises (WP6)
		Caner Imren	January 2011	Work on seismic data and data integration (WP4)
ITU	ISMAR	Namik Cagatay Umut B. Ülgen Dursun Acar	May 2010	- Discussion on URANIA 2010 cruise plan - Review of the results of SN-4 station and its recovery and possible redeployment in October 2010 - Work on 2 papers : 1) Sedimentary; 2) slip rate along NAF
		Namik Cagatay Emre Dabci Gülsen Uçarkus	Feb 2011	Work on core samples from Marmara 2010 cruise and integration of all data (WP4)
ITU	INGV	Umut B. Ülgen Dursun Acar	May 2010	Land and marine seismological data integration from the Sea of Marmara region (WP3)
		Namik Cagatay Emre Dabci Gülsen Uçarkus	Feb 2011	- discussed the *MARDEP* project proposal - work on SN-4 data obtained during one year of deployment, with INGV scientists - compare the earthquake and tsunami record results of core studies in the Sea of Marmara and Ionian Sea - work on database management system to be built up for Marmara Sea Observatory.

Institutions concerned FROM	Institutions concerned FROM	Name of scientist	Date	Objective and Marmara-DM Work Package
ISMAR	ITU	Luca Gasperini Giovanni Bortoluzzi Alina Polonia Giuliana Panieri	March-April/Nov 2010	Work on core samples and integration of all data (WP4) Collect data from the SN4 station, and share data and results with the Turkish team (WP1)
CNRS-CEREGE	ITU	Pierre Henry Céline Grall	September 2010	Work on core samples and integration of all data (WP4)
Ifremer	DEU	Bruno Marsset Yannick Thomas Louis Géli	June 2009	Preparation of Pirmara Cruise (WP2)
Ifremer	KOERI	Jean-Baptiste Tary	August 2009	Merging KOERI land and marine stations (WP3)
DEU	Ifremer	Günay Cifci	Jan. 2010	Preparing PIRMARMARA cruise (WP2) and Work on TAMAM seismic data (WP4)
KOERI	Ifremer	Mustafa Comoglu	April 2009	Merging KOERI land and marine stations (WP3)
Ifremer	ITU	Louis Géli	October 2010	Completion of project deliverables – Preparation of MARDEP Proposal (WP6)
Ifremer	ITU	Yves Auffret	August 2009	Observatory Design (WP5)
HCMR	Ifremer	Christos Tsabaris	January 2011	Work on Underwater Radon Measurements
DEU	Ifremer	Günay Cifci Seda Okay Orhan Atgın Burcu Barin	February-March 2011	MarmEsonet Days meetings and to discuss the future publications on the data from PirMarmara cruise

4. Data Management

4.1 MARMARA-DM Data Management

The main objective of the Marmara-DM Demo Mission was to conduct site surveys and preliminary studies to test the feasibility of multi-parameters seafloor observatories for monitoring earthquake hazards in the Sea of Marmara. Only a few continuous, short-term (< 6 months) time series were collected using MARMARA-DM using autonomous instruments:

- SN-4 recorded 12 months of data, including: oxygen, methane, 3 component broad-band seismometers (D2.3)
- 4 short-period (4.5 Hz) OBSs and one piezometer recorded data continuously during 3 months (may-september 2007).

All data collected during the Marmara-DM project were deposited on ITU-EMCOL Network Attached Storage (NAS). NAS is a solution for safe and platform independent file storage over Internet. According to Wikipedia, "NAS is a file-level computer data storage connected to a computer network providing data access to heterogeneous network clients".

ITU-EMCOL NAS allows SSH and FTP protocols for sake of security and can be accessed from any kind of OS (Windows, Linux, Unix, Mac OS X). Each MARMARA-DM member has been notified about his or her username or password. The procedure to connect to ITU-EMCOL NAS is described hereafter in terms of both SSH and FTP protocols. Username and password may be provided on request to the project coordinator Dr. Louis Geli (Louis.Geli@ifremer.fr).

4.2 Design of the future observatory Data Center / Data management and archiving system

To prepare the MARDEP Proposal, a preliminary, undisclosed study was made by Ocean Works Canada (www.oceanworks.com) to determine the main characteristics and costs of the data management and archiving system, based on the experience acquired for the Neptune Project (www.neptunecanada.ca). These characteristics are described in Deliverables D5.1, D5.2 and D5.3.

The Observatory Data Center (ODC) consists of the hardware and software elements required to sustain long term observatory operations and user interaction with the data. The ODC computer hardware includes a system server to host the Data Management and Archiving System (DMAS) software, database, and web applications. The DMAS is a scalable operational software system, which consists of two main components:

1) The Data Acquisition Framework (DAF) takes care of the interaction with instruments in terms of control, monitoring as well as data acquisition and storage. The framework also contains operation control tools. Those functions are typically run at the shore station. The other key element of the DAF is its archival function. The archival function gathers all the data produced by the various instruments and stores them either in the database for selected scalar values or in a structured file system for all other data.
2) The user interaction features (UIFs) include data search and retrieval, data distribution. Current developments in the Web 2.0 area will provide a complete research environment where users will have the ability to work and interact on-line with colleagues, process and visualize data, establish observation schedules and pre-program autonomous, event detection and reaction.

DMAS provides services that perform both user functions (such as data retrieval, data visualization, metadata discovery) and observatory operation support functions such as: observatory maintenance and management (monitor and control of junction boxes and instruments from a power point of view and monitor and control of instruments from a data flow point of view); science users interfacing; service segmentation (if special categories of instruments need to be isolated from one another for security reasons); system security (to prevent accidental damage to the infrastructure and limit malevolent activities); etc.

User access control and monitoring for such large infrastructure is an important requirement. Control will help prevent accidental damage to the infrastructure and limit malevolent activities. Monitoring/auditing will allow the managers of the system and their stakeholders to see how much the system is being used and how. The cost of the infrastructure and its public nature, the need to provide as much as possible an uninterrupted service (in e.g., a response to a service level agreement) impose the set up of a controlled access policy and of its enforcement. Control will take the form of the determination of who is allowed to do what on the system through the definition of roles. Monitoring of the activities will serve purposes of understanding changes that have occurred in the system configuration and their impact but also will help demonstrate to funding agencies and sponsors how much the facility is being used and for what purposes. Monitoring will therefore require auditing changes to the infrastructure configuration and activity recording. A typical implementation of the control and monitoring can be done through the definition of accounts, groups of users as well as privileges that can be granted or revoked.

5. Project Management

Note : The approximate costs are not given here, because the final, exact costs will be stated in the partners management report.

Expected Men-Month

	Researcher		Engineer		Technician		Post-Doc		Ph. D.		SUM	
	TC	EC	TC	EC	TC	EC	TC	EC	TC	EC	TC	EC
ITU	39	0	18	12	20		16		36	24	87	36
DEU	24		18		18		36	0	72	0	168	0
Ifremer	16	0	12	6	12	6	18	0	72	0	130	12
CNRS	33				0		26	18			59	18
INGV	33		3		15		24				75	0
ISMAR	16	0	0	0	10	0	22	22	0	0	48	22
TOTAL	161	0	51	18	75	6	142	40	180	24	567	88

Man-Month DISTRIBUTION BY WP, 1st Reporting period (April 1st, 2008 - Sept 30th, 2008)

	WP1		WP2		WP3		WP4		WP5		WP6		TOTAL	
	1st P.	Total	1st P.	Total	1st P.	Total	1st P.	Total	1st P.	Total	1st P.	Total	Total 1st	Total Expected
ITU	1,5	12	0,5	15	1,5	8	0	10	0	10	3,5	36	7	91
DEU	0	0	9	60	0	72	0	14	0	10	9	12	18	168
Ifremer	14,5	36	12	42	2	16	0	14	0	8	1	12	29,5	128
CNRS	5	30		7	0,5	10	0	8	0	0	1,5	3	7	58
INGV	0	4	12	30	0	15	0	12	0	7	1	7	13	75
ISMAR	2	8	0,5	12	0	12	0	10	0	1	0,5	4	3	47
Total	23	90	34	166	4	133	0	68	0	36	16,5	74	77,5	567
													77,5	

Man-Month DISTRIBUTION BY WP, 2nd reporting period (Oct 1st , 2008 - May 30th, 2009)

	WP1		WP2		WP3		WP4		WP5		WP6		TOTAL		
	2nd P.	Total	2nd P.	Total	2nd P.s	Total	2nd P.	Total	2nd P.	Total	2nd P.	Total	Total 2nd	Total 1st+2nd	Total Expected
ITU	0	12	1,5	15	1,5	8	14	10	0	10	8	36	25	32	91
DEU	0	0	4	60	0	72	10,5	14	0	10	0,5	12	15	33	168
Ifremer	2	36	9,3	42	2	16	1	14	0	8	2	12	16,3	45,8	128
CNRS	4	30	1,5	7	0	10	7	8	0	0	0,5	3	13	20	58
INGV	0,5	4	6	30	0	15	0	12	0	7	0	7	6,5	19,5	75
ISMAR	0	8	2	12	0	12	2	10	0	1	0	4	4	7	47
Total	6,5	90	24,3	166	3,5	133	34,5	68	0	36	11	74	79,8	157,3	567
													79,8		

Man-Month DISTRIBUTION BY WP, 3dd reporting period (June 1st, 2009 - January 31st, 2010)

	WP1		WP2		WP3		WP4		WP5		WP6		TOTAL		
	3rd P.	Total	3rd P.	Total	3rd P.s	Total	3rd P.	Total	3rd P.	Total	3rd P.	Total	Total 3rd	otal 1s+2ndt+3r	Total Expected
ITU	2,5	12	5,5	15	0,5	8	10,5	10	3	10	11,5	36	33,5	65,5	91
DEU	0	0	5,5	60	0,5	72	21	14	0	10	0,2	12	27,2	60,2	168
Ifremer	1	36	20	42	2	16	1	14	2	8	1	12	27	72,8	128
CNRS	4	30	4	7	1	10	3	8	0	0	0,5	3	12,5	32,5	58
INGV	3	4	24	30	1	15	0	12	0	7	0	7	28	47,5	75
ISMAR	0,5	8	12	12	2	12	1	10	0	1	0	4	15,5	22,5	47
Total	11	90	71	166	7	133	36,5	68	5	36	13,2	74	143,7	301	567
													143,7		

Man-Month DISTRIBUTION BY WP, 4th reporting period (February 1st, 2010 - Septmeber 30th, 2010)

	WP1		WP2		WP3		WP4		WP5		WP6		TOTAL		
	4th P.	Total	4th P.	Total	4th P.s	Total	4th P.	Total	4th P.	Total	4th P.	Total	Total 4th	al Total (1+2+3	Total Expected
ITU	4	12	2,5	15	1	8	10	10	4	10	4	36	25,5	91	91
DEU	0	0	61,8	60	26	72	14	14	4	10	2	12	107,8	168	168
Ifremer	10	36	14	42	9	16	12	14	6,2	8	4	12	55,2	128	128
CNRS	12	30	3,5	7		10	5	8	5	0		3	25,5	58	58
INGV	0,5	4	4	30	10	15	5	12	4	7	4	7	27,5	75	75
ISMAR	4	8	13	12	2,5	12	3	10	1	1	1	4	24,5	47	47
Total	30,5	90	98,8	166	48,5	133	49	68	24,2	36	15	74	266	567	567

6. Results

6.1 Introduction

The major result of the Marmara-DM is to have collected important data to address the question on the predictability of earthquakes in the Istanbul area, one of the most exposed to earthquake hazards in Europe. The predictability of earthquakes is *per se* a subject that needs massive efforts and adapted, large-scale means concentrated on one well-studied seismic area, where the probability of occurrence is high. For many reasons, the Istanbul area is one of the most suitable areas for this purpose.

The first two reasons are well known: i) there is a high probability that an earthquake of $M_w > 7.0$ will strike within the next decades along the NAF in the Sea of Marmara, directly affecting the heavily populated Istanbul area; ii) the segment having the highest probability to rupture is relatively well determined (Fig. 6.1).

The two other reasons are less known, both result from recent findings :

1) Recent work has reported the observation of the nucleation phase of the *Mw 7.4* Izmit earthquake, which devastated part of northwestern Turkey in 1999, and the fact that this nucleation was accompanied by tremors at least 44 minutes before the main shock *[Bouchon et al, 2011]*.
2) Gas emissions were found in the water column near the surface expression of known active faults *[Géli et al, 2008]*. Based on geochemical analysis, it is shown that the NAF in the Sea of Marmara strikes across hydrocarbon gas reservoirs from the Thrace Basin gas province *[Bourry et al, 2009]*.

The first discovery is of fundamental importance, as the presence of very characteristics tremors during the nucleation phase of a large earthquake may yield direct information on the timing and location of the preparing rupture, before the earthquake strikes *[Bouchon et al, 2011]*. This clearly supports the imperious necessity to deploy ocean bottom seismometers close to the fault zone, most particularly close to the fault segment having the highest probability to rupture.

This discovery and the finding that gas reservoirs are connected to the fault zone opens new perspectives that were not even imaginable a few years ago, and supports the necessity to monitor gas emission activity along with seismicity. If seismic tremors are found to be associated with clear anomalies in gas emission activity, then we will have more criteria for characterizing and identifying the recorded signals as indicators that the probability of occurrence of an impending earthquake is increasing. In this respect, the work proposed is meant to improve the preparedness of the authorities in charge of civil protection.

Hence the concept: to improve the predictability of the next large earthquake in the Istanbul area, we propose to continuously collect geochemical and geophysical data from the immediate vicinity of the fault zone, most particularly by implementing permanent seafloor observatories in the Sea of Marmara and developing methods and tools for data processing, integration and analysis. The submarine stations deployed during the Marquake Project will provide high quality data from the close vicinity of the submerged fault, within the Sea of Marmara and benefit to the improvement of the ongoing early warning systems in the Istanbul area *[e. g. Oth et al, 2010]*.

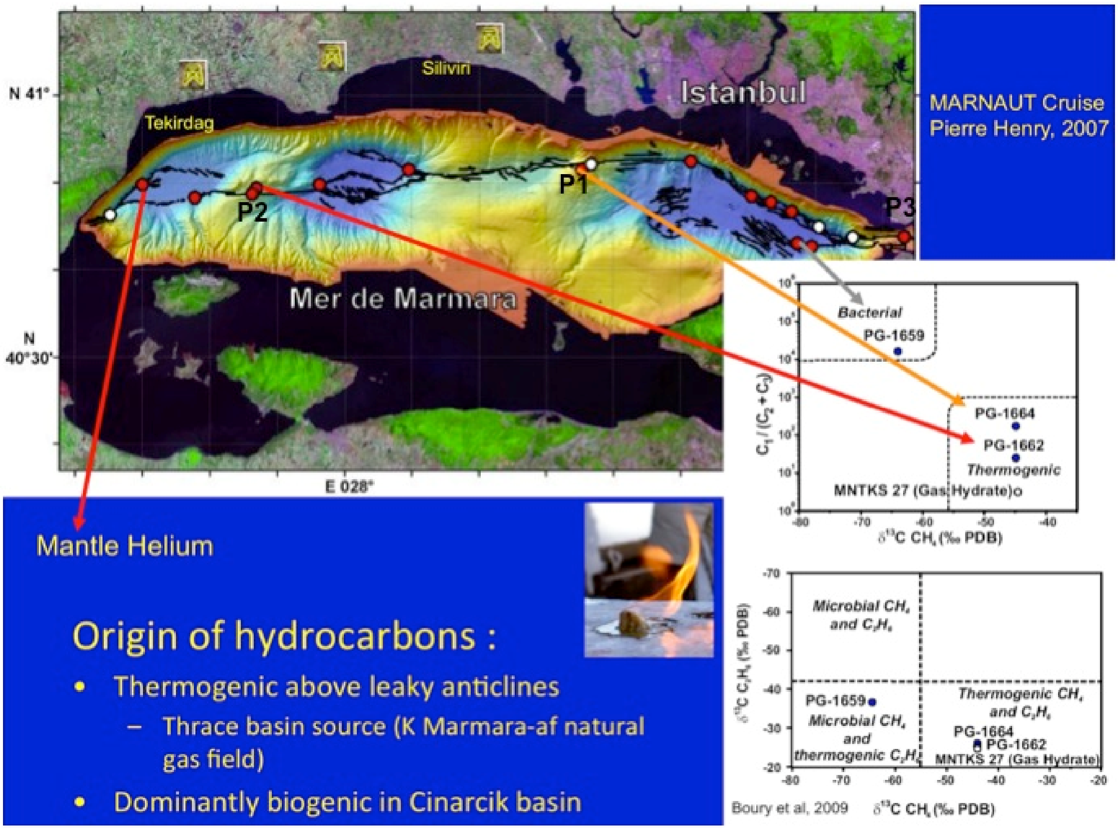


Fig.6.1 Map showing the most active northern branch of the North Anatolian Fault (NAF; black line), gas emission sites (red dots). The inset diagrams show the composition plots of gases showing the thermogenic and deep origin (Géli et al., 2008; Bourry et al., 2009). P1, P2 and P3 indicate potential sites that were identified for multi-disciplinary seafloor observatories during Marmara-DM Demonstration Mission of Esonet.

6.2 Relations with fluids and gas emissions

In the Gulf of Izmit, repeated surveys showed that the intensity of methane emissions increased after the August 17, 1999 earthquake *[Alpar, 2000 ; Kuscu et al, 2005]*. In the deeper parts, cold seeps and the associated manifestations, such as carbonate crusts, black patches, and bacterial mats, are present along the fault *[Armijo et al, 2005]*. Based on the results of the Marmara-DM project, a systematic correlation was also found between active faulting and the acoustically detected gas escapes (cf Deliverable D4.4). Geochemical analysis of gases and fluid flux rates through the Marmara seafloor using flowmeters and osmo-samplers were performed during Marmara-DM, within work packages 1 (cf D1.2 and D1.3, respectively). This segment is the most dangerous, as it is the only one that did not rupture since at least 1766. Thermogenic hydrocarbons having the same geochemical signature as those from the Thrace Basin have been found on top of anticline structures (cf Deliverable D1.3), suggesting that the North Anatolian Fault cross-cuts gas reservoirs from the southern continuation of the Thrace Basin gas field *[Bourry et al, 2009]*.

Cold seeps are often observed in association with active faults [e.g. *Moore et al., 1990 ; Henry et al., 2002*]. Furthermore, gas expulsion from pockmarks is also reported to occur in such submarine zones in relation to the occurrence of earthquakes. This has lead the scientific community to hypothesize that at least some of these faults channel fluids from deep levels within the sediments and, possibly, from the seismogenic zone. Coupling between deformation, pore pressure transients, and fluid flow may lead to post seismic fluid release, precursor events, and/or systematic variations of flow rates, fluid chemistry and pore pressure during inter-seismic phases. In addition, gas bubbles in the water are very easy to detect via acoustic methods. Hence, a major challenge addressed within the Marmara-DM was is to determine whether gas can generate **detectable** signals related to the stress building process during the seismic cycle, an issue related to detection of precursory signals before an earthquake, and therefore of direct societal importance. This issue is widely discussed in Deliverable D4.3, which consists in a report to test working hypothesis and to validate the concept of seafloor observatories.

6.3 Dataset used in the Marmara-DM project

The results of the Marmara-DM are based on the data collected during the 6 following cruises, which were conducted within Work Package 2:

- 2 Cruises with R/V Le Suroit of Ifremer, from november 4th to december 14th, 2009. The first for acoustic detection of gas emissions, AUV microbathymetry and seabottom deployment of BOB (acoustic gas bubble detector); the second cuise for high resolution, 3D seismic site survey on the Western High.
- 2 cruises with R/V Urania (Italy) in september 2009 and september 2010, for deploying and recovering the multiparameter sea-bottom observatory SN-4 of INGV at the entrance of the Gulf of Izmit, together with autonomous OBSs and piezometers from Ifremer.
- 2 cruises with Turkish vessels, respectively R/V Yunuz (from ITU) and R/V Piri Reis (from DEU) were respectively conducted in march 2010 to recover and redeploy SN-4 and to recover the Ifremer instruments and in june 2010 to collect additional high resolution, 2D seismic profiles to complete the different site surveys.

In addition, data and samples acquired in 2007 with R/V L'Atalante and manned submersible Nautile during Marnaut cruise were included in the Marmara-DM data set. These included echo-sounder data, analysis of interstitial water and gas composition and deployments of flow meters, piezometers and of a mini OBS network.

6.4 Best site selection (D4.4)

Three sites are identified as priorities for the future multi-parameters sea-floor observatories (Fig. 6.1):

- 1) The Istanbul-Silivri segment, in the seismic gap immediately south of Istanbul
- 2) The Western High / Gas Hydrates area.
- 3) Entrance of Izmit Gulf.

It is important to note that the detection of transient crustal events now appears as a scientific objective *per se*. The identification of seismic tremors and low frequency earthquakes –and of their relation with episodic "silent" slip– has been progressing very rapidly, first at subduction zones [e.g. *Shelly et al., 2006*], and now at strike-slip faults [*Nadeau and Dolenc, 2009; Bouchon et al., 2011*]. These progresses lead to consider the identification of slipping zones on the edges of seismic gaps or at the upper/lower limits of the seismogenic zone, as the next objectives to be achieved in the SoM. Work performed on Marmara-DM data met difficulties in the precise determination of the depth of offshore earthquakes and in the identification of tremors from noise analysis in the marine environment. Emphasis could now be given to focused, small-scale networks and to the identification of repeating earthquakes. Repeating earthquakes were recognized in the Central Basin area, which appears as an hypothetical nucleation site for a rupture on the Istanbul-Silivri segment. The gas hydrate site is remarkable as the only site next to the main fault where a relatively deep source is recognized for both interstitial water and hydrocarbons. The ideal monitoring network at Site 2 should span the Central Basin and the gas hydrates area on the western high.

6.5 Concept

Based on the Marmara-DM results, the MARDEP project is to be proposed to the Turkish authorities in June 2011 (Deliverable D6.1). The concept behind the MARDEP project is to improve earthquake predictability by combining microseismic monitoring (including the search for tremors) and fluid emission monitoring (including gas released in the water column).

- The tremor-like signal that was recently documented by *[Bouchon et al, 2011]* prior to the Izmit earthquake shows the existence for that earthquake of a nucleation phase which is both detectable and identifiable. The search of seismic tremors in the Istanbul area is hence a challenge of dramatic importance, which requires not only the collection of seismological data from the near vicinity of the fault, but also the development of specific methods, including the precise, real-time location and characterization of events and the real-time identification of tremors. We still must learn on these tremors. The context in which they occur needs to be analyzed and understood, in order to draw general conclusions on their capacity to provide clear indications on the occurrence of an impending earthquake.

• The fact that emissions of thermogenic gases, and, in some places, hydrocarbon seepages have been found on the seafloor in the close vicinity of the main fault, within the fault valley or on top of neighbouring anticlines, clearly indicates that there is a direct connexion between the sediment surface and the hydrocarbon reservoirs at depth. In addition, high-resolution 3D seismic data reveal a 300 meters wide, chimney-like conduit, rising from below the Western High, up to the site where gas hydrates were sampled at the sea surface. The existence of this structure, located less than 600 m away from the main fault suggest that shear movement along the fault perturbs the hydrogeological system, likely affecting the precarious equilibrium of over-pressured units, and thereby allowing fluids to be flushed along the fault pathway.

More generally, focused fluid expulsion structures (such as vent complexes, pockmarks and mud volcanoes) are often associated with faults in various geological settings. To explain these observations, it has been proposed that the critical fluid pressure required to induce sediment deformation is reduced when strike-slip faulting is active [*Mazzini et al, 2009*]. Fluid expulsion then occurs when overpressure at depth is sufficient to fracture the overburden sedimentary units [e.g. *Kopf, 2002* and references therein]. When a threshold is reached due to continuous generation of fluids (e.g. water, hydrocarbons, gas) at depth, a system of fractures propagates towards the surface breaching the seal.

Inversely, one can reasonably expect that when the total stress approaches the failure strength immediately prior to an earthquake (reaching 90 to 95 % of the yield stress), the critical overpressure to fracture the overburden layers is reduced, causing fluids to escape along the fault. We hypothesize that the intensity of thermogenic hydrocarbon emission is related to the coulomb stress on the fault, and that information of fault criticality, and hence earthquake probability, could be derived from long-term records. On a shorter time-scale, observation of precursory fluid emissions during earthquake nucleation would presumably require interaction between the slipping patch and the fluid reservoir or conduit. Coupled seismological and fluid monitoring would be needed to detect such events.

6.6 Design of future Multi-Disciplinary Seafloor Observatories (MDSOs)

- At sites 1 and 2 (both located on anticlines where numerous sites of gas emissions of thermogenic origin were found), the shore station will be cabled to one node, itself connected to four junctions boxes : one on each side of the fault (JBN and JBS), one to the east (JBE) and one to the west (JBW) of Central High. Junction boxes will have the same requirements [1] as those produced by Oceanworks [2] (Canada), the provider of the Neptune Project [3], allowing the connexion of 10 instrument packages each (Table 1). At JBE and JBW, we will deploy, respectively: an array of 4 seismometers, at distances < 500 from the junction box; one piezometer, one BOB, one methane

[1] ***Junction Box Requirements***
Depth requirements : 200, 450,700m
Maximum power : 1800W
Input voltage : 375VDC (nominal)
Input data interface : 100 BaseTX
Number of ports : 8 science, 2 expansion/high power
Science power interface : software configurable 12, 15, 24VDC at 75W
Science data interface : ideally RS232/485 and Ethernet ports on same connector
Expansion port : 375VDC at 1800W, 100BaseTX (allows connection of high power instrument system or another junction box for expansion)
Monitoring capabilities : voltage, current, ground fault (internal and science interfaces)
Science control/monitoring : fully integrated, secure operator web interface ; disconnect breakers for each Science port Operating distance from Node : 70m without additional media converter modules.

[2] *http://www.oceanworks.com/*
[3] *http://www.neptunecanada.ca/*

sensor. At JBN and JBS, we will deploy 2 OBSs, 3 distance meters, one BOB, one methane sensor, one piezometer. Clusters of seismometers will allow the ultra-precise characterization of earthquakes near the fault zone, using array-based methods for hypocenter determination.

- At site 3, one junction box, directly cabled to the shore station, will be sufficient to meet the project requirements, due to the proxility to the shore.

A significant research effort has been made during Marmara-DM for developing innovative sensors for monitoring variations in the geochemical and geophysical properties of gas emissions:

- *Pore-pressure sensors.* The piezometer we propose to use is a free-fall device with a 15-m long sediment-piercing lance equipped with sensors for measuring the differential pore pressure at 5 different depths (< 15 m) below the seafloor. This device has been shown to be very powerful for detecting and monitoring episodes of free gas accumulation and release in surficial sediments [Sultan et al, 2010, in review].
- *Gas-bubble monitoring.* We will use standard and well known acoustic technology, such as high directivity single beam or multibeam echo-sounders, to map and quantify gas bubbles emissions from the seafloor and monitor their temporal variability *[Greinert, 2008]*. These echo-sounders are ideally combined with 70 to 300 KHz ADCPs systems to identify different seeps in the data sets and to determine the horizontal and vertical velocity of the bubbles.
- *Methane sensor.* Based on one-year long tests performed by INGV for measuring variations in methane concentrations in the Gulf of Izmit, we will use the methane sensor METS developed by the German FRAMATECH company, which has provided satisfactory results.
- *Distance meters network:* an array of 6 geodetic stations to monitor displacements along the active fault, in order to determine the fault behaviour with regard to the existence (or not) of a creep component and the accumulation of elastic deformation before faulting, a critical, first order information.
- Arrays of Broadband Ocean Bottom Seismometers ((BB-OBS)[4] having bandwith of 0.03 - 30 Hz. In order to improve real-time event localization (within less than a few hundreds of meters), we will deploy an array of 4 seismometers –spaced by ~ 500 m) connected to each junction box.

Connectors	*Supplier*	*Availability of instrument/ Manufacturer*	*Interface*	*Power (Approx)*
1	*OBS*	*Guralp*	*RS-232*	*< 10 W*
2	*Piezometer*	*NKE*	*RS-232*	*< 10 W*
3	*BOB (Bubble Observatory)*	*Ifremer*	*100BaseTX*	*< 10 W*
4	*Methane sensor*	*FRAMATECH*	*RS-232*	*< 10 W*
5	*Accelerometer*	*On-the-shelf*	*RS-232*	*< 10 W*
6	*Absolute Bottom Pressure Recorder*	*Paroscientific*	*RS-232*	*< 10 W*
7	*CTD/Oxygen/Turbidity*	*On-the-shelf*	*RS-232*	*< 10 W*
8	*Current meter / ADCP*	*On-the-shelf*	*RS-232*	*< 10 W*
9	*Time Lapse Camera*	*On-the-shelf*	*100BaseTX*	*< 10 W*
10	*Strong Motion Accelerometer*			
11	*Distance Meter*	*Sonardyne*	*RS-232*	*< 10 W*

Table 3.1: List of the 11 sensor packages tested during EC-funded programmes, e.g.: the ESONET NoE Programme (for slots 1 to 10) and ASSEM (for slot 11).

[4] *There are two leading manufactures of BB sensors used in Ocean Bottom Seismology: Guralp (www.guralp.com) and Kinemetrics (www.kinemetrics.com).*

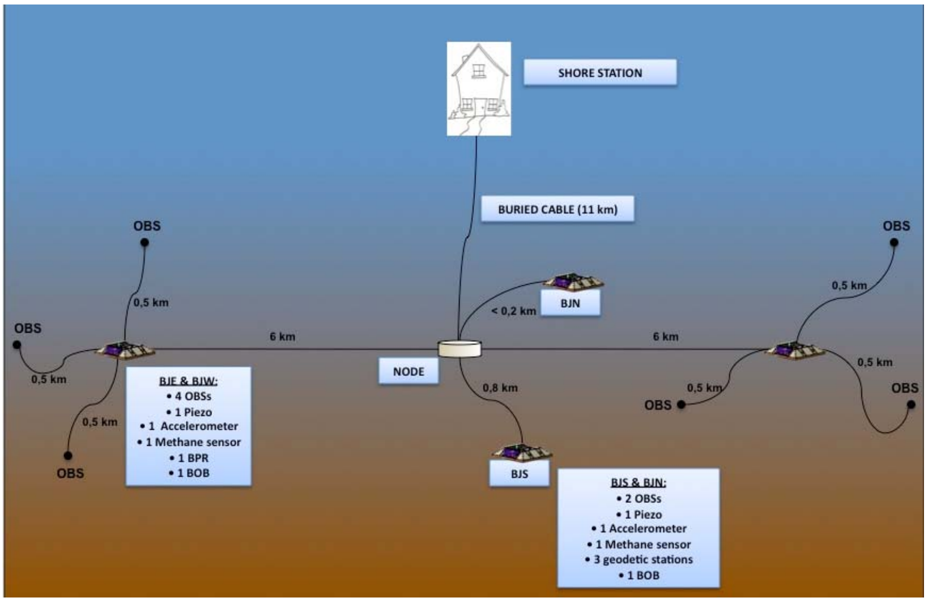


Fig. 3.4: Example of ideal multi-parameter seafloor observatory of TYPE I. The shore station should be cabled to one node, itself ideally connected to four junctions boxes : one on each side of the fault (JBN and JBS), one to the east (JBE) and one to the west (JBW). Clusters of seismometers will allow the ultra-precise characterization of earthquakes using array-based methods for hypocenter determination. The cable between the node and the land stations will be deeply buried. The cables from the node to the JBs will be deployed on the seafloor using Remote Operated Vehicles (ROVs).

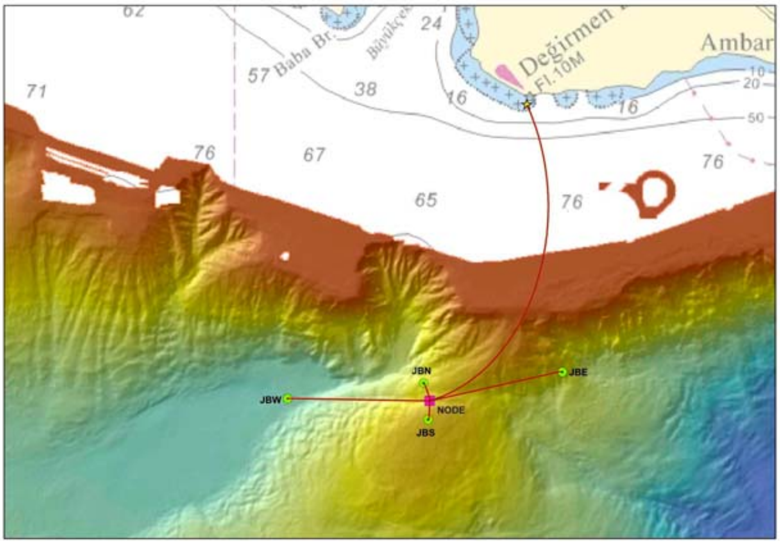


Fig. 6.3: Detailed set up of the multi-disciplinary observatory, example given for site1, located south of Istanbul on the Silivri-İstanbul segmen), with the cable routes and nodes south and north of the fault. Juction Boxes North and South are shown (black squares). Thecable is located near, but outside the anchoring area.

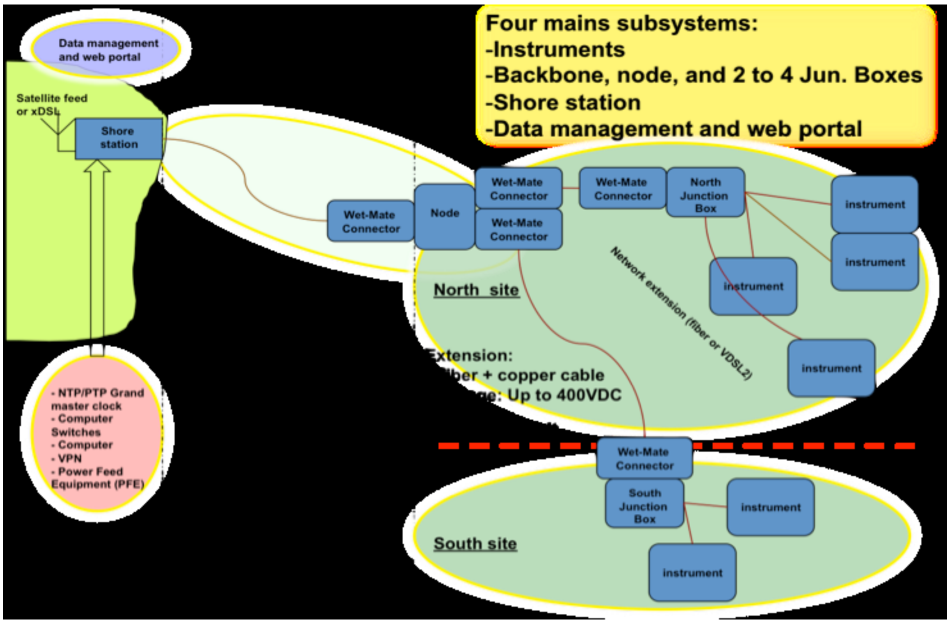


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Fig. 4d : Design of the modular seafloor observatory, based on the study perfomed during the Esonet/Marmara-DM Demonstration mission.

6.7 Autonomous, mobile seafloor equipments to enhance the multi-parameter approach

Additional geophysical and geochemical time series from autonomous, mobile seafloor instruments are critically needed for at least two reasons :

- the installation of a permanent multidisciplinary seafloor observatory will take time (~ 36 to 40 months) ; hence, it is necessary to collect data from the very beginning of the project, in order to start the work on data processing and analysis as early as possible;
- data from other sites are required, in order to assess the background variability of gas emissions and improve our ability to identify and detect anomalous variations.

Some physical parameters are relatively well understood, like seismicity in relation with fault creeping. Other parameters (e. g. sediment pore pressure or gas bubble acoustic response) require further research. Additional time series are needed to evaluate the real significance of each gas emission anomaly and its relevance to earthquake occurrence.

These general statements are illustrated by the results obtained by INGV with SN-4 SN-4 (the multi-parameter, autonomous seafloor observatory developed by INGV, Italy), which was deployed at the entrance of the Gulf of Izmit between october 2009 and march 2010 (Figures 6 and 7) :

- ➢ the Broad-Band OBS recorded very long period (~3 hours) signals on the vertical component, appearing like an arch, with an episode of rising seafloor and then an episode of dropping seafloor suggesting return to equilibrium (Fig. 6). Simultaneously, high amplitude, long period signals (up to 30 seconds) are visible on horizontal components. Such signals often occur on the vertical component (Fig. 7a, b, c). The very long period (~3 hours) signals on the vertical component appear associated with very strong amplitude, non-seismic micro-events of short-duration (< 3 s) and high-frequency (20 Hz) (Fig. 7).

- The very long period (~3 hours) signals apparently occur simultaneously with the following sequence: temperature drop, methane peak oxygen decrease, turbidity variation and “short duration, gas outburst signal” (Fig. 6). No apparent correlation exists between the local seismicity occurrence and physico-chemical parameters trend (e.g Methane peaks).

These data are encouraging, but long-term observations and further research are needed to confirm the causality link between the two observations: are the observed methane pulses «significant»? In other words: do methane pulses occur randomly or preferentially prior to earthquakes? What are the characteristics of these earthquakes (exact location, magnitude)? What is the optimal duration of the time windows for the short and long term averages of methane concentration?

The above example clearly shows that for each measured parameters, data processing and research on the physics of the phenomena are intimately related. The better our understanding on the physics, the better our ability to determine the appropriate criteria for data processing, such as, for instance, the time durations for the short and long term average analysis.

At each site (P1, P2 and P3), it is recommended to deploy autonomous equipments, including SN-4 (the autonomous, multi-parameter observatory developed by INGV), additional seismometers, piezometers, and acoustic bubble detector. Detailed site surveys have already been carried out during the ESONET/Marmara-DM demonstration mission. The geological structures and the hydro-geological system are thus well known, as well as the exact position of the instruments at each site.

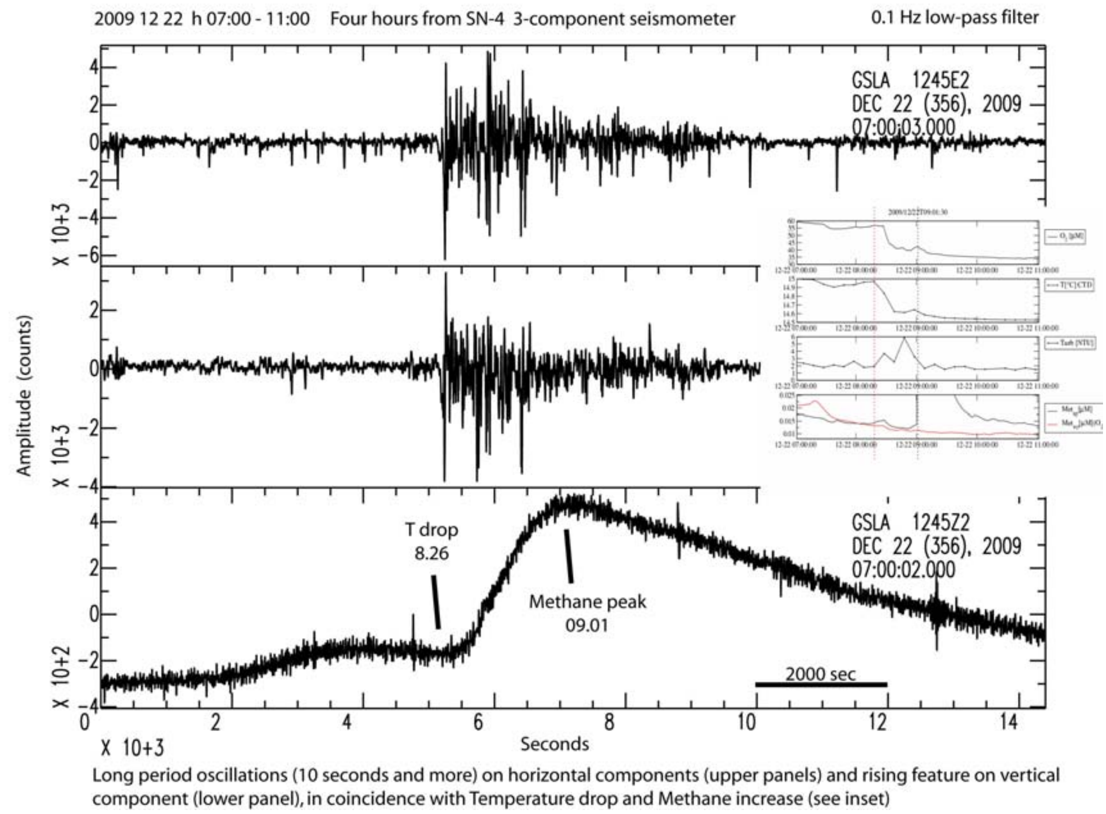

Fig. 6 : Figure summarizing the observations on SN-4 (courtesy of Francesco Frugoni and colleagues, INGV) : very long period (~3 hours) signals are observed on the vertical component, appearing like an arch, with an episode of rising seafloor and then an episode of dropping seafloor suggesting return to equilibrium. Simultaneously, high amplitude, long period signals (up to 30 seconds) are visible on horizontal components during the rising phase of the vertical component. Short-duration (< 3 s), high-frequency (20 Hz), events, are also recorded during the rising phase. Based on other experience from the Sea of Marmara (Ph. D. work of JB Tary), these events are interpreted as gas outbursts from the upper, gassy, sediment layers. Inset shows that the very long period (~3 hours) signals apparently occur simultaneously with temperature drop, methane peak oxygen decrease and turbidity variation.

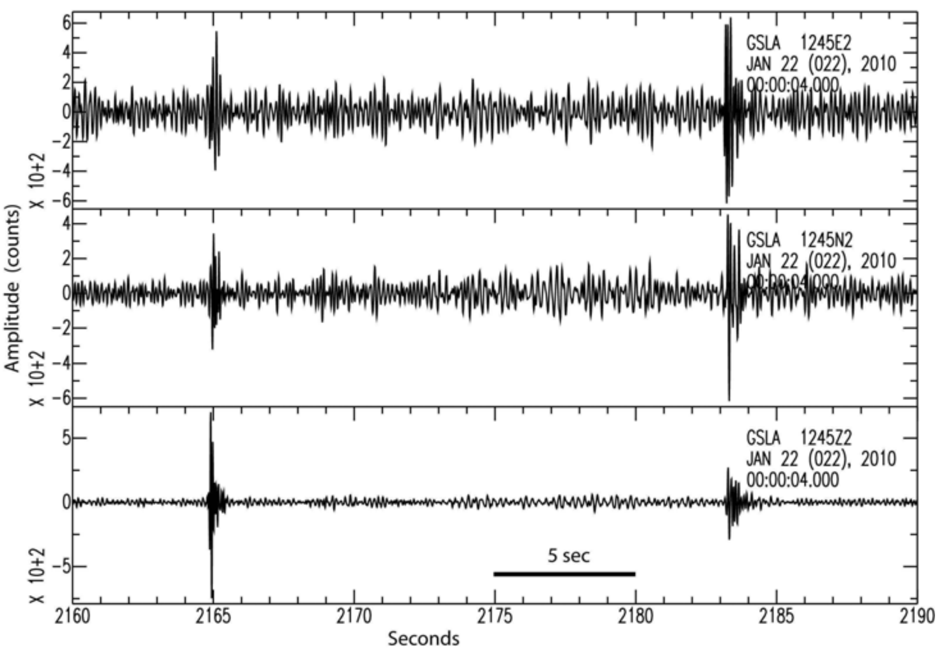

Fig.7a Example of 2 short duration events recorded on the BB-OBS (Guralp CGM-3). Signals band-pass filtered 4-20 Hz. Courtesy Frugoni and INGV colleagues.

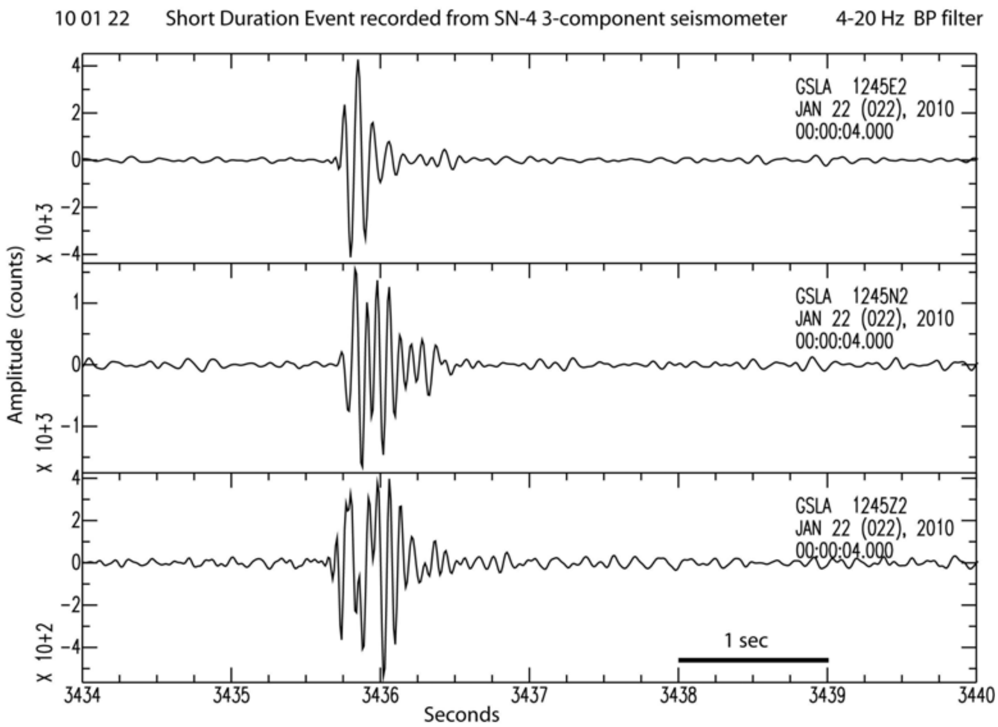

Fig. 7b : Zoom on one short-duration event recorded on the BB-OBS Guralp CGM-3 installed on SN-4. Signal is band-pass filtered [4-20] Hz. The upper plot represents the vertical component. Courtesy of Francesco Frugoni and colleagues, INGV.

6.12 Outreach and communication

During the 30 months of the Marmara-DM project several activities were carried out in Turkey to obtain funding for the establishment of seafloor observatories in the Sea of Marmara. For this, first we increased the visibility of the ESONET and EMSO projects' activities in the Sea of Marmara by special presentations in scientific meetings and by organizing an ESONET training course and a symposium in August 2009 (Deliverable D6.3). A public conference gathering the principal mass media in Turkey was held at the French General Consultate in Istanbul on December 15th, 2009. A public project website is now hosted at the Istanbul Technical University (Deliverable D6.2).

Second, we held meetings of Turkish institutions of marine and geohazard studies to reach a consensus on the establishment of the seafloor observatories and agree on a project proposal to obtain funding from the Turkish authorities, under the acronym "*MARDEP"(Marmara Seafloor Observatory Infrastructure for Earthquake and Environmental Research and Modeling)*. This proposal was ready to be submitted to the Turkish authorities (initially TUBITAK) by June 2010 (Deliverable D6.1). However, the submittal was postponed, to be submitted for funding to the Prime Ministry of Turkey State Planning Department's (DPT) call that will be either in April or June 2011.

The *MARDEP project* is designed as a national project with participation of all concerned marine institutions, as well as the Turkish Geological Survey (MTA), Undersecretariat for Maritime Affairs, Department of Hydrography Navigation Oceanography (SHOD), Istanbul Metropolitan Municipality (IBB), and Coast Guards General Command in the meetings. The Istanbul Metropolitan Municipality will be a user of the MARDEP project (see Annex 2). MTA (Mineral Research and Exploration General Directorate: Turkish Geological Survey) also strongly supports the project (Annex 3) If funded, we plan the completion of the infrastructure by 2014, and thereafter start its operation as regional department of the EMSO science infrastructure. In Turkey there are 11 stakeholders in the MARDEP proposal including the MTA (Turkish Geological Survey), Istanbul Municipality, and all Marine Sciences Institutes. The European partners include: IFREMER, CNRS, INGV and ISMAR, (French EMSO and Italian EMSO) all providing support letters (Annexes 4 and 5). Furthermore the ESONET and EMSO partners of the Marmara node applied to a recent EC FP 7 call: ENV.2011.1.3.1-1: Towards real-time earthquake risk reduction with a proposal: "MARQUAKE: Earthquake Predictability in the Sea of Marmara areas" in November, 2010.

The details of the activities concerning fund raising and preparation of the *MARDEP project* are extensively described in D6.1 The Sea of Marmara Node group (ITU, AFAD, IFREMER, CEREGE, ISMAR, DEU-IMST) also applied on 16 November 2010 to call ENV.2011.1.3.1-1 Towards real-time earthquake risk reduction with the MARQUAKE: Earthquake Predictability in the Sea of Marmara areas proposal.

6.13 List of publications resulting from the MARMARA-DM project

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7. Conclusion and perspectives

The Marmara Demonstration Mission (april 2008 to september 2010) was conducted within the EU-funded ESONET Network of Excellence programme: i) to characterize the temporal and spatial relations between fluid expulsion, fluid chemistry and seismic activity in the SoM ; ii) to test the relevance of permanent seafloor observatories for an innovative monitoring of earthquake related hazards, appropriate to the Marmara Sea specific environment ; and iii) to conduct a feasibility study to optimize the submarine infrastructure options (fiber optic cable, buoys with a wireless meshed network, autonomous mobile stations with wireless messenger). A total of 6 cruises were conducted, allowing the selection of the optimum sites for the future multi-parameters sea-floor observatories: i) on the Istanbul-Silivri segment, located in the seismic gap immediately south of Istanbul where intense bubbling is observed; ii) on the Western High, where gas hydrates, oil and gas seeps from the Thrace Basin were found; and iii) at the entrance of Izmit Gulf near the western end of the surface rupture associated with the 1999 Izmit earthquake. A significant research effort has also been made during Marmara-DM for testing innovative sensors for monitoring variations in the geochemical and geophysical properties of gas emissions.

The conclusions of the Marmara-DM project were used to build a full implementation plan, submitted to two funding agencies as 2 different proposals, respectively MARQUAKE and MARDEP:

- the MARQUAKE Proposal was submitted on november, 16th, 2010, to the FP7 Cooperation Work Programme 2011for Environment, Sub-Activity 6.1.3 « Natural Hazards », Area 6.1.3.1 « Hazard assessment, triggering factors and forecasting », Topic ENV.2011.1.3.1-1 « Towards real-time earthquake risk reduction ». Partners re : Ifremer (coodinator), ITU, AFAD, Ismar-CNR, CNRS and DEU. This proposal (see appendix in deliverable D5.3) received a mark of 10 out of 15, the negociation phase is still pending.
- The MARDEP Proposal will be submitted in june 2011 to the Disaster and Emergency Management Presidency (AFAD) of the Republic of Turkey (see Deliverable 6.1).

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Project contract no. 036851

ESONET

European Seas Observatory Network

Instrument: **Network of Excellence (NoE)**
Thematic Priority: **1.1.6.3 – Climate Change and Ecosystems**
Sub Priority: **III – Global Change and Ecosystems**

MODOO Demonstration Mission

Periodic Reports

Start date of project: **March 2007** Duration: **48 months**

Start date of the Demonstration Mission: **May 2009** Duration: **17 months**

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

ESONET Demonstration Missions
1st Periodic Activity Report
(WP4/MODOO/ Deliverable D5.1.)

Part I

DM acronym:	MODOO
DM title:	MOdular and mobile Deep Ocean Observatory (MODOO) and its application in the Porcupine Abyssal Plain area
ESONET Site:	Porcupine
Scientific Area(s):	SArea 1, SArea2, SArea 3, SArea 4
Technological Area(s):	TArea 1, TArea 2, TArea 4
DM Start date:	1st, May 2009
DM duration:	17 month
Period of the reporting	01.05.2009 to 31.12.2009

Partner Num.	Partner institution short name	Principal Investigator (PI) for the Demo Mission	WP in charge
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Executive summary *(max one page)*

This DM will demonstrate the functioning of a Modular and mObile Deep Ocean Observatory (MODOO) with real-time data access. The MODOO concept is that of linking and operating stand-alone observatory modules (lander, mooring) in such a way that they merge into a single observatory. The MODOO concept shall be applicable to any non-cabled environment as well as to link non-cabled with a cables site.

The first 8 month of the DM have been concentrated on outlying and building the hardware, in particular the Data Collection and Dissemination (DCD) node that connect lander and mooring. This activity is still ongoing. In addition, procedures (e.g. data flow, testing of equipment) have to be defined.

In respect to deliverables: A reference document for implementing the existing telemetry system (Iridium) with the DCD node has been created (D2.1). Information from the at-sea operations for both the deployment and recovery cruises will now be incorporated in D3.1, now scheduled for delivery in Month 17. Milestone 1 (Purchase of DCD node) has been achieved. One milestone (M3) has been redefined as it turned out that more efficient and save testing procedures needed to be established. A website has been established (www.modoo.info) and linked to the ESONET NoE website (deliverable D4.1). The website will be extended to link to the real time data. Preparation for the data collection and dissemination have been taken (type of sensors, data streams expected, responsible contact). The data processing (near real time, delayed mode) has been outlined in accordance with international standards (e.g. GTS, OceanSITES).

The deployment and the recovery cruise for the first MODOO installation at the Porcupine Abyssal Plain (PAP), 350 nm off southwest Ireland have been applied for and approved. The deployment will take place in May/June 2010 with the RRS James Clark Ross. A second 9 day recovery cruise has now been planned for September 2010 on board the Celtic Explorer and is provisionally approved. The water column observatory at PAP is part of the EuroSITES project. MODOO fosters the synergistic between ESONET NoE and EuroSITES – e.g. in respect to standardization, data dissemination, networking of expertise and the use of common infrastructure and servicing facilities.

MODOO is well on track. This is to a large part because of additional projects (EuroSITES, national projects) that provide significant resources (men month, infrastructure) through synergistic effects.

Table 1: Deliverables List

Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months*	Used indicative person months*	Lead contractor
D 1.1	Adapted BOBO lander to host extra instruments (including DCD node)	WP 1	9	11	9.5	8.25	NIOZ
D 1.2	Test BOBO lander for deployment including data records and telemetry	WP 1	12	12	0.5	0	NIOZ
D 1.3	Integration and expectation of passive acoustics with other sensors on the BOBO lander	WP 1	18	18	0.5	0	UNIABDN
D 2.1	Document describing NERC-NOCS Iridium telemetry system	WP 2	2	2	0.5	0.5	NERC-NOCS
D 2.2	Telemetry buoy modified to communicate with DCD nodes	WP 2	10	12	2	0	NERC-NOCS
D 3.1	Report on procedures for sea operations	WP 3	14	17	7	0.25	MI
D 3.2	Report on technological development in MODOO DM (including DCD nodes)	WP 3	14	17	4	0	IFM-GEOMAR
D 4.1	MODOO web presence established	WP 4	4	1	0.1	0.1	NERC-NOCS
D 4.2	Test data processed	WP 4	12	12	0.4	0.4	NERC-NOCS
D 4.3	Test outputs from data received via satellite	WP 4	15	13	0.75	0	NERC-NOCS
D 4.4	Live data processed and presented on web/ftp	WP 4	17	14	0.5	0	NERC-NOCS
D 5.1	8/17 month progress reports	WP 5	8,17	8 & 17	2	1	IFM-GEOMAR

D 5.2	Final report including: Evaluation of system performance and recommendation for future work, MODOO Data Management systems performance	WP 5	17	17	5	0	IFM-GEOMAR, MI, NIOZ, UNIABDN, NERC-NOCS

the person month must be the same as indicated in Part II- WP progress report (see pag. 10)

Table 2: Milestones List

Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
M 1	Order and Purchase of DCD nodes	WP 3	Month 2	Month 4	IFM-GEOMAR
M 2	Test (dry, wet) of DCD nodes finalized and evaluated	WP 3	Month 11	Month 12	MI/IFM-GEOMAR
M 3	MODOO system deployed and in operational mode	WP 2	Month 15	Month 13	NERC-NOCS
M 4	Reception real time data; Quality control of real time data and public available through Coriolis data centre, Brest, France, via EuroSITES	WP 4	Month 14	Month 14	NERC-NOCS
M5	Control of selected sensors via satellite/acoustic underwater telemetry system (demonstrate event triggered control)	WP 4	Month 17	Month 17	IFM-GEOMAR

Table 3: Person-months *(see Part II for each WP person-months)*

WP number and name		First period		Permanent staff(1) First period	
		Full duration		Full duration	
WP1	Actual person months	9.25		0.25	
	Planned total person months		10.5		1
WP2	Actual person months	2.0		0.58	
	Planned total person months		3.5		11.5
WP3	Actual person months	3		2.625	
	Planned total person months		13.4		4.25
WP4	Actual person months	0.5		1.0	
	Planned total person months		2.25		2.0
WP5	Actual person months	1.5		1.0	
	Planned total person months		4.25		2.25
TOTAL	**Actual tot person months**	**16.25**		**5.46**	
	Planned total person months		33.9		21

(1) *not charged to the DM*

WP bar chart (planned/actual):

insert the time extension of each work-package (see example) according to each WP bar-chart reported in Part II)

	Month																
WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
1 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
2 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
3 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
4 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
5 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Milestones planned		M1				M2										M3	M4, M5
Milestones actual				**M1**								**M2**	**M3, M4**				**M5**

Link with ESONET main activities: *please update the dates and contents of the foreseen activities*

Inputs to the DM from ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments
Data management issues (including archiving of images) to be input from WP2 (Standardisation and Interoperability) of ESONET NoE underwater intervention procedures, testing and calibration procedures,	1	17	MODOO personnel will attend the next ESONET data management workshop which will take place at the Marum in Bremen, Germany, June 4-5 2009
Generic sensor package (including interoperability) input from WP3 of ESONET NoE	1	17	WP3 leader (H. Ruhl) is MODOO participant
Incorporate experience and technical expertise from other ESONET DMs	1	17	MODOO connect (Exchange of Personnel) – links with Jerome Blandin of Ifremer and ensures available expertise. Input from WP1 (Networking) of ESONET NoE.
Contribution to Stand-alone solution (WP5)	1	14	Cost model etc.
Registration of Sensors in the Sensor Registry	12	14	Given that the registry is available

Outputs of the DM activity to ESONET WPs :	**Expected period mm/yy**	**Actual period mm/yy**	Comments
Technological developments report (D3,2)	Month 14	Month 14	
Final report (data management, evaluation of system performance)	Month 18	Month 18	
Input to WP2 & WP9 sensor registry	Month 14	Month 14	Given that the registry is available

Sensors & data management plan:

Measured parameters	**Depth range of the measurements**	**Sampling/storage/acquisition frequency**	**Access restriction / unrestriction** (ESONET partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	**Comments**
Temperature	Several in water column	Real time: 24hours; Delayed mode: 60 minutes	Real-time data **immediately public available** Delayed mode after recovery of systems All data is shared and distributed via GDAC Coriolis (EuroSITES data policy)	Real time data available via EuroSITES website – input to GEOSS via Coriolis data centre
Salinity (Conductivity)	Several in water column	Real time: 24hours; Delayed mode: 60 minutes		
Pressure	Several in water column	Real time: 24hours; Delayed mode: 60 minutes		
Oxygen	Several in water column & Sea floor	Real time: 24hours; Delayed mode: 120 minutes		
Ocean currents	Upper 400m & lower 10m of water column	Real time: 24hours; Delayed mode: 120 minutes		In part real time (lander)
Turbidity	40m & Sea floor	Real time: 24hours; Delayed mode: 120 minutes		Real time data available via EuroSITES website – input to GEOSS via Coriolis data centre
Nitrate	40m	delayed mode: 120 minutes		
pCO2	40m	delayed mode: 120 minutes		
Fluorescence	40 m	delayed mode: 120 minutes		
Passive acoustic	Positioned at sea floor, sources unknown	240h available, sampling may be synchronized with photo		Delayed mode only
Seismicity	Sub-sea floor	1 Minute subsample available on request (e.g. event)		Suppressed real-time data on demand
Photography	Sea floor	On demand		

Dissemination and outreach: please update the table

Type of school material available at the issue of the mission (photos, video, courses,…others)	**Description**
Introduction of the MODOO mission at outreach site	ESONET NoE (http://mars-srv.oceanlab.iu-bremen.de/)
Introduction of the MODOO mission at outreach site	EuroSITES (http://outreach.eurosites.info/) outreach activities
Type of dissemination (through collaborations with aquaria, museum, sciences centres, etc.)	**Description**
Information on MODOO Mission	ESONET NoE (http://mars-srv.oceanlab.iu-bremen.de/)
Information on MODOO Mission	EuroSITES (http://outreach.eurosites.info/) outreach activities
Press Release (Maine Institute, January 2010)	http://www.marine.ie/home/aboutus/newsroom/news/NewDecadeofDiscoveryforIrishMarineScience.htm

Part II

WP # 1

(from 01. May 2009 to 31. December 2009)

WORKPACKAGE	1
Full WP title	Lander component
Period covered	From 01. May 2009 to 31. December 2009
Partner Institution responsible of the WP	NIOZ
Person in charge for the report (WP Leader)	J. Greinert
Partners involved in the Work	UNIABDN, NERC-NOCS, IFM-GEOMAR

WP objectives and starting point (max 500 characters)

The objective was to advance the capabilities of the BOBO lander to be interfaced with the EuroSITES mooring via the DCD nodes and to host additional sensors. The BOBO lander originally carried only a sediment trap, an ADCP and a Seabird CT + backscatter.

Work Performed *:*

At NIOZ, Dries Boone was employed to work on interfacing the existing sensors (ADCP, the CT and the sediment trap) with the DCD nodes. Boone held the contact with Developics and got familiar with the entire modem structure and interfacing possibilities. Together with NIOZ personal Bob Koster they went for a 2 days training course to the DCD node manufacturer Develogics in Hamburg, Germany. Dries programmed parts of the ADCP and sediment trap interfacing and agreed with Jon Campbell on protocols to communicate to both systems via the satellite link. Bob Koster was involved in discussions about the camera system and how it could be interfaced to the modem. Jens Greinert overlooked followed the progress and kept contact to the other partners. The lander configuration was outlined and information about the expected payload was collected. The University of Aberdeen built the passive acoustic sensor - this will be shipped to NIOZ during the week 15th-19th February 2010 for implementation into the lander.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Major costs were the employment of Dries Bone for 6 month, travel to and from Germany for sensor interfacing and programming training (Dries Boone, Bob Koster). Lander consumables as weights, batteries, frame material, and a dll library for programming of instrumentation. A sediment trap motor that allows to be re-programmed needed to be be purchased. The new motor will allow access to the sediment trap via two way communication interface card which is seen as an important demonstration of the project. The events will be monitored with a fluorometer/turbidity sonde with two way communication access that was required to be purchased as well.

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period		# Person-month Planned	Used
Personnel costs	IFM-GEOMAR: 0 MI: 0 NIOZ:25651,00 NERC-NOCS:0 UNIABDN:15000	40,651.00 €	IFM-GEOMAR: 1 MI: 0 NIOZ: 7.5 NERC-NOCS: 1 UNIABDN: 1	IFM-GEOMAR: 0.25 MI: 0 NIOZ: 8 NERC-NOCS: 0 UNIABDN: 1
			10.5	**9.25**
Subcontracting	IFM-GEOMAR: 0 MI: 0 NIOZ: 0 NERC-NOCS: 0 UNIABDN: 0	0.00 €		
Travels	IFM-GEOMAR: 0 MI: 0 NIOZ: 3641,00 NERC-NOCS: 0 UNIABDN: 2000,00	5,641.00 €		
Consumables	IFM-GEOMAR: 0 MI: 0 NIOZ: 3939,00 NERC-NOCS: 0 UNIABDN: 11000	14,939.00 €		
Other costs	IFM-GEOMAR: 0 MI: 7339,00 NIOZ: 0 NERC-NOCS: 0 UNIABDN: 0	7,339.00 €		
Total Costs		**68,570.00 €**		

WP # 1 progress

(from 01. May 2009 to 31. December 2009)

Progress towards objectives

Phase 1.1: *Implementation of CT & ADCP*

Interface the CT and the ADCP to the DCD node. This has been successfully undertaken. Currently a filter routine is developed to extract subsets of the ADCP data to be send via the DCD node in real-time mode

contractors involved: NIOZ

Phase 1.2: *Sediment trap 2-way communication*

Implementing a sediment trap that can be started and programmed by means of two way communication via surface and underwater telemetry. The trap sampling will be modified in response to sedimentation events.

contractors involved: NIOZ

Phase 1.3: *Improvement of turbid observations.*

Turbidity observations are key to many benthic processes. Two different types of turbidity sensors will be used in parallel to compare their performance. One sensor (Wetlabs FLNTUSB) has been purchased for this reason. The sensor data will be accessed in near-real time.

contractors involved: NIOZ

Phase 1.4: *Implementation of Optode*

An oxygen optode will be interfaced to the DCD node. This instrument will demonstrate the use of the DCD node for single logging.

contractors involved: IFM-GEOMAR, NIOZ

Phase 1.5: *Passive acoustics*

A passive bio-acoustic sensor package will be implemented to the lander (not interfaced to DCD node).

contractors involved: UNIABDN, NIOZ

Phase 1.6: *Sea floor photography*

A photo camera will be interfaced with the lander DCD node and has to be mounted on the lander. NOCS has ordered a system that will have the capability to store full resolution images internal and output low resolution images to an RS232 port in parallel.

contractors involved: NERC-NOCS, NIOZ

Phase 1.7: *Implementation of Geohazard instrumentation*

An ocean bottom seismometer (OBS) and a bottom pressure sensor will be used to retrieve geohazard relevante data. The OBS will be interfaced to the DCD node. The hardware needs to be implemented in the lander frame once the system is at NIOZ.

contractors involved: IFM-GEOMAR, NIOZ

Phase 1.8: Prepare the lander for deployment, mechanical incorporation of all new sensors + DCD node, transport logistics for deployment & recovery.

<u>contractors involved:</u> NIOZ

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

It was originally planned to have the mechanical work on the lander finished in month 9. This will now become month 10 as not all sensors are available at NIOZ to be properly implemented. It was planned to have a second, DCD node-interfaced CTD attached to the lander. This was plan cancelled.

Corrective actions:

No corrective actions required.

TABLE 1: WP#1 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D1.1	Adapt BOBO lander to host extra instruments	NIOZ	9	11	9.5	8.25
D1.2	Test BOBO lander for deployments including data records and telemetry	NIOZ, IFM-GEOMAR, NOCS, UNIABDN	12	12	0.5	0
D1.3	Integration and expectation of passive acoustics with other sensors o the BOBO lander	UNIABDN	18	18	0.5	0

TABLE 2: WP#1 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**

UPDATED BAR-CHART

<u>for all the WP tasks</u>: fill in the 'Planned' cells according to the time duration of the tasks as described in the implementation

<u>for the tasks/phases to be developed in the period of this report</u>: fill in the 'Actual' cells of the following table according to the actual or forecast duration of the task/phases.

(Example is reported below)

	May		**July**		**Sept**		**Nov**		**Jan**		**March**		**Deploy ment**		**July**		**Recover y & End of MODOO**
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP#1 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase 1.1-5 Planned	X	X	X	X	X	X	X	X	X								
Phase 1.1-5 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**							
Phase 1.6 Planned	X	X	X	X	X	X	X	X	X								
Phase 1.6 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**					
Phase 1.7 Planned	X	X	X	X	X	X	X	X	X								
Phase 1.7 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**							
Phase 1.8 Planned									X	X	X						X
Phase 1.8 Actual									**X**	**X**	**X**	**X**					**X**

WP # 2

(from 01. May 2009 to 31. December 2009)

WORKPACKAGE	2
Full WP title	Mooring component
Period covered	From 01. May 2009 to 31. December 2009
Partner Institution responsible of the WP	NERC-NOCS
Person in charge for the report (WP Leader)	R. Lampitt
Partners involved in the Work	NERC-NOCS, IFM-GEOMAR, NIOZ

WP objectives and starting point (max 500 characters)

The objective of this WP is to design the EuroSITES water column observatory to incorporate the needs to the MODOO mission. In particular the inductive link based communication between the CDC node and the surface control unit must be defined and programmed.

The data logging and telemetry system on the PAP mooring has already been used for the PAP mooring (first time in 2007). The system is based around a Persistor CF2 computer board linked to an Iridium 9522 modem, a Seabird inductive modem, a GPS receiver, a compass/pitch/roll unit and internal voltage/current/temperature monitors.

Work Performed *:*

Much of the design required for the new mooring has been completed and some of the hardware required has been purchased. This work is shared with EuroSITES preparation for the PAP deployment. The major enhancement is the installation of a new type of surface buoy (shared with the Met Office) which host a variety of air/sea exchange sensors, telemetry system and energy supply.

A document describing NERC-NOCS Iridium telemetry system has been written and delivered (D2.1). This document is the base to create a suitable interface of the Mooring and Lander DCD node.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

The main component of this project so far has been to design and develop the mooring. As a consequence most of the costs have been for labour and a much smaller part for procurement of hardware required.

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro) First period**		**# Person-month**	
			Planned	**Used**
Personnel costs	IFM-GEOMAR: 0 NERC-NOCS: 8687	8687.00 €	IFM-GEOMAR: 1.0 NERC-NOCS: 13.0	IFM-GEOMAR: 0.58 NERC-NOCS: 11.92
			14.0	**12.5**
Subcontracting	IFM-GEOMAR: 0 NERC-NOCS: 0			
Travels	IFM-GEOMAR: 0 NERC-NOCS:353	353.00 €		
Consumables	IFM-GEOMAR: 0 NERC-NOCS:953	953.00 €		
Other costs	IFM-GEOMAR: 0 NERC-NOCS: 446	446.00 €		
Total Costs		**10,439.00 €**		

WP # 2 progress

(from 01. May 2009 to 31. December 2009)

Progress towards objectives

Phase 2.1*:* *Implementation of inductive linked DCD node into surface telemetry system* telemetry A review of the PAP telemetry system was performed (see deliverable D2.1) to evaluate the compatibility and technical requirements for the DCD nodes with the telemetry. The mooring mounted DCD node will be integrated into the “standard” mooring inductive loop. The challenge is that the DCD node does not only send data to the surface telemetry on request but receives data (commands) from the surface buoy (event control/ two-way communication). In the upcoming months the integration will be continued and system will be tested.

contractors involved: . NERC-NOCS, NIOZ

Phase 2.2*:Mooring design*
The design of the PAP mooring was developed (in collaboration with EuroSITES). The mooring now has a large surface buoy with own energy supply (solar panel) and several engineering option. The original plan to place the mooring DCD node at 1000m water depth has been revised for reasons of mooring construction, now the nodes are placed at nominal 40m depth in dedicated frame.

contractors involved: NERC-NOCS

Phase 2.3*: Mooring cruise preparation*
Preparation of the deployment and recovery cruises were made. An arrangement with the British Antarctic Survey (BAS) was made to deploy the mooring (and the lander WP1) with James Clarke Ross in May/June 2010. Cruise planning meetings and other related work must be done (documents as risk assessment, logostics etc.). The preparation for the recovery of the MODOO system by September 2010 (Celtic Explorer) requires more preparations.

contractors involved: NERC-NOCS, NIOZ, MI, IFM-GEOMAR

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

NA

Corrective actions:

NA

TABLE 1: WP#2 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D 2.1	Document describing NERC-NOCS Iridium telemetry system	NERC-NOCS	2	2	0.5	0.5
D 2.2	Telemetry buoy modified to communicate with DCD nodes.	NERC-NOCS	10	12	2	0

TABLE 2: WP#2 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**

UPDATED BAR-CHART

<u>for all the WP tasks</u>: fill in the 'Planned' cells according to the time duration of the tasks as described in the implementation

<u>for the tasks/phases to be developed in the period of this report</u>: fill in the 'Actual' cells of the following table according to the actual or forecast duration of the task/phases.

(Example is reported below)

	May		July		Sept		Nov		Jan		March		Deploy ment		July		Recover y & End of MODOO
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP#2 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WP#2 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Phase 2.1 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X				
Phase 2.1 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Phase 2.2 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X				
Phase 2.2 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Phase 2.3 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
Phase 2.3 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**			**X**	**X**

WP # 3

(from 01. May 2009 to 31. December 2009)

WORKPACKAGE	3
Full WP title	Scientific and technological integration
Period covered	From 01. May 2009 to 31. December 2009
Partner Institution responsible of the WP	MI & IFM-GEOMAR
Person in charge for the report (WP Leader)	F. Grant & J. Karstensen
Partners involved in the Work	NIOZ, NOCS, MI, IFM-GEOMAR

WP objectives and starting point (max 500 characters)

The major step for the scientific integration of the observatory components is: standardization, interoperability and access to data (see also WP4). The technological integration includes the linking between the observatories (see also WP1 & WP2) and the linking of their components/sensors. The integrating geostatistical variable is “time of observation” and synchronization is required. The integrating devices are the “data collection and dissemination” (DCD) nodes. The DCD nodes host an acoustic modem, a precise clock and a data storage that logs connected instrumentation and tags a common time stamp to their data. The DCD nodes are central to the MODOO Demomission as they fulfil the scientific and technological integration of the observatory modules. Financial and men month effort has been invested in creating/defining the DCD node requirements and in helping to adapt existing modems to fit the MODOO needs. The process started by letting the whole MODOO consortium defining its needs (scientific and technological) followed by integrating the requirements with the help of MODOO engineers (NIOZ, NERC-NOCS, IFM-GEOMAR). This process is still ongoing – while the main objective for the next month of the DM is on testing the performance of the DCD nodes under laboratory and water conditions before the installation takes place in May/June 2010. The tests will not concentrate on the hardware but in parallel will be used to test the data access and distribution concepts.

Work Performed *:*

The DCD nodes are central to the MODOO Demomission as they fulfil the scientific and technological integration of the observatory modules. Financial and men month effort has been invested in creating/defining the DCD node requirements and in helping to adapt existing modems to fit the MODOO needs. The process started by letting the whole MODOO consortium defining its needs (scientific and technological) followed by integrating the requirements with the help of MODOO engineers (NIOZ, NERC-NOCS, IFM-GEOMAR) and a company (Develogic). This process is still ongoing – while the main objective for the next month of the DM is on testing the performance of the DCD nodes under laboratory and water conditions before the installation takes place in May/June 2010. The tests will not concentrate on the hardware but in parallel will be used to test the data access and distribution concepts.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

One major cost item was an ESONET NoE WP4 demo mission contribution to the purchase of the hardware that underlies the DCD nodes (based on the HAM.NODE by Develogic). About half of the hardware cost have been charged to MODOO the other half was paid by institutional money (IFM-GEOMAR). The DCD nodes are of central importance for all participating partners and the MODOO system itself. A large part of the intellectual and design work within MODOO focus on the definition of the DCD node. This concerted design work was only possible through the unique partnership in this ESONET NoE demo mission. Through a parallel running exchange of personal training (MODOO connect) other ESONET partners outside of MODOO have been involved in the design process as well (IFREMER) and from which the MODOO partnership benefit substantially. Other major cost items were batteries to be used for the MODOO DCD nodes operation at PAP.

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro) First period**		**# Person-month Planned**	**Used**
Personnel costs	IFM-GEOMAR: 0 MI:1459.15 NIOZ: 0 NERC-NOCS: 0 UNIABDN: 0	1,459.15 €	IFM-GEOMAR: 6 MI: 6.9 NIOZ: 0.25 NERC-NOCS: 0.25 UNIABDN: 0	IFM-GEOMAR: 2.625 MI: 0.25 NIOZ: 0.125 NERC-NOCS: 0 UNIABDN: 0
			13.4	**3.0**
Subcontracting	IFM-GEOMAR: 0 MI: 0 NIOZ:0 NERC-NOCS: 0 UNIABDN: 0	0.00 €		
Travels	IFM-GEOMAR: 0 MI: 0 NIOZ: 0 NERC-NOCS: 0 UNIABDN: 0	0.00 €		
Consumables	IFM-GEOMAR: 2.702,30 MI: NIOZ: NERC-NOCS: UNIABDN:	2,702.30 €		
Other costs	IFM-GEOMAR: 17765.44 MI: NIOZ: NERC-NOCS: UNIABDN:	17,765.44 €		
Total Costs		**21,926.89 €**		

WP # 3 progress

(from 01. May 2009 to 31. December 2009)

Progress towards objectives

Phase 3.1: *Definition of the scientific requirements for designing the DCD nodes.* To ensure that the DCD node design can help to facilitate the concerted scientific interpretation of the data we collected basic information on required sampling interval, sampling depth, accuracy of clock, etc. This information is used for Phase 3.2. One other important action was in phase 3.1. was to identify individuals that act as a contact for sensors (also in respect to ESONET NoE sensor registry).

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI, UNIABDN, AWI

Phase 3.2: *Definition of the technological requirements for designing the DCD nodes.* In this phase we collected specification of the instrumentation that will be mounted on the lander and mooring. Based on the specifications we selected a set of devices (also in reflection to Phase 3.1.) that is most useful in achieving the MODOO goals.

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI, UNIABDN, AWI

Phase 3.3: *Implementation of Phase 3.1. and Phase 3.2. results in DCD nodes design and programming* This is an on-going phase which includes the definition of the instrument ports, implementation of re-programming capabilities for certain instrumentation via telemetry, implementation of inductive link for data real time access and event control. This phase includes work for deliverable D3.2 (Report on technological development in MODOO DM (including DCD nodes)).

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI

Phase 3.4: *Preparation for deployment considering scientific and technological integration* This is an on-going phase and comprises the work towards Milestone M2 (test procedures finalized and evaluated) and M3 (). It considers the work in WP1 (lander component), WP2 (mooring component), and WP4 (data management). This phase includes work for deliverable D3.1 (Report on procedures for sea operations).

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI, UNIABDN

Phase 3.5: *Preparation for recovery and evaluation*
In this final phase preparation for a successful recovery will be done. The final evaluation of the system in terms of scientific and technological aspects will be done

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI, UNIABDN

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

The milestone M3 (*Shallow water test of DCD nodes with RV ALKOR, Baltic Sea/Gotland: Test of communication between submerged and near-surface DCD nodes: data retrieval, two way communication – due: month 6*) has been redefined as it turned out that more efficient and save testing procedures can be applied for the benefit of the project. Responsible partner for deviation: IFM-GEOMAR.

As a second recovery cruise is now planned for September 2010, it was decided by the WP3 leaders that delivery of D3.1 (Report on procedures for sea operations) should be deferred to Month 17 (from Month 12). The resulting report will now incorporate both deployment and recovery at-sea operations information which will prove useful to the ESONET project. Responsible partner for deviation: MI.

Corrective actions:

The milestone M3 has been redefined (*Test procedures (dry, wet) for the DCD nodes finalized and evaluated*) but with a focus now on thorough tests of the system under more idealized conditions. This new testing strategy allows modification and intervention in case it is needed. It will although allow to take appropriate actions in case of failures. The due date was set to 12 – which is shortly before the deployment of the system.

D3.1 will now incorporate more information than previously planned due to a second recovery cruise for the MODOO system.

TABLE 1: WP#3 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D 3.1	Report on procedures for sea operations	MI	14	17	7	0.25
D 3.2	Report on technological development in MODOO DM (including DCD nodes)	IFM-GEOMAR	14	17	4	0

TABLE 2: WP#3 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**
M 1	Order and Purchase of DCD nodes	Month 2	Month 4
M 2	Test procedures (dry, wet) for the DCD nodes finalized and evaluated	Month 12	Month 12
M 3	MODOO system deployed and in operational mode	Month 15	Month 13
M5	Control of selected sensors via satellite/acoustic underwater telemetry system (demonstrate event triggered control)	Month 17	Month 17

UPDATED BAR-CHART

<u>for all the WP tasks</u>: fill in the 'Planned' cells according to the time duration of the tasks as described in the implementation

<u>for the tasks/phases to be developed in the period of this report</u>: fill in the 'Actual' cells of the following table according to the actual or forecast duration of the task/phases.

(Example is reported below)

	May		**July**		**Sept**		**Nov**		**Jan**		**March**		**Deployment**		**July**		**Recovery & End of MODOO**
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP#3 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase 3.1 Planned	X	X	X	X													
Phase 3.1 Actual	**X**	**X**	**X**	**X**													
Phase 3.2 Planned		X	X	X	X	X											
Phase 3.2 Actual			**X**	**X**	**X**	**X**											
Phase 3.3 Planned				X	X	X	X	X	X	X	X						
Phase 3.3 Actual				**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**						
Phase 3.4 Planned									X	X	X	X	X				
Phase 3.4 Actual									**X**	**X**	**X**	**X**	**X**				
Phase 3.4 Planned												X	X	X	X	X	X
Phase 3.4 Actual												**X**	**X**	**X**	**X**	**X**	**X**

WP # 4

(from 01. May 2009 to 31. December 2009)

WORKPACKAGE	4
Full WP title	Data management and outreach
Period covered	From 01. May 2009 to 31. December 2009
Partner Institution responsible of the WP	NERC-NOCS
Person in charge for the report (WP Leader)	M Pagnani
Partners involved in the Work	NERC-NOCS

WP objectives and starting point (max 500 characters)

The MODOO project data management will be an extension of the systems already being undertaken under the auspices of EuroSITES. This will enhance links between EuroSITES and ESONET NoE data management principles. A large range of data types will be handled in real-time, including meterological air/sea exchange instrumentation, water column and sea floor lander. Real-time data will be quality controlled and displayed on the MODOO and EuroSITES's websites. If appropriate, data will also be made available to scientists via the GTS (Global Telecommunication System) and in the OceanSITES data format.

After recovery of the system (planned for September 2010), the delayed mode datawill be processed by the nominated Principal Investigator for each sensor or instrument. Quality controlled outputs will then be made available to the general public in OceanSITES format.

Work Performed *:*

During this pre-deployment phase of MODOO links with the Principal Investigators have been establish and meta-data such as the number and types of sensors to be used on the mooring and lander have been gathered. The serial numbers of the hardware, which is planned to be used, have also been recorded.Recording logs for use during the deployment cruise have also been developed to ease the task of recording significant events during the cruise and to collate this essential metadata in one place. Searching for and collecting metadata after deployment can be time-consuming. Requirements for reading GTS data (meteorological variables) and placing data (water column variables) on the GTS system are being specified.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

This package does not plan to buy any MODOO specific items.

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period	# Person-month Planned	Used
Personnel costs	NERC-NOCS: 3528	2.25	0.5
Subcontracting	NERC-NOCS: 0		
Travels	NERC-NOCS: 0		
Consumables	NERC-NOCS: 0		
Other costs	NERC-NOCS: 0		
Total Costs	3,528.00 €		

WP # 4 progress

(from 01. May 2009 to 31. December 2009)

Progress towards objectives

Phase 4.1: *Web site*

Create web design and populate with project information. Continue updating web pages as project develops.

contractors involved :*NERC-NOCS*

Phase 4.2: *Meta-data collection and processing preparation*

Collate pre-deployment meta-data. Identify MODOO data sets and create systems to process.

contractors involved : *NERC-NOCS*

Phase 4.3: *Test data*

Process test data.

contractors involved : *NERC-NOCS*

Phase 4.4: *Data interoperability*

Collate deployment meta-data. Collate calibration data. Process real-time data. Publish data via web and ftp.

contractors involved : *NERC-NOCS*

Phase 4.5: *Documentation on interoperability*

Finalize documentation ready for post-recovery processing, and inclusion in final project report.

contractors involved : *NERC-NOCS*

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

NA

Corrective actions:

NA

TABLE 1: WP#4 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D4.1	MODOO web presence established	NERC-NOCS	4	1	0.1	0.1
D4.2	Test data processed	NERC-NOCS	12	12	0.4	0.4
D4.3	Test outputs from data received via satellite	NERC-NOCS	15	13	0.75	0
D4.4	Live data processed and presented on web/ftp	NERC-NOCS	17	14	0.5	0

TABLE 2: WP#4 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**
M4	Receive and preliminary processing of real time data:Quality control of real time data (based on international standard if available),QC Real time data is made public available (Coriolis data centre via EuroSITES)	14	14

UPDATED BAR-CHART

	May		July		Sept		Nov		Jan		March		Deploy ment		July		Recover y & End of MODOO
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP 4 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase4.1 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase 4.1 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**									
Phase 4.2 Planned								X	X	X	X	X	X				
Phase 4.2 Actual																	
Phase 4.3 Planned										X	X	X					
Phase 4.3 Actual																	
Phase 4.4 Planned													X	X	X	X	X
Phase 4.4 Actual																	
Phase 4.5 Planned																X	X
Phase 4.5 Actual																	

WP # 5

(from 01. May 2009 to 31. December 2009)

WORKPACKAGE	2
Full WP title	Coordination
Period covered	From 01. May 2009 to 31. December 2009
Partner Institution responsible of the WP	IFM-GEOMAR
Person in charge for the report (WP Leader)	J. Karstensen
Partners involved in the Work	NERC-NOCS, IFM-GEOMAR, NIOZ

WP objectives and starting point (max 500 characters)

The WP 5 objective is managing the DM MODOO. This includes reporting, coordinating communication internal & external, meetings, teleconferences etc.

Work Performed *:*

Shortly after the official project start (01. May 2009) a kick-off meeting was organized and held from the 07. May to 08. May 2009 at NERC-NOCS Southampton (see attached agenda & meeting notes). Other meetings (also in collaboration with the "exchange of personal" MODOO connect) have been held in December 2009). Preparatory work for the first report to ESONET NoE WP4 have been made. Project updates and request have been posted to the partners.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

No major costs are associated with this WP

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period		# Person-month Planned	Used
Personnel costs	IFM-GEOMAR:0	0	IFM-GEOMAR: 4 NIOZ: 0.25	IFM-GEOMAR: 1.0 NIOZ: 0
			4.25	**1.0**
Subcontracting	IFM-GEOMAR:0	0		
Travels	IFM-GEOMAR:0	0		
Consumables	IFM-GEOMAR:0	0		
Other costs	IFM-GEOMAR:0	0		
Total Costs		**0.00 €**		

WP # 5 progress

(from 01. May 2009 to 31. December 2009)

Progress towards objectives

Phase 5.1*:* *Reporting*

Reporting includes reports to ESONET NoE as well as internal communication between partners. External reporting to the science community have been prepared (e.g. conference applications EGU 2010, Liege symposium 2010).

contractors involved: IFM-GEOMAR & all

Phase 5.2*:* *Meetings*

The kick-off meeting have been organized and held. Updating emails have been send to all partners. Upcoming “all partners” meeting is planned at NIOZ in mid April 2010. This meeting will also be used to evaluate the system before deployment. Most partners participate in the deployment and the planned recovery cruise. A final meeting will be held after the recovery cruise.

contractors involved: IFM-GEOMAR & all

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

NA

Corrective actions:

NA

TABLE 1: WP#5 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D 5.1	6 month progress reports to ESONET WP4	IFM-GEOMAR	8 & 17	8 & 17	2	1
D 5.2	Final report including: Evaluation of system performance and recommendation for future work, MODOO Data Management systems performance	IFM-GEOMAR, MI, NIOZ, UNIABDN, NERC-NOCS, AWI	17	17	5	0

TABLE 2: WP#5 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**

UPDATED BAR-CHART

	May		July		Sept		Nov		Jan		March		Deploy ment		July		Recover y & End of MODOO
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP#5 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WP#5 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Phase 5.1 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X				
Phase 5.1 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Phase 5.2 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X				
Phase 5.2 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Phase 5.3 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
Phase 5.3 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**			**X**	**X**

Appendix

Meeting notes:

Agenda Kick-off MODOO and MODOO connect
NOCS, 7. May 2009 (09:00-17:30) – 8. May 2009 (09:00-12:00)

Day 1: Thursday 7. May 2009 ***Conference Room 344/32 (Level 4 near cafeteria)***

08:30 Meet at NOCS reception/main entrance
09:00 Welcome
Introduction of Participants
Logistics
Objectives of Meeting
Agenda Modifications
MODOO and MODOO connect: Overview

Presentation of MODOO Science
09:30 Science core mission (Henry, Jens, Johannes)
Science guest missions:
- Deep Sea Marine Life (Acoustic, Camera) (Jens, Anne)
- Geohazard (NN POL, Johannes)

Discussion on requirements/expectations for successful science missions:
- data availability and science requirement on data availability

(with input from Maureen) including data retrieval from moving platforms: ship, AUV – opportunities?
- two - way communication: which instruments needs to be controlled?
- Expertise in programming of instruments (e.g. MODE 12 on 1200kHz ADCP, minimum sampling requirement to resolve tidal signals), list of "sensor" contacts/expertise
- interaction with ESONET WP1 & WP 3 (Henry)
- How long is a time series?
  Discussion on long term visions – MODOO@PAP and beyond...

In between: Coffee break (room next door 344/38)

Administrative aspects (MODOO & MODOO connect)
11:30 Finances:
- MODOO (as part of ESONET NoE WP4 task a & b)
- MODOO connect (as part of ESONET NoE WP1 task a)

12:00 – 13:00 Lunch break in NOCS canteen – own expenses

Presentation of MODOO Technology (shared with MODOO connect)
13:00 Discussion on technological aspects of MODOO

MODOO components (with current status)
- BOBO Lander (Jens & Dries)
- PAP Mooring (Richard, Jon)

More details on platform payload:
- seismometer/bottom pressure
- camera systems

- surface telemetry system at PAP (Jon)
- Generic sensor package (Henry, Jens)
- status of DCD nodes (integration of camera!!!) and Underwater acoustic modems: experiences, tests

Standardization, quality control, calibration (with link to WP2 of ESONET)

Interaction with ESONET WP5 (stand-alone observatories)

15:00-15:30 Coffee break (room next door 344/38)

Time line of project
15:30 Review and update of timing of the project

- Implementation plan
- Milestones, deliverables
- Update cruise schedule – possibilities of cruise participation, required technical expertise on board
- Meetings (ESONET, others) – Bremen IEEE session Thursday afternoon
- web page

17:30 End of first day

19:00 Dinner at: tba. (own expenses)

Day 2: Friday 8. May 2009 ***Meeting room 1/Plate 251 (Ground floor/entrance level)***

Continuation of Technology (shared with MODOO connect)
08:30 Meet at NOCS reception
09:00 Summary of first day in respect to technological requirements

Discussion on technical issues:

7. The DCD node in more details (requirements, ports, …)
8. Integration of camera(s)
9. Integration of DCD node into surface telemetry
10. two-way communication with instruments (camera, seismometer)

In between: Coffee break (in room)

11. Sensor list (XLS file)
12. mooring requirement (steel wire, break load of DCD frame, launching procedure)
13. Lander requirements (maximum payload, specific launching e.g. which crane is available for deployment/recovery ship dependent...)
14. Underwater modem manufacturer

Summary of tasks, define action items – planning for next MODOO connect exchange
12:00 End of second day and end of meeting

Update on MODOO after 7./8. May 2009 meeting at NOC Southampton.

Table of Contents

Infrastructure and sensors

BOBO lander

For operation at sea at well as for deployment calculations the exact dimensions (length, weight, etc..) of instruments and batteries are required. This information is requested for:

- Deliverables 'calibration, test, deployment and recovery' aka 'operation at sea'

Easiest would be a list of sensor weights, both “in air” and “in water” to estimate the total weight + dimension of the lander for deployment and to do the buoyancy calculations.

Sensor list needs one “responsible” for each instrument + column with dimensions.

Table: Specification of MODOO sensors

Instrument/Parameter	Model	responsible
CT (C, T, 1x OBS, Fluorometer)	SBE 16	Jens G. (NIOZ)
ADCP currents/ echo intensity	Teledyne RDI workhorse 1200kHz	Jens G. (NIOZ)
Oxygen logger	Aanderaa Optode 3830	Andreas P. (IFM-GEOMAR)
Bottom pressure sensor 1	Parascientific	Kevin H (POL)
Bottom pressure sensor 2 & Seismometer	Parascientific with SEND recorder	Ernst F. (IFM-GEOMAR)
Sea & Sun multisonde		Jens G. (NIOZ)
Sediment trap		Jens G. (NIOZ)
Still camera 1	Imenco SDS1210	Henry R. (NOCS)
Still camera 2	NIOZ: ???	Jens G. (NIOZ)
Passive acoustic		Anne H. (UNIABDN)
ARGOS mooring/lander locator		Andreas P. (IFM-GEOMAR)
Lander DCD node	Develogic HAM.NODE	Johannes K.(IFM-GEOMAR)
Mooring DCD node	Develogic HAM.NODE + with extened housing for battery (without frame!!)	Johannes K.(IFM-GEOMAR)
Oxygen respiration	IODA 6000	Richard L. (NOCS)

To keep the DCD nodes as much at a “generic level” as possible, it was agreed that an interface module (like the COSTOF of the BOREL buoy presented by Jermone B.) shall be used/constructed.

PAP Mooring
It was discussed that it can be very useful to have an IODA oxygen respiration rate system not only on the mooring (part of EuroSITES) but also on the lander.

Action Richard: Approach Dominique Lefevre to see if he can provide an additional IODA system for installation at the BOBO lander and check data availability: it was not clear if the IODA is with a data logger or with real-time data only (no internal storage).

Components of the PAP mooring have been shown to us (surface buoy, biogeochemical sensor frame).

DCD nodes
Jerome reported on tests performed at the IFREMER with underwater acoustic modems. Also the results have been kept anonymous it interesting to hear about the different methods to evaluate the instrumentation.
NIOZ will design an interface board

It is expected that the communication strategy between PAP telemetry and MDCD node will require quite a bit of exchange between NOCS and the modem manufacturer (very likely Develogics http://www.develogic.de/en/products/ham_node/index.php).

Specific Instrumentation
Passive acoustics:
dimension of device 35kg, 50cm long
sampling: 240 hours with 24 bit, typical operation frequency: 16kHz (1Hz – 96kHz possible)

Action Anne: Provide more details about passive acoustic

Seismometer (OBS) & Ocean bottom pressure sensor (OBP):
POL (Kevin Horsburgh) will provide an OBP which, if real time access is requested, will connect to the LDCD node via cable/RS232. As the scientific core mission of the MODOO application at PAP is not on geohazards only a subset of the data will be transferred. The size of the data that will finally be transferred depends on the availability of bandwidth after all core mission data has been considered.

IFM-GEOMAR will provide a combined OBS/OBP instrument. The data can be accessed sequentially and for arbitrary time intervals. The instrument needs to be decoupled from the lander (e.g. time triggered release or corrosion wire) to ensure high quality data. Exact this instrument has been used for Geohazard monitoring with acoustic real time telemetry several times before (GITEWS).

Action Kevin: provide details about OBP, including interface requirements, protocols. Is a sequential and targeted data retrieval possible (e.g. retrieval of data collected at a certain time interval, say 5 minutes, 3 weeks ago between 21:00 and 21:05) or only a complete set of data?
Can the OBP be installed directly on the lander or does it need to be separated? If both systems (POL and IFM-GEOMAR) are installed the coherence of the measurements can be investigated – particularly an assessment of the initial drift, which often hampers the use to determine long term trends, would be of scientific interest.

ADCP:
It would be useful to switch between water current and turbulence measurements (Mode 12 Teledyne- RDI 1200kHz) for boundary layer investigations.

Action Jens: Check if boundary layer turbulence measurements are of use (With NIOZ Hans van Haarem) and investigate if switch between the normal and the mode 12 can be done via two-way-telemetry/RS232 port of ADCP and what the mode 12 requires in terms of a 1 year deployment period.

The 75kHz (??) ADCP from MI should for reasons of the mooring design not installed on the PAP mooring – is an installation on the BOBO lander (upward looking) possible of use? And technically feasible (pressure rating of housing)?

Action Fiona: Communicate ADCP pressure rating.

Sediment trap:
The BOBO Lander will have a sediment trap on board. It was discussed if this makes sense because of unknown/degraded trapping efficiency. NIOZ will decide if they want to deploy or not.

Cruises

The PAP cruise proposal for July 2010, where a short activity was the installation of MODOO, has been rejected. However, it is very likely that a shorter (maybe a few days only) cruise to the PAP site for the PAP/MODOO installation will be possible. This is currently under negotiation. A second possibility is using the Irish “Celtic Explorer”. As Fiona told us before and also in a recent email, the MI can apply for ship time on rather short notice.

Mainly for weather reasons the time window for the cruise shall be between 1. June – 15. August. In case of a dedicated MODOO cruise more partners could attend (if needed). The following advantages/disadvantages were identified for earlier and later deployment:

Earlier deployment

- Less time for preparations (not good)
- Longer time series of observations (good)
- Having the installation at place during the spring bloom – which might be nice to have in the data (good)

Later deployment

- More time for preparations (good)
- Shorter time series (not good)

There will be no extra recovery cruise of the MODOO system before the “official” exchange in Summer 2011.

Action Richard: Please inform us about any outcome of the ship time negotiations for summer 2010.

Data Management and accessibility:

Initial access point for data is the EuroSITES data centre at NOCS.
The existing real time data quality control protocols will be extended to handle the new (non EuroSITES) types of data.

Action all: Instruments need to be registered at the ESONET sensor registry. Found link at http://dataportals.pangaea.de/esonet/index.php/sensor but so far not accessible.

Outreach:

MODOO website will be installed (draft at http://www.noc.soton.ac.uk/eurosites/modoo/ - ask for username/password)

Action Maureen: Reserve an http://www.modoo.info/, maybe at http://www.europeregistry.com/?? 18 Euros a year (two years minimum) and transfer website to it.

Deliverables and concepts with feedback to ESONET NoE

Henry mentioned that it is useful to test the functioning of a generic sensor package. The DCD nodes can be seen like such a “package” - as all data from connected sensors are merged and a dedicated time stamp is added. As part of ESONET NoE WP3 (task b) Henry & Jens have been part of a group which considered the following variables to be “generic” (D13). As passive acoustics is irrelevant for biogeochemistry (and to my knowledge also for Physical Oceanography) this has to be see with a question mark.

Table: Generic variables list.

Variable	Geosciences	Physical Oceanography	Biogeochemistry	Marine Ecology
Temperature	X	X	X	X
Conductivity	X	X	X	X
Pressure	X	X	X	X
Dissolved O2	X	X	X	X
Turbidity	X	X	X	X
Ocean currents	X	X	X	X
Passive acoustics	*X*	-	-	*X*

Unfortunately it was not possible to have MODOO being represented at the IEEE09 in Bremen. For the next “All Regions” workshop in Paris and the “Best Practice” workshop in Brest MODOO will be represented as probably most of us will be at one or the other (I will attend both workshops).

Future perspective

Discuss further plans at the PAP site at a workshop before the ESONET all regions workshop 5.-7.10.2009 Paris, further details to be defined.
Requires a regional implementation committee (RIC – WP3 task a)
Next EU call “Deep Sea Frontier” (expected 2010/2011) - shall MODOO be part of potential proposals
Other possible installations of MODOO:
A possible installation at the CIS site in the Central Irminger Sea should be discussed. The site is potentially shared by US/OOI and the European programm.

In respect to a tropical ocean application, Doug Wallace (IFM-GEOMAR) expressed his interest during a recent EuroSITES meeting to have a MODOO application at the Cape Verde observatory (part of EuroSITES).

Finances

The so called Grant agreement has been send out to all. It is requested from all to have it signed by the “representative” of the institute and to be send back. It is very important that each partner quickly arranges for the signature.
The ESONET coordinator notified us that we can not expect to have the “advance money” before Sept. 2009.

ESONET Demonstration Missions
2nd Periodic Activity Report
(WP4 / MODOO / contribution to Deliverable D5.1.)

Part I

DM acronym:	MODOO
DM title:	MOdular and mobile Deep Ocean Observatory (MODOO) and its application in the Porcupine Abyssal Plain area
ESONET Site:	Porcupine
Scientific Area(s):	SArea 1, SArea2, SArea 3, SArea 4
Technological Area(s):	TArea 1, TArea 2, TArea 4
DM Start date:	1st, May 2009
DM duration:	17 month
Period of the reporting	01.01.2010 to 31.05.2010

Partner Num.	Partner institution short name	Principal Investigator (PI) for the Demo Mission	WP in charge
1.	IFM-GEOMAR (KDM)	Johannes Karstensen	IFM-GEOMAR Düsternbrooker Weg 20 24105 Kiel, Germany, jkarstensen@ifm-geomar.de, tel. ++49 431 6004156 fax. ++49 431 6004102
2.	NERC-NOCS	Richard Lampitt	Natural Environment Research Council-NOCS, University of Southampton Waterfront Campus, European Way, Southampton, SO14 3ZH, UK, rsl@noc.soton.ac.uk tel. +44 (0)2380 596347 fax. +44 (0)2380 596247
3.	MI	Fiona Grant	Marine Institute, Rinville Oranmore Co. Galway, Ireland fiona.grant@marine.ie

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5.	UNIABDN	Imants Priede	University of Aberdeen, Oceanlab Main Street Newburgh, AB41 6AA, U.K. i.g.priede@abdn.ac.uk tel. +44 (0)1224 274408 fax.+44 (0)1224 274408
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Executive summary *(max one page)*

This Demomission will work out the requirements and test the functioning of a Modular and mObile Deep Ocean Observatory (MODOO). Based on the MODOO concept the linkage and operation of individual stand-alone observatory modules into a single observatory will be achived. MODOO is a concept that shall be applicable to any non-cabled observatory group as well as to link non-cabled with a cabled observatories. The first deployment of the system was planned at the ESONET Porcupine node. MODOO took significant profit from additional projects, namely FP7 EuroSITES as well as national projects/resources that provided significant resources to build on.

During the first 12 month the MODOO DM has concentrated its activities in outlying and building the hardware and in preparing the deployment of the system at the Porcupine node (PAP site) in collaboration with the EuroSITES PAP mooring. The so called “Data Collection and Dissemination (DCD) nodes” have been designed. DCD nodes collect data from connected instrumentation and merge them into one synchronized data set. In addition subsets of the synchronized data is acoustically exchanged between the DCD ndes (two-way). In case of the Porcupine node, the DCD nodes are installed on a lander and on a full water depth mooring with surface meteorological package.

A reference document for implementing the mooring telemetry system (based on Iridium communication) with the DCD node has been created (D2.1:*Telemetry buoy modified to communicate with DCD nodes*). Hardware tests have been performed and a final assembly of the lander system took place in Mid April 2010 at NIOZ, Texel (Deliverable 1.2: *Test BOBO lander for deployment including data records and telemetry*). A website has been established (*www.modoo.info*) and linked to the ESONET NoE website (deliverable D 4.1). Preparation for the data collection and dissemination have been taken (type of sensors, data streams expected, responsible contact). The data processing (near real time, delayed mode) has been outlined in accordance with international standards (e.g. GTS, OceanSITES). Milestone 1 (Purchase of DCD node) has been achieved. One milestone (M3) has been redefined as it turned out that more efficient and save testing procedures needed to be established.

The deployment cruise took place on board the RRS James Clark Ross (JR221), starting from Vigo, Spain 24. May and ended in Southampton/Immingham, U.K. 5/6. June 2010. The main activity on that cruise was the deployment of the EuroSITES mooring (with MODOO DCD component) and the MODOO Lander with the lander DCD node. Information from the at-sea operations are incorporated in D3.1 (S*ea operations*), now scheduled for delivery in Month 17 but a draft version has been created for the JCR221 cruise. During JCR221 two deployments of the MODOO lander component have been performed. During the first deployment the DCD node did not work as expected and the system was recovered. It turned out that the transducer on the Lander DCD node was not working properly. The transducer was modified and the lander was deployed for a second time. Unfortunately it turned out that several hours after the second deployment one or more buoyancy glass spheres on the lander may have imploded and very likely destroyed at least the two acoustic releases on the lander. Several release attempts failed. Given the water depth of 4850m it is unclear if the inspection of lander or even a recovery will ever be possible.

Currently plans for another deployment are discussed. Given the limited resources and technical constrains this deployment will be for a short period and not in too deep waters. We propose to make use from a combination of RV POSEIDON cruise (14. to 30. August 2010) and of a NV PourQuaPas cruise (1. to 16. October 2010) to the Lucky Strike hydrothermal vent field, south-west of the Azores (MOMAR-D DM site). This deployment will have some synergetic effects with the MOMAR-D and will allow to further demonstrate the MODOO concept. The idea is to deploy the one remaining DCD node, as part of a deep sea mooring (approx. 150m above sea floor) and connect a 300kHz ADCP to it. By using a ship-based-only modem ADCP data will be downloaded (e.g. after two weeks) and the device will be reprogrammed via the DCD nodes. The recovery of the system will be done during the MOMAR-D PQP cruise. This installation would allow to demonstrate some of the MODOO functionality that could not be shown because of the damaged/lost PAP lander.

Table 1: Deliverables List

Deliverable n.	Deliverable name	Corresponding WP n.	Due Date	Actual/ Forecast delivery date	Estimated indicative person months*	Used indicative person months*	Lead contractor
D 1.1	Adapted BOBO lander to host extra instruments (including DCD node)	WP 1	9	11	9.5	8.25	NIOZ
D 1.2	Test BOBO lander for deployment including data records and telemetry	WP 1	12	12	0.5	0	NIOZ
D 1.3	Integration and expectation of passive acoustics with other sensors on the BOBO lander	WP 1	18	18	0.5	0	UNIABDN
D 2.1	Document describing NERC-NOCS Iridium telemetry system	WP 2	2	2	0.5	0.5	NERC-NOCS
D 2.2	Telemetry buoy modified to communicate with DCD nodes	WP 2	10	12	2	0	NERC-NOCS
D 3.1	Report on procedures for sea operations	WP 3	14	17	7	0.25	MI
D 3.2	Report on technological development in MODOO DM (including DCD nodes)	WP 3	14	17	4	0	IFM-GEOMAR
D 4.1	MODOO web presence established	WP 4	4	1	0.1	0.1	NERC-NOCS
D 4.2	Test data processed	WP 4	12	12	0.4	0.4	NERC-NOCS
D 4.3	Test outputs from data received via satellite	WP 4	15	13	0.75	0	NERC-NOCS
D 4.4	Live data processed and presented on web/ftp	WP 4	17	14	0.5	0	NERC-NOCS
D 5.1	8/14/17 month progress reports	WP 5	8,14,17	8,14,17	2	1	IFM-GEOMAR

D 5.2	Final report including: Evaluation of system performance and recommendation for future work, MODOO Data Management systems performance	WP 5	17	17	5	0	IFM-GEOMAR, MI, NIOZ, UNIABDN, NERC-NOCS

the person month must be the same as indicated in Part II- WP progress report (see pag. 10)

Table 2: Milestones List

Milestone n.	Milestone name	WP n.	Due date	Actual/Forecast delivery date	Lead contractor
M 1	Order and Purchase of DCD nodes	WP 3	Month 2	Month 4	IFM-GEOMAR
M 2	Test (dry, wet) of DCD nodes finalized and evaluated	WP 3	Month 11	Month 12	MI/IFM-GEOMAR
M 3	MODOO system deployed and in operational mode	WP 2	Month 15	Month 13	NERC-NOCS
M 4	Reception real time data; Quality control of real time data and public available through Coriolis data centre, Brest, France, via EuroSITES	WP 4	Month 14	Month 14	NERC-NOCS
M5	Control of selected sensors via satellite/acoustic underwater telemetry system (demonstrate event triggered control)	WP 4	Month 17	Month 17	IFM-GEOMAR

Table 3: Person-months *(see Part II for each WP person-months)*

WP number and name		First period		Permanent staff[1] First period	
		Full duration		Full duration	
WP1	Actual person months	9.25		0.25	
	Planned total person months		10.5		1
WP2	Actual person months	2.0		0.58	
	Planned total person months		3.5		11.5
WP3	Actual person months	3		2.625	
	Planned total person months		13.4		4.25
WP4	Actual person months	0.5		1.0	
	Planned total person months		2.25		2.0
WP5	Actual person months	1.5		1.0	
	Planned total person months		4.25		2.25
TOTAL	**Actual tot person months**	**16.25**		**5.46**	
	Planned total person months		33.9		21

[1]*not charged to the DM*

WP bar chart (planned/actual):

insert the time extension of each work-package (see example) according to each WP bar-chart reported in Part II)

	Month																
WP#	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
1 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
1 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
2 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
2 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
3 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
3 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
4 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
4 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
5 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
5 actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Milestones planned		M1				M2										M3	M4, M5
Milestones actual				**M1**								**M2**	**M3, M4**				**M5**

Link with ESONET main activities: *please update the dates and contents of the foreseen activities*

Inputs to the DM from ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments
Data management issues (including archiving of images) to be input from WP2 (Standardisation and Interoperability) of ESONET NoE underwater intervention procedures, testing and calibration procedures,	1	17	MODOO personnel will attend the next ESONET data management workshop which will take place at the Marum in Bremen, Germany, June 4-5 2009
Generic sensor package (including interoperability) input from WP3 of ESONET NoE	1	17	WP3 leader (H. Ruhl) is MODOO participant
Incorporate experience and technical expertise from other ESONET DMs	1	17	MODOO connect (Exchange of Personnel) – links with Jerome Blandin of Ifremer and ensures available expertise. Input from WP1 (Networking) of ESONET NoE.
Contribution to Stand-alone solution (WP5)	1	14	Cost model etc.
Registration of Sensors in the Sensor Registry	12	14	Given that the registry is available

Outputs of the DM activity to ESONET WPs :	**Expected period mm/yy**	**Actual period mm/yy**	Comments
Technological developments report (D3,2)	Month 14	Month 14	
Final report (data management, evaluation of system performance)	Month 18	Month 18	
Input to WP2 & WP9 sensor registry	Month 14	Month 14	Given that the registry is available

Sensors & data management plan:

Measured parameters	**Depth range of the measurements**	**Sampling/storage/acquisition frequency**	**Access restriction / unrestriction** (ESONET partners, public, immediately or delayed, to raw data, processed data …) *please note that EC ask Esonet community to provide data in easy and free access*	**Comments**
Temperature	Several depth water column & lander	Real time: 24hours; Delayed mode: 60 minutes	Real-time data **immediately public available** Delayed mode after recovery of systems All data is shared and distributed via GDAC Coriolis (EuroSITES data policy)	Real time data available via EuroSITES website – input to GEOSS via Coriolis data centre
Salinity (Conductivity)	Several depth water column & lander	Real time: 24hours; Delayed mode: 60 minutes		
Pressure	Several depth water column & lander	Real time: 24hours; Delayed mode: 60 minutes		
Oxygen	Several depth water column & lander	Real time: 24hours; Delayed mode: 120 minutes		
Ocean currents	Near seafloor	Real time: 24hours; Delayed mode: 120 minutes		In part real time (lander)
Turbidity	40m & Sea floor	Real time: 24hours; Delayed mode: 120 minutes		Real time data available via EuroSITES website – input to GEOSS via Coriolis data centre
Nitrate	40m	delayed mode: 120 minutes		
pCO2	40m	delayed mode: 120 minutes		
Fluorescence	40 m	delayed mode: 120 minutes		
Passive acoustic	Positioned at sea floor, sources unknown	240h available, sampling may be synchronized with photo		Delayed mode only
Seismicity	Sub-sea floor	450 Hz – delayed mode only		Delayed mode only
Photography	Sea floor	~~Real time: 24hours/low resolution; delayed mode: 1 hour/high resolution~~		Not deployed due to technical problems with the camera

Dissemination and outreach: please update the table

Type of school material available at the issue of the mission (photos, video, courses,…others)	**Description**
Introduction of the MODOO mission at outreach site	ESONET NoE (http://mars-srv.oceanlab.iu-bremen.de/)
Introduction of the MODOO mission at outreach site	EuroSITES (http://outreach.eurosites.info/) outreach activities
MODOO and ESONET related interviews with National Geographic TV	National Geographic team on board JCR221 cruise. NG plan a movie and other releases to the public on Deep Sea by 2012.
Type of dissemination (through collaborations with aquaria, museum, sciences centres, etc.)	**Description**
Information on MODOO Mission	ESONET NoE (http://mars-srv.oceanlab.iu-bremen.de/)
Information on MODOO Mission	EuroSITES (http://outreach.eurosites.info/) outreach activities
Press Release (Maine Institute, January 2010)	http://www.marine.ie/home/aboutus/newsroom/news/NewDecadeofDiscoveryforIrishMarineScience.htm
Press Release (NOC Southampton, May 2010)	http://noc.ac.uk/news/met-office-and-noc-enhance-ocean-observatory

Part II

WP # 1

(from 01. May 2009 to 31. May 2010)

WORKPACKAGE	1
Full WP title	Lander component
Period covered	From 01. May 2009 to 31. May 2010
Partner Institution responsible of the WP	NIOZ
Person in charge for the report (WP Leader)	J. Greinert
Partners involved in the Work	UNIABDN, NERC-NOCS, IFM-GEOMAR

WP objectives and starting point (max 500 characters)

The objective was to advance the capabilities of the BOBO lander to be interfaced with the EuroSITES mooring via the DCD nodes and to host additional sensors. The BOBO lander originally carried only a sediment trap, an ADCP and a Seabird CT + backscatter.

Work Performed *:*

At NIOZ, Dries Boone was employed to work on interfacing the existing sensors (ADCP, the CT and the sediment trap) with the DCD nodes. Boone held the contact with Develogics and got familiar with the entire modem structure and interfacing possibilities. Together with NIOZ personal Bob Koster they went for a 2 days training course to the DCD node manufacturer Develogics in Hamburg, Germany. Dries programmed parts of the ADCP and sediment trap interfacing and agreed with Jon Campbell on protocols to communicate to both systems via the satellite link. Bob Koster was involved in discussions about the camera system and how it could be interfaced to the modem. Jens Greinert overlooked followed the progress and kept contact to the other partners. The lander configuration was outlined and information about the expected payload was collected. The University of Aberdeen built the passive acoustic sensor - this will be shipped to NIOZ during the week 15^{th}-19^{th} February 2010 for implementation into the lander.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

Major costs were the employment of Dries Bone for 6 month, travel to and from Germany for sensor interfacing and programming training (Dries Boone, Bob Koster). Lander consumables as weights, batteries, frame material, and a dll library for programming of instrumentation. A sediment trap motor that allows to be re-programmed needed to be be purchased. The new motor will allow access to the sediment trap via two way communication interface card which is seen as an important demonstration of the project. The events will be monitored with a fluorometer/turbidity sonde with two way communication access that was required to be purchased as well. IFM-GEOMAR has purchased connectors and refurbished the Seismometer (5566,60€) for deploying the instrumentation at the PAP node lander.

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period		# Person-month Planned	Used
Personnel costs	IFM-GEOMAR: 0 MI: 0 NIOZ:25651,00 NERC-NOCS:0 UNIABDN: 15.000,00€	40,651.00 €	IFM-GEOMAR: 1 MI: 0 NIOZ: 7.5 NERC-NOCS: 1 UNIABDN: 1	IFM-GEOMAR: 1 MI: 0 NIOZ: 8 NERC-NOCS: 0 UNIABDN: 1
			10.5	**9.25**
Subcontracting	IFM-GEOMAR: 0 MI: 0 NIOZ: 0 NERC-NOCS: 0 UNIABDN: 0	0.00 €		
Travels	IFM-GEOMAR: 0 MI: 0 NIOZ: 3641,00 NERC-NOCS: 0 UNIABDN: 2000,00	5,641.00 €		
Consumables	IFM-GEOMAR: 13077,72 MI: 0 NIOZ: 3939,00 NERC-NOCS: 0 UNIABDN: 11000,00	28,016.72 €		
Other costs	IFM-GEOMAR: 0 MI: 7339,00 NIOZ: 0 NERC-NOCS: 0 UNIABDN: 0	7,339.00 €		
Total Costs		**€**		

WP # 1 progress

(from 01. May 2009 to 31. May 2010)

Progress towards objectives

Phase 1.1: *Implementation of CT & ADCP*

Interface the CT and the ADCP to the DCD node. This has been successfully undertaken. Currently a filter routine is developed to extract subsets of the ADCP data to be send via the DCD node in real-time mode

contractors involved: NIOZ

Phase 1.2: *Sediment trap 2-way communication*

Implementing a sediment trap that can be started and programmed by means of two way communication via surface and underwater telemetry. The trap sampling will be modified in response to sedimentation events.

contractors involved: NIOZ

Phase 1.3: *Improvement of turbid observations.*

Turbidity observations are key to many benthic processes. Two different types of turbidity sensors will be used in parallel to compare their performance. One sensor (Wetlabs FLNTUSB) has been purchased for this reason. The sensor data will be accessed in near-real time.

contractors involved: NIOZ

Phase 1.4: *Implementation of Optode*

An oxygen optode will be interfaced to the DCD node. This instrument will demonstrate the use of the DCD node for single logging.

contractors involved: IFM-GEOMAR, NIOZ

Phase 1.5: *Passive acoustics*

A passive bio-acoustic sensor package will be implemented to the lander (not interfaced to DCD node).

contractors involved: UNIABDN, NIOZ

Phase 1.6: *Sea floor photography*

A photo camera will be interfaced with the lander DCD node and has to be mounted on the lander. NOCS has ordered a system that will have the capability to store full resolution images internal and output low resolution images to an RS232 port in parallel.

contractors involved: NERC-NOCS, NIOZ

Phase 1.7: *Implementation of Geohazard instrumentation*

An ocean bottom seismometer (OBS) and a bottom pressure sensor will be used to retrieve geohazard relevante data. The OBS will be interfaced to the DCD node. The hardware needs to be implemented in the lander frame once the system is at NIOZ.

contractors involved: IFM-GEOMAR, NIOZ

Phase 1.8: Prepare the lander for deployment, mechanical incorporation of all new sensors + DCD node, transport logistics for deployment & recovery.

<u>contractors involved:</u> NIOZ

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

It was originally planned to have the mechanical work on the lander finished in month 9. This will now become month 10 as not all sensors are available at NIOZ to be properly implemented. It was planned to have a second, DCD node-interfaced CTD attached to the lander. This was plan cancelled.

Corrective actions:

No corrective actions required.

TABLE 1: WP#1 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D1.1	Adapt BOBO lander to host extra instruments	NIOZ	9	11	9.5	8.25
D1.2	Test BOBO lander for deployments including data records and telemetry	NIOZ, IFM-GEOMAR, NOCS, UNIABDN	12	12	0.5	0
D1.3	Integration and expectation of passive acoustics with other sensors o the BOBO lander	UNIABDN	18	18	0.5	0

TABLE 2: WP#1 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**

UPDATED BAR-CHART

<u>for all the WP tasks</u>: fill in the 'Planned' cells according to the time duration of the tasks as described in the implementation

<u>for the tasks/phases to be developed in the period of this report</u>: fill in the 'Actual' cells of the following table according to the actual or forecast duration of the task/phases.
(Example is reported below)

	May		**July**		**Sept**		**Nov**		**Jan**		**March**		**Deploy ment**		**July**		**Recovery & End of MODOO**
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP#1 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase 1.1-5 Planned	X	X	X	X	X	X	X	X	X								
Phase 1.1-5 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**							
Phase 1.6 Planned	X	X	X	X	X	X	X	X	X								
Phase 1.6 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**					
Phase 1.7 Planned	X	X	X	X	X	X	X	X	X								
Phase 1.7 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**							
Phase 1.8 Planned									X	X	X						X
Phase 1.8 Actual									**X**	**X**	**X**	**X**					**X**

WP # 2

(from 01. May 2009 to 31. May 2010)

WORKPACKAGE	2
Full WP title	Mooring component
Period covered	From 01. May 2009 to 31. May 2010
Partner Institution responsible of the WP	NERC-NOCS
Person in charge for the report (WP Leader)	R. Lampitt
Partners involved in the Work	NERC-NOCS, IFM-GEOMAR, NIOZ

WP objectives and starting point (max 500 characters)

The objective of this WP is to design the EuroSITES water column observatory to incorporate the needs to the MODOO mission. In particular the inductive link based communication between the CDC node and the surface control unit must be defined and programmed.

The data logging and telemetry system on the PAP mooring has already been used for the PAP mooring (first time in 2007). The system is based around a Persistor CF2 computer board linked to an Iridium 9522 modem, a Seabird inductive modem, a GPS receiver, a compass/pitch/roll unit and internal voltage/current/temperature monitors.

Work Performed *:*

Much of the design required for the new mooring has been completed and some of the hardware required has been purchased. This work is shared with EuroSITES preparation for the PAP deployment. The major enhancement is the installation of a new type of surface buoy (shared with the Met Office) which host a variety of air/sea exchange sensors, telemetry system and energy supply.

A document describing NERC-NOCS Iridium telemetry system has been written and delivered (D2.1). This document is the base to create a suitable interface of the Mooring and Lander DCD node.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

The main component of this project so far has been to design and develop the mooring. As a consequence most of the costs have been for labour and a much smaller part for procurement of hardware required.

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period		# Person-month Planned	Used
Personnel costs	IFM-GEOMAR: 0 NERC-NOCS: 8687	8687.00 €	IFM-GEOMAR: 1.0 NERC-NOCS: 13.0	IFM-GEOMAR: 1.0 NERC-NOCS: 11.92
			14.0	**12.92**
Subcontracting	IFM-GEOMAR: 0 NERC-NOCS: 0			
Travels	IFM-GEOMAR: 0 NERC-NOCS:353	353.00 €		
Consumables	IFM-GEOMAR: 0 NERC-NOCS:953	953.00 €		
Other costs	IFM-GEOMAR: 0 NERC-NOCS: 446	446.00 €		
Total Costs		**1,752.00 €**		

WP # 2 progress

(from 01. May 2009 to 31. May 2010)

Progress towards objectives

Phase 2.1*: Implementation of inductive linked DCD node into surface telemetry system*

telemetry A review of the PAP telemetry system was performed (see deliverable D2.1) to evaluate the compatibility and technical requirements for the DCD nodes with the telemetry. The mooring mounted DCD node will be integrated into the "standard" mooring inductive loop. The challenge is that the DCD node does not only send data to the surface telemetry on request but receives data (commands) from the surface buoy (event control/ two-way communication). In the upcoming months the integration will be continued and system will be tested.

contractors involved: . NERC-NOCS, NIOZ, IFM-GEOMAR

Phase 2.2*:Mooring design*

The design of the PAP mooring was developed (in collaboration with EuroSITES). The mooring now has a large surface buoy with own energy supply (solar panel) and several engineering option. The original plan to place the mooring DCD node at 1000m water depth has been revised for reasons of mooring construction, now the nodes are placed at nominal 40m depth in dedicated frame.

contractors involved: NERC-NOCS

Phase 2.3*: Mooring cruise preparation*

Preparation of the deployment and recovery cruises were made. An arrangement with the British Antarctic Survey (BAS) was made to deploy the mooring (and the lander WP1) with James Clarke Ross in May/June 2010. Cruise planning meetings and other related work must be done (documents as risk assessment, logistics etc.).

contractors involved: NERC-NOCS, NIOZ, MI, IFM-GEOMAR

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

NA

Corrective actions:

NA

TABLE 1: WP#2 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D 2.1	Document describing NERC-NOCS Iridium telemetry system	NERC-NOCS	2	2	0.5	0.5
D 2.2	Telemetry buoy modified to communicate with DCD nodes.	NERC-NOCS	10	12	2	0

TABLE 2: WP#2 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**

UPDATED BAR-CHART

for all the WP tasks: fill in the 'Planned' cells according to the time duration of the tasks as described in the implementation

for the tasks/phases to be developed in the period of this report: fill in the 'Actual' cells of the following table according to the actual or forecast duration of the task/phases.

(Example is reported below)

	May		July		Sept		Nov		Jan		March		Deploy ment		July		Recovery & End of MODOO
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP#2 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WP#2 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Phase 2.1 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X				
Phase 2.1 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Phase 2.2 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X				
Phase 2.2 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Phase 2.3 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
Phase 2.3 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**			**X**	**X**

WP # 3

(from 01. May 2009 to 31. May 2010)

WORKPACKAGE	3
Full WP title	Scientific and technological integration
Period covered	From 01. May 2009 to 31. May 2010
Partner Institution responsible of the WP	MI & IFM-GEOMAR
Person in charge for the report (WP Leader)	F. Grant & J. Karstensen
Partners involved in the Work	NIOZ, NOCS, MI, IFM-GEOMAR

WP objectives and starting point (max 500 characters)

The major step for the scientific integration of the observatory components is: standardization, interoperability and access to data (see also WP4). The technological integration includes the linking between the observatories (see also WP1 & WP2) and the link of the components/sensors. The integrating geostatistical variable is “time of observation” and here a central synchronization is due via the “data collection and dissemination” (DCD) nodes. The DCD nodes host data loggers, acoustic modems and a precise clock. The central time stamp is added to all incoming data on the logger. The DCD nodes are central to the MODOO Demomission as they fulfil the scientific and technological integration of the observatory modules.

Work Performed *:*

The DCD nodes are central to the MODOO Demomission as they fulfil the scientific and technological integration of the observatory modules. Financial and men month effort has been invested in creating/defining the DCD node requirements and in helping to adapt existing modems to fit the MODOO needs. Efforts has been spent in creating/defining the DCD node requirements. This process started by letting the whole MODOO consortium defining its needs (scientific and technological) followed by integrating the requirements with the help of MODOO engineers (NIOZ, NERC-NOCS, IFM-GEOMAR). Next was a to set up suitable test procedures – under laboratory conditions and after the system is in the water. The tests include hardware tests as well as electronic/handling which includes the data access and distribution concepts. The tests at the laboratory and at the sea

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

One major cost item was an ESONET NoE WP4 demo mission contribution to the purchase of the hardware that underlies the DCD nodes (based on the HAM.NODE by Develogic).

About half of the hardware cost have been charged to MODOO the other half was paid by institutional money (IFM-GEOMAR). The DCD nodes are of central importance for all participating partners and the MODOO system itself. A large part of the intellectual and design work within MODOO focus on the definition of the DCD node. This concerted design work was only possible through the unique partnership in this ESONET NoE demo mission. Through a parallel running exchange of personal training (MODOO connect) other ESONET partners outside of MODOO have been involved in the design process as well (IFREMER) and from which the MODOO partnership benefit substantially. Other major cost items were batteries to be used for the MODOO DCD nodes operation at PAP, communication costs to test the telemetry protocols of the Optode and travel costs for the deployment cruises.

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	**Actual costs(Euro) First period**		**# Person-month Planned**	**Used**
Personnel costs	IFM-GEOMAR: 5596,03 MI:1459,15 NIOZ: 0 NERC-NOCS: 0 UNIABDN: 0	1,459.15 €	IFM-GEOMAR: 6 MI: 6.9 NIOZ: 0.25 NERC-NOCS: 0.25 UNIABDN: 0	IFM-GEOMAR: 2.625 MI: 0.25 NIOZ: 0.125 NERC-NOCS: 0 UNIABDN: 0
			13.4	**3.0**
Subcontracting	IFM-GEOMAR: 0 MI: 0 NIOZ:0 NERC-NOCS: 0 UNIABDN: 0	0.00 €		
Travels	IFM-GEOMAR:1194,00: MI: 0 NIOZ: 0 NERC-NOCS: 0 UNIABDN: 0	1194.00 €		
Consumables	IFM-GEOMAR: 641,47 MI: NIOZ: NERC-NOCS: UNIABDN:	641.47 €		
Other costs	IFM-GEOMAR: 17765.44 MI: NIOZ: NERC-NOCS: UNIABDN:	17,765.44 €		
Total Costs		**€**		

WP # 3 progress

(from 01. May 2009 to 31. May 2010)

Progress towards objectives

Phase 3.1*: Definition of the scientific requirements for designing the DCD nodes.* To ensure that the DCD node design can help to facilitate the concerted scientific interpretation of the data we collected basic information on required sampling interval, sampling depth, accuracy of clock, etc. This information is used for Phase 3.2. One other important action was in phase 3.1. was to identify individuals that act as a contact for sensors (also in respect to ESONET NoE sensor registry).

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI, UNIABDN, AWI

Phase 3.2*: Definition of the technological requirements for designing the DCD nodes.* In this phase we collected specification of the instrumentation that will be mounted on the lander and mooring. Based on the specifications we selected a set of devices (also in reflection to Phase 3.1.) that is most useful in achieving the MODOO goals.

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI, UNIABDN, AWI

Phase 3.3*: Implementation of Phase 3.1. and Phase 3.2. results in DCD nodes design and programming* This is an on-going phase which includes the definition of the instrument ports, implementation of re-programming capabilities for certain instrumentation via telemetry, implementation of inductive link for data real time access and event control. This phase includes work for deliverable D3.2 (Report on technological development in MODOO DM (including DCD nodes)).

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI

Phase 3.4*: Preparation for deployment considering scientific and technological integration* This work is central in working towards Milestone M2 (test procedures finalized and evaluated) and M3 (MODOO system deployed and in operational mode). It considers the work in WP1 (lander component), WP2 (mooring component), and WP4 (data management). This phase includes work for deliverable D3.1 (Report on procedures for sea operations).

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI, UNIABDN

Phase 3.5*: Preparation for recovery and evaluation*
In this final phase preparation for a successful recovery will be done. The final evaluation of the system in terms of scientific and technological aspects will be done

contractors involved: IFM-GEOMAR, NERC-NOCS, NIOZ, MI, UNIABDN

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

The milestone M3 (*Shallow water test of DCD nodes with RV ALKOR, Baltic Sea/Gotland: Test of communication between submerged and near-surface DCD nodes: data retrieval, two way communication – due: month 6*) has been redefined as it turned out that more efficient and save testing procedures can be applied for the benefit of the project. The Responsible partner for deviation: IFM-GEOMAR.

As a second recovery cruise is now planned for September 2010, it was decided by the WP3 leaders that delivery of D3.1 (Report on procedures for sea operations) should be deferred to Month 17 (from Month 12). The resulting report will now incorporate both deployment and recovery at-sea operations information which will prove useful to the ESONET project. The Responsible partner for deviation: MI.

Because of the loss of the lander (including the lander DCD node) the some deliverables cannot be executed as planned.

Corrective actions:

The milestone M3 has been redefined (*Test procedures (dry, wet) for the DCD nodes finalized and evaluated*) but with a focus now on thorough tests of the system under more idealized conditions. This new testing strategy allows modification and intervention in case it is needed. It will although allow to take appropriate actions in case of failures. The due date was set to 12 – which is shortly before the deployment of the system.

D3.1 will now incorporate more information than previously planned due to a second recovery cruise for the MODOO system.

A new deployment at the MOMAR-D site is currently discussed for which it is believed that The deployment of the system will be in the period 14. to 30 August 2010. After all details of the final mooring design are clear – the MODOO Modem mooring could maybe recovered by Jermone Blandin (MOMAR-D partner) at the beginning of October 2010 as part of the MOMAR-D deployment cruise.

Relevance of the planned activity in context of the MODOO GA:

1) deployment/recovery - contribution to D3.1. ("operations at sea") and Milestone M3 ("MODOO system deployed and in operational mode")

2) ADCP data will be downloaded from the ship - contribution to D3.2.("Report on technological development in MODOO DM (including DCD nodes)")

3) Sampling of ADCP will be changed via surface modem - contribution to MODOO milestone M5 ("event control")

TABLE 1: WP#3 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D 3.1	Report on procedures for sea operations	MI	14	17	7	0.25
D 3.2	Report on technological development in MODOO DM (including DCD nodes)	IFM-GEOMAR	14	17	4	0

TABLE 2: WP#3 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**
M 1	Order and Purchase of DCD nodes	Month 2	Month 4
M 2	Test procedures (dry, wet) for the DCD nodes finalized and evaluated	Month 12	Month 12
M 3	MODOO system deployed and in operational mode	Month 15	Month 13
M5	Control of selected sensors via satellite/acoustic underwater telemetry system (demonstrate event triggered control)	Month 17	Month 17

UPDATED BAR-CHART

<u>for all the WP tasks</u>: fill in the 'Planned' cells according to the time duration of the tasks as described in the implementation

<u>for the tasks/phases to be developed in the period of this report</u>: fill in the 'Actual' cells of the following table according to the actual or forecast duration of the task/phases.
(Example is reported below)

	May		July		Sept		Nov		Jan		March		Deploy ment		July		Recovery & End of MODOO
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP#3 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase 3.1 Planned	X	X	X	X													
Phase 3.1 Actual	**X**	**X**	**X**	**X**													
Phase 3.2 Planned		X	X	X	X	X											
Phase 3.2 Actual			**X**	**X**	**X**	**X**											
Phase 3.3 Planned				X	X	X	X	X	X	X	X						
Phase 3.3 Actual				**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**						
Phase 3.4 Planned									X	X	X	X	X				
Phase 3.4 Actual									**X**	**X**	**X**	**X**	**X**				
Phase 3.4 Planned												X	X	X	X	X	X
Phase 3.4 Actual												**X**	**X**	**X**	**X**	**X**	**X**

WP # 4

(from 01. May 2009 to 31. May 2010)

WORKPACKAGE	4
Full WP title	Data management and outreach
Period covered	From 01. May 2009 to 31. May 2010
Partner Institution responsible of the WP	NERC-NOCS
Person in charge for the report (WP Leader)	M Pagnani
Partners involved in the Work	NERC-NOCS

WP objectives and starting point (max 500 characters)

The MODOO project data management will be an extension of the systems already being undertaken under the auspices of EuroSITES. This will enhance links between EuroSITES and ESONET NoE data management principles. A large range of data types will be handled in real-time, including meterological air/sea exchange instrumentation, water column and sea floor lander. Real-time data will be quality controlled and displayed on the MODOO and EuroSITES's websites. If appropriate, data will also be made available to scientists via the GTS (Global Telecommunication System) and in the OceanSITES data format.

After recovery of the system (planned for September 2010), the delayed mode datawill be processed by the nominated Principal Investigator for each sensor or instrument. Quality controlled outputs will then be made available to the general public in OceanSITES format.

Work Performed *:*

During this pre-deployment phase of MODOO links with the Principal Investigators have been establish and meta-data such as the number and types of sensors to be used on the mooring and lander have been gathered. The serial numbers of the hardware, which is planned to be used, have also been recorded.Recording logs for use during the deployment cruise have also been developed to ease the task of recording significant events during the cruise and to collate this essential metadata in one place. Searching for and collecting metadata after deployment can be time-consuming. Requirements for reading GTS data (meteorological variables) and placing data (water column variables) on the GTS system are being specified.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

This package does not plan to buy any MODOO specific items.

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period	# Person-month Planned	Used
Personnel costs	NERC-NOCS: 3528	2.25	0.5
Subcontracting	NERC-NOCS: 0		
Travels	NERC-NOCS: 0		
Consumables	NERC-NOCS: 0		
Other costs	NERC-NOCS: 0		
Total Costs	3,528.00 €		

WP # 4 progress

(from 01. May 2009 to 31. May 2010)

Progress towards objectives

Phase 4.1: *Web site*

Create web design and populate with project information. Continue updating web pages as project develops.

contractors involved :*NERC-NOCS*

Phase 4.2: *Meta-data collection and processing preparation*

Collate pre-deployment meta-data. Identify MODOO data sets and create systems to process.

contractors involved : *NERC-NOCS*

Phase 4.3: *Test data*

Process test data.

contractors involved : *NERC-NOCS*

Phase 4.4: *Data interoperability*

Collate deployment meta-data. Collate calibration data. Process real-time data. Publish data via web and ftp.

contractors involved : *NERC-NOCS*

Phase 4.5: *Documentation on interoperability*

Finalize documentation ready for post-recovery processing, and inclusion in final project report.

contractors involved : *NERC-NOCS*

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

NA

Corrective actions:

NA

TABLE 1: WP#4 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D4.1	MODOO web presence established	NERC-NOCS	4	1	0.1	0.1
D4.2	Test data processed	NERC-NOCS	12	12	0.4	0.4
D4.3	Test outputs from data received via satellite	NERC-NOCS	15	13	0.75	0
D4.4	Live data processed and presented on web/ftp	NERC-NOCS	17	14	0.5	0

TABLE 2: WP#4 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**
M4	Receive and preliminary processing of real time data:Quality control of real time data (based on international standard if available),QC Real time data is made public available (Coriolis data centre via EuroSITES)	14	14

UPDATED BAR-CHART

	May		July		Sept		Nov		Jan		March		Deploy ment		July		Recover y & End of MODOO
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP 4 planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase4.1 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
Phase 4.1 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**									
Phase 4.2 Planned								X	X	X	X	X	X				
Phase 4.2 Actual																	
Phase 4.3 Planned										X	X	X					
Phase 4.3 Actual																	
Phase 4.4 Planned													X	X	X	X	X
Phase 4.4 Actual																	
Phase 4.5 Planned																X	X
Phase 4.5 Actual																	

WP # 5

(from 01. May 2009 to 31. May 2010)

WORKPACKAGE	2
Full WP title	Coordination
Period covered	From 01. May 2009 to 31. May 2010
Partner Institution responsible of the WP	IFM-GEOMAR
Person in charge for the report (WP Leader)	J. Karstensen
Partners involved in the Work	NERC-NOCS, IFM-GEOMAR, NIOZ

WP objectives and starting point (max 500 characters)

The WP 5 objective is managing the DM MODOO. This includes reporting, coordinating communication internal & external, meetings, teleconferences etc.

Work Performed *:*

Shortly after the official project start (01. May 2009) a kick-off meeting was organized and held from the 07. May to 08. May 2009 at NERC-NOCS Southampton (see attached agenda & meeting notes). Other meetings (also in collaboration with the “exchange of personal” MODOO connect) have been held in December 2009, April 2010. Preparatory work for the reports to ESONET NoE WP4 have been made. Project updates and request have been posted to the partners.

Rough Estimation of Major Cost: *Explanatory note on any major cost roughly estimated of items such as major travel costs, large consumable items etc., justifying their necessity to the project.*

No major costs are associated with this WP

Overview of the Actual Major Costs, *by major cost item including personnel (fill in the Table here below)*

Type of expenditure	Actual costs(Euro) First period		# Person-month Planned	Used
Personnel costs	IFM-GEOMAR:0	0	IFM-GEOMAR: 4 NIOZ: 0.25	IFM-GEOMAR: 2.5 NIOZ: 0
			4.25	**2.5**
Subcontracting	IFM-GEOMAR:0	0		
Travels	IFM-GEOMAR: 1.041,93€	1.041,93		
Consumables	IFM-GEOMAR:0	0		
Other costs	IFM-GEOMAR:0	0		
Total Costs		**1.041,93€**		

WP # 5 progress

(from 01. May 2009 to 31. May 2010)

Progress towards objectives

Phase 5.1: *Reporting*

Reporting includes reports to ESONET NoE as well as internal communication between partners. External reporting to the science community have been prepared (e.g. conference applications EGU 2010, Liege symposium 2010).

contractors involved: IFM-GEOMAR & all

Phase 5.2: *Meetings*

The kick-off meeting have been organized and held. Updating emails have been send to all partners. May partners participated in the deployment (JCR 221) and informal meeting where held there. A teleconferences on the progressing, in particular for the objectives of the CE cruise in September 2010 and for a new short term deployment cruise in August 2010 (Poseidon at MOMAR-D field) will be discussed. Oral and Poster presentations have been prepared and presented at scientific meetings to communicate ESONET and MODOO objectives to outside of the project. A final meeting will be held after the recovery cruise.

contractors involved: IFM-GEOMAR & all

Deviations from the project work programme, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*

Deviations:

NA

Corrective actions:

NA

TABLE 1: WP#5 DELIVERABLES LIST *(list and status of the deliverables of the WP)*

Del.n. *(insert deliverable num.)*	**Deliverable name Workpackage** *(insert deliverable title)*	**Responsible partners of the deliverable**	**Due Date** *(insert month according to the DM implementation plan)*	**Actual or Forecast delivery date** *(month)*	**Estimated indicative person months** *(insert month according to the DM implementation plan)*	**Used indicative person months**
D 5.1	6 month progress reports to ESONET WP4	IFM-GEOMAR	8 & 17	8 & 17	2	1
D 5.2	Final report including: Evaluation of system performance and recommendation for future work, MODOO Data Management systems performance	IFM-GEOMAR, MI, NIOZ, UNIABDN, NERC-NOCS, AWI	17	17	5	0

TABLE 2: WP#5 MILESTONES LIST *(list and status of the Milestones linked to the WP)*

Milestone n.	**Milestone name**	**Due Date** (project month)	**Actual or Forecast date**

UPDATED BAR-CHART

	May		July		Sept		Nov		Jan		March		Deploy ment		July		Recover y & End of MODOO
Project month	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**
WP#5 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
WP#5 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**
Phase 5.1 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X				
Phase 5.1 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Phase 5.2 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X				
Phase 5.2 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**				
Phase 5.3 Planned	X	X	X	X	X	X	X	X	X	X	X	X	X			X	X
Phase 5.3 Actual	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**	**X**			**X**	**X**

Appendix

Meeting notes:

Agenda Kick-off MODOO and MODOO connect
NOCS, 7. May 2009 (09:00-17:30) – 8. May 2009 (09:00-12:00)

Day 1: Thursday 7. May 2009
Conference Room 344/32 (Level 4 near cafeteria)

08:30 Meet at NOCS reception/main entrance
09:00 Welcome
Introduction of Participants
Logistics
Objectives of Meeting
Agenda Modifications
MODOO and MODOO connect: Overview

Presentation of MODOO Science
09:30 Science core mission (Henry, Jens, Johannes)
Science guest missions:
- Deep Sea Marine Life (Acoustic, Camera) (Jens, Anne)
- Geohazard (NN POL, Johannes)

Discussion on requirements/expectations for successful science missions:
- data availability and science requirement on data availability (with input from Maureen) including data retrieval from moving platforms: ship, AUV – opportunities?
- two - way communication: which instruments needs to be controlled?
- Expertise in programming of instruments (e.g. MODE 12 on 1200kHz ADCP, minimum sampling requirement to resolve tidal signals), list of "sensor" contacts/expertise
- interaction with ESONET WP1 & WP 3 (Henry)
- How long is a time series? Discussion on long term visions – MODOO@PAP and beyond...

In between: Coffee break (room next door 344/38)

Administrative aspects (MODOO & MODOO connect)
11:30 Finances:
- MODOO (as part of ESONET NoE WP4 task a & b)
- MODOO connect (as part of ESONET NoE WP1 task a)

12:00 – 13:00 Lunch break in NOCS canteen – own expenses

Presentation of MODOO Technology (shared with MODOO connect)
13:00 Discussion on technological aspects of MODOO

MODOO components (with current status)
- BOBO Lander (Jens & Dries)
- PAP Mooring (Richard, Jon)

More details on platform payload:
- seismometer/bottom pressure
- camera systems

- surface telemetry system at PAP (Jon)
- Generic sensor package (Henry, Jens)
- status of DCD nodes (integration of camera!!!) and Underwater acoustic modems: experiences, tests

Standardization, quality control, calibration (with link to WP2 of ESONET)

Interaction with ESONET WP5 (stand-alone observatories)

15:00-15:30 Coffee break (room next door 344/38)

Time line of project
15:30 Review and update of timing of the project

- Implementation plan
- Milestones, deliverables
- Update cruise schedule – possibilities of cruise participation, required technical expertise on board
- Meetings (ESONET, others) – Bremen IEEE session Thursday afternoon
- web page

17:30 End of first day

19:00 Dinner at: tba. (own expenses)

Day 2: Friday 8. May 2009 ***Meeting room 1/Plate 251 (Ground floor/entrance level)***

Continuation of Technology (shared with MODOO connect)
08:30 Meet at NOCS reception
09:00 Summary of first day in respect to technological requirements

Discussion on technical issues:

7. The DCD node in more details (requirements, ports, …)
8. Integration of camera(s)
9. Integration of DCD node into surface telemetry
10. two-way communication with instruments (camera, seismometer)

In between: Coffee break (in room)

11. Sensor list (XLS file)
12. mooring requirement (steel wire, break load of DCD frame, launching procedure)
13. Lander requirements (maximum payload, specific launching e.g. which crane is available for deployment/recovery ship dependent...)
14. Underwater modem manufacturer

Summary of tasks, define action items – planning for next MODOO connect exchange
12:00 End of second day and end of meeting

Update on MODOO after 7./8. May 2009 meeting at NOC Southampton.

Table of Contents

Infrastructure and sensors

BOBO lander

For operation at sea at well as for deployment calculations the exact dimensions (length, weight, etc..) of instruments and batteries are required. This information is requested for:

- Deliverables 'calibration, test, deployment and recovery' aka 'operation at sea'

Easiest would be a list of sensor weights, both “in air” and “in water” to estimate the total weight + dimension of the lander for deployment and to do the buoyancy calculations.

Sensor list needs one “responsible” for each instrument + column with dimensions.

Table: Specification of MODOO sensors

Instrument/Parameter	Model	responsible
CT (C, T, 1x OBS, Fluorometer)	SBE 16	Jens G. (NIOZ)
ADCP currents/ echo intensity	Teledyne RDI workhorse 1200kHz	Jens G. (NIOZ)
Oxygen logger	Aanderaa Optode 3830	Andreas P. (IFM-GEOMAR)
Bottom pressure sensor 1	Parascientific	Kevin H (POL)
Bottom pressure sensor 2 & Seismometer	Parascientific with SEND recorder	Ernst F. (IFM-GEOMAR)

Sea & Sun multisonde		Jens G. (NIOZ)
Sediment trap		Jens G. (NIOZ)
Still camera 1	Imenco SDS1210	Henry R. (NOCS)
Still camera 2	NIOZ: ???	Jens G. (NIOZ)
Passive acoustic		Anne H. (UNIABDN)
ARGOS mooring/lander locator		Andreas P. (IFM-GEOMAR)
Lander DCD node	Develogic HAM.NODE	Johannes K.(IFM-GEOMAR)
Mooring DCD node	Develogic HAM.NODE + with extened housing for battery (without frame!!)	Johannes K.(IFM-GEOMAR)
Oxygen respiration	IODA 6000	Richard L. (NOCS)

To keep the DCD nodes as much at a “generic level” as possible, it was agreed that an interface module (like the COSTOF of the BOREL buoy presented by Jermone B.) shall be used/constructed.

PAP Mooring
It was discussed that it can be very useful to have an IODA oxygen respiration rate system not only on the mooring (part of EuroSITES) but also on the lander.

Action Richard: Approach Dominique Lefevre to see if he can provide an additional IODA system for installation at the BOBO lander and check data availability: it was not clear if the IODA is with a data logger or with real-time data only (no internal storage).

Components of the PAP mooring have been shown to us (surface buoy, biogeochemical sensor frame).

DCD nodes
Jerome reported on tests performed at the IFREMER with underwater acoustic modems. Also the results have been kept anonymous it interesting to hear about the different methods to evaluate the instrumentation.
NIOZ will design an interface board

It is expected that the communication strategy between PAP telemetry and MDCD node will require quite a bit of exchange between NOCS and the modem manufacturer (very likely Develogics http://www.develogic.de/en/products/ham_node/index.php).

Specific Instrumentation
Passive acoustics:
dimension of device 35kg, 50cm long
sampling: 240 hours with 24 bit, typical operation frequency: 16kHz (1Hz – 96kHz possible)

Action Anne: Provide more details about passive acoustic

Seismometer (OBS) & Ocean bottom pressure sensor (OBP):
POL (Kevin Horsburgh) will provide an OBP which, if real time access is requested, will connect to the LDCD node via cable/RS232. As the scientific core mission of the MODOO application at PAP is not on geohazards only a subset of the data will be transferred. The size of the data that will finally be transferred depends on the availability of bandwidth after all core mission data has been considered.

IFM-GEOMAR will provide a combined OBS/OBP instrument. The data can be accessed sequentially and for arbitrary time intervals. The instrument needs to be decoupled from the lander (e.g. time triggered release or corrosion wire) to ensure high quality data. Exact this instrument has been used for Geohazard monitoring with acoustic real time telemetry several times before (GITEWS).

Action Kevin: provide details about OBP, including interface requirements, protocols. Is a sequential and targeted data retrieval possible (e.g. retrieval of data collected at a certain time interval, say 5 minutes, 3 weeks ago between 21:00 and 21:05) or only a complete set of data?
Can the OBP be installed directly on the lander or does it need to be separated? If both systems (POL and IFM-GEOMAR) are installed the coherence of the measurements can be investigated – particularly an assessment of the initial drift, which often hampers the use to determine long term trends, would be of scientific interest.

ADCP:
It would be useful to switch between water current and turbulence measurements (Mode 12 Teledyne- RDI 1200kHz) for boundary layer investigations.

Action Jens: Check if boundary layer turbulence measurements are of use (With NIOZ Hans van Haarem) and investigate if switch between the normal and the mode 12 can be done via two-way-telemetry/RS232 port of ADCP and what the mode 12 requires in terms of a 1 year deployment period.

The 75kHz (??) ADCP from MI should for reasons of the mooring design not installed on the PAP mooring – is an installation on the BOBO lander (upward looking) possible of use? And technically feasible (pressure rating of housing)?

Action Fiona: Communicate ADCP pressure rating.

Sediment trap:
The BOBO Lander will have a sediment trap on board. It was discussed if this makes sense because of unknown/degraded trapping efficiency. NIOZ will decide if they want to deploy or not.

Cruises

The PAP cruise proposal for July 2010, where a short activity was the installation of MODOO, has been rejected. However, it is very likely that a shorter (maybe a few days only) cruise to the PAP site for the PAP/MODOO installation will be possible. This is currently under negotiation. A second possibility is using the Irish “Celtic Explorer”. As Fiona told us before and also in a recent email, the MI can apply for ship time on rather short notice.

Mainly for weather reasons the time window for the cruise shall be between 1. June – 15. August. In case of a dedicated MODOO cruise more partners could attend (if needed). The following advantages/disadvantages were identified for earlier and later deployment:

Earlier deployment

- Less time for preparations (not good)
- Longer time series of observations (good)
- Having the installation at place during the spring bloom – which might be nice to have in the data (good)

Later deployment

- More time for preparations (good)
- Shorter time series (not good)

There will be no extra recovery cruise of the MODOO system before the “official” exchange in Summer 2011.

Action Richard: Please inform us about any outcome of the ship time negotiations for summer 2010.

Data Management and accessibility:

Initial access point for data is the EuroSITES data centre at NOCS.
The existing real time data quality control protocols will be extended to handle the new (non EuroSITES) types of data.

Action all: Instruments need to be registered at the ESONET sensor registry. Found link at http://dataportals.pangaea.de/esonet/index.php/sensor but so far not accessible.

Outreach:

MODOO website will be installed (draft at http://www.noc.soton.ac.uk/eurosites/modoo/ - ask for username/password)

Action Maureen: Reserve an http://www.modoo.info/, maybe at http://www.europeregistry.com/?? 18 Euros a year (two years minimum) and transfer website to it.

Deliverables and concepts with feedback to ESONET NoE

Henry mentioned that it is useful to test the functioning of a generic sensor package. The DCD nodes can be seen like such a "package" - as all data from connected sensors are merged and a dedicated time stamp is added. As part of ESONET NoE WP3 (task b) Henry & Jens have been part of a group which considered the following variables to be "generic" (D13). As passive acoustics is irrelevant for biogeochemistry (and to my knowledge also for Physical Oceanography) this has to be see with a question mark.

Table: Generic variables list.

Variable	Geosciences	Physical Oceanography	Biogeochemistry	Marine Ecology
Temperature	X	X	X	X
Conductivity	X	X	X	X
Pressure	X	X	X	X
Dissolved O2	X	X	X	X
Turbidity	X	X	X	X
Ocean currents	X	X	X	X
Passive acoustics	*X*	-	-	*X*

Unfortunately it was not possible to have MODOO being represented at the IEEE09 in Bremen. For the next "All Regions" workshop in Paris and the "Best Practice" workshop in Brest MODOO will be represented as probably most of us will be at one or the other (I will attend both workshops).

Future perspective

Discuss further plans at the PAP site at a workshop before the ESONET all regions workshop 5.-7.10.2009 Paris, further details to be defined.
Requires a regional implementation committee (RIC – WP3 task a)
Next EU call "Deep Sea Frontier" (expected 2010/2011) - shall MODOO be part of potential proposals
Other possible installations of MODOO:
A possible installation at the CIS site in the Central Irminger Sea should be discussed. The site is potentially shared by US/OOI and the European programm.

In respect to a tropical ocean application, Doug Wallace (IFM-GEOMAR) expressed his interest during a recent EuroSITES meeting to have a MODOO application at the Cape Verde observatory (part of EuroSITES).

Finances

The so called Grant agreement has been send out to all. It is requested from all to have it signed by the "representative" of the institute and to be send back. It is very important that each partner quickly arranges for the signature.
The ESONET coordinator notified us that we can not expect to have the "advance money" before Sept. 2009.

Project contract no. 036851

ESONET

European Seas Observatory Network

Instrument: **Network of Excellence (NoE)**
Thematic Priority: **1.1.6.3 – Climate Change and Ecosystems**
Sub Priority: **III – Global Change and Ecosystems**

MoMAR-D Demonstration Mission

Periodic Reports

Start date of project: **March 2007** Duration: **48 months**

Start date of the Demonstration Mission: **February 2008** Duration: **36 months**

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

ESONET Demonstration Missions

1st Periodic Activity Report

The Periodic Activity Report contains an overview of the activities carried out during the reporting period, describes the progress in relation to the project objectives, the progress towards the milestones and deliverables set for the period, and any problems encountered and corrective actions taken.

This document has to be filled in with reference to the DM Implementation plan. This means that Deliverables, Milestones and WPs have to be the same as in the DM Implementation plan.

The Periodic Report contains 2 parts:
- Part I: it is addressed to the coordinator with minimum input from the partners
- Part II: it is addressed to each WP Leader and reports a detailed update of each WP activity at task level.

The report includes a rough justification of the costs incurred and of the resources deployed by each contractor linking them to activities implemented and justifying their necessity.

Finally the report contains information on use and dissemination activities.

Reporting period:
30 September 2008

Part I *(to be filled by the DM coordinator)*

In January 2008, the MoMARSAT cruise proposal, core of the MoMAR-D project, was submitted to the French Fleet Committee. After evaluation, the cruise has been prescheduled for the summer 2010. The activity of the MoMAR-D DM was then postponed to cope with this new schedule. The MoMAR-D project actually started in September 2008. This first report does not contain the part II and only presents the updated schedule.

DM acronym:	MoMAR-D
DM title:	MoMAR-Demonstration
ESONET Site:	Azores- MoMAR, Lucky Strike hydrothermal field
Scientific Area(s):	SArea1 : physical oceanography processes
	SArea2 : hydrothermal processes
	SArea3 : biodiversity
Technological Area(s):	TArea1 : interoperability, data transmission, power supply
DM Start date:	*September 2008*
DM duration:	*24*
Period of the reporting	September 2008

Partner Num.	**Institution Name**	**PI**	**PI coordinates**
1	DOP/UAÇ	A. Colaço	IMAR- Dept Oceanography and Fisheries-Univ of Azores, acolaco@uac.pt
2	FFCUL/CGUL	M. Miranda	Centro de Geofisica, Universidade de Lisboa, jmmiranda@fc.ul.pt
3	IPGP	M. Cannat	Equipe de Géosciences Marines. Institut de Physique du Globe de Paris. CNRS UMR 7154 cannat@ipgp.jussieu.fr
4	NOC	D. Connelly	Geochemistry Group National Oceanography Centre dpc@noc.soton.ac.uk
5	CNRS - F CNRS - C	V. Chavagnac J. Goslin	LMTG - UMR 5563 UR 154 CNRS Université Paul-Sabatier IRD Observatoire Midi-Pyrénées - chavagnac@lmtg.obs-mip.fr UMR6538 "Domaines Oceaniques" U.Bretagne Occidentale-CNRS IUEM - Jean.Goslin@univ-brest.fr
6	Univ. Bremen	C. Waldmann and M. Fabian	University of Bremen/MARUM waldmann@marum.de University of Bremen Department 5, Geosciences Sea Technics / Sensors marcus.fabian@uni-bremen.de
7	Ifremer	P.M. Sarradin	Ifremer Brest, DEEP/Laboratoire Environnement Profond BPierre.Marie.Sarradin@ifremer.fr
8	SOPAB	S. Ghiron	Océanopolis sylvain.ghiron@oceanopolis.com

Associated partners

9	UPMC-LOCEAN Associé P# 3	G. Reverdin	LOCEAN, Univ. Paris VI, boite 100, gilles.reverdin@lodyc.jussieu.fr
10	CVARG Associé P#1	Gabriela Queiroz	Centro de Vulcanologia e Avaliação de Riscos Geológicos - Universidade dos Açores - Maria.GP.Queiroz@azores.gov.pt

WP#	WP/Activity name	Leader
1	Scientific experiments	M. Cannat (P#3)
2	Infrastructure of the observing system	J. Blandin (P#7)
3	Data management	T. Carval (P#7)
4	Site management	A. Colaço (P#1)
5	Communication plan	J. Sarrazin (P#7)
6	Cruise	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)
7	Management	A. Colaço (P#1) & P.M. Sarradin (P#7)

Executive summary

The MoMAR (Monitoring the Mid Atlantic Ridge) initiative aims at providing multidisciplinary time-series data set for hydrothermal systems in the Azores region of the Mid-Atlantic Ridge. This coordinated plan aims at determining the feed-backs between volcanism, deformation, seismicity, and hydrothermalism, and to understand how hydrothermal ecosystems couple with these sub-surface processes, and how this affects exchanges with the ocean.

Monitoring at Lucky Strike has started with the MoMARETO (ecology), GRAVILUCK (geodesy), and BBMoMAR (sismology and MT) experiments and will be further implemented in 2008 with the deployment of autonomous temperature probes at selected vents. MoMARSAT will maintain and reinforce these experiments, with a stronger participation of colleagues from other European countries. MoMARSAT is the cruise proposal to implement the MoMAR-D project.

We will use the SEAMON technology developed during the ASSEM EC project, with two nodes acoustically linked to a surface buoy that will ensure satellite communication to a land base station. The system will comprise 2 scientific nodes: a geophysical node moored in the Lucky Strike lava lake, and a geochemical/ecological node at the Eiffel Tower vent site. This observatory infrastructure will acquire a synchronized multidisciplinary data set, and allow us to develop solutions for sensor interoperability, shore-sensor interactive communication, data management and dissemination, and public outreach.

MoMARSAT comprises two multidisciplinary ROV cruises, the first one is prescheduled in 2010 to deploy the acoustically-linked multidisciplinary observing system at the Lucky Strike vent field and the second one in 2010 to recover it. The study area belongs to the Portuguese ZEE and is part of a planned OSPAR “Marine Protected Area”.

Progress of the project

In January 2008, the MoMARSAT cruise proposal was submitted to the French Fleet Committee. After evaluation, the cruise has been prescheduled for the summer 2010. The activity of the MoMAR-D DM was then postponed to cope with this new schedule. The MoMAR-D project actually started in September 2008. The first MoMAR-D plenary meeting will be held in early 2009.

Table 1: Deliverables List

	Deliverable Name	**WP**	**Lead contractor**	**Due date**	**Actual/ Forecast delivery date**
D1	**Cruise proposal submission**	**WP6**	**M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)**	**01/08**	**01/ 2008**
D2	Report Description of the operational system : interface specifications, sensors, localisation	WP2	J. Blandin (P#7)	03/09	
D3	Signed agreement Data management policy	WP3	T. Carval (P#7)	03/09	
D4	Communication plan	WP5	J. Sarrazin (P#7)	03/09	
D5	On shore integration and test report	WP2	J. Blandin (P#7)	12/09	
D6	Cruise preparation file	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	03/10	
D7	Deployment of the system during the cruise	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	08/10	
D8	1 month data file	WP1-WP3	M. Cannat (P#3) T. Carval (P#7)	09/10	
D9	Report of dissemination activities	WP5	J. Sarrazin (P#7)	10/10	

Indicative staff effort per partners

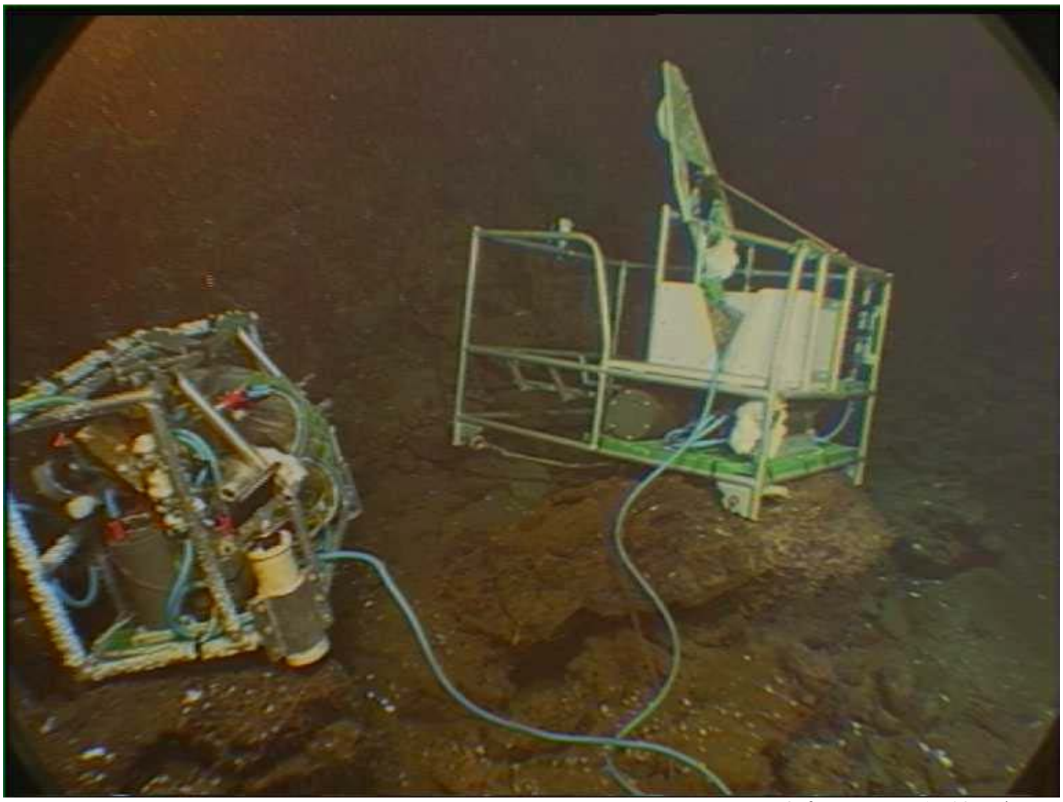
P#			WP1	WP2	WP3	WP4	WP5	WP6	WP7	**Total**
P#1	DOP/UAÇ	Pt	2	0.5		2	2.5	3	1	**11**
P#2	FFCUL/CGUL	Pt	3	0.5	0.5	0.5	0.5	2		**7**
P#3	IPGP	Fr	19	10	4	2	1	10		**46**
P#4	NOC	UK	16.5	4	0.5	0.5	0.5	3		**25**
P#5	CNRS - F	Fr	9.5		0.5			2		**12**
P#6	CNRS - F	Fr	8		0.5	0.5		2		**11**
P#7	Univ. Bremen	Ge	3	2	0.5		0.5	2		**8**
P#8	Ifremer	Fr	6	12.5	1.5	0	1	15	1	37
P#9	SOPAB	Fr					0.5	0.5		**1**
P#10	UPMC-LOCEAN	Fr	1	1	0.5			1.5		**4**
P#11	CVARG	Pt			0.5	1	0.5			**2**
	Total		**68**	**30.5**	**9**	**6.5**	**7**	**41**	**2**	**164**

Table 2: Milestones List

Milestone	Milestone name	WP	Due date	Actual/Forecast delivery date	Lead contractor
M1	**Submission of a cruise proposal to the French fleet**	**WP6**	**01/2008**	**01/2008**	**P#3 and P#7**
M2	Data management policy	WP2, WP3, WP5	03/ 2009		P#7
M3	On shore integration and test report	WP2	12/2009		P#7
M4	Deployment of the system 20 days Cruise	WP6	08/2010		P#3 and P#7

ESONET Demonstration Missions

MoMAR-D



2nd Periodic Activity Report

P.M. Sarradin and A. Colaço

September 2009 – May 2009

DEEP LEP 09 27

Part I

DM acronym:	MoMAR-D
DM title:	MoMAR-Demonstration
ESONET Site:	Azores- MoMAR, Lucky Strike hydrothermal field
Scientific Area(s):	SArea1 : physical oceanography processes SArea2 : hydrothermal processes SArea3 : biodiversity
Technological Area(s):	TArea1 : interoperability, data transmission, power supply
DM Start date:	September 2008
DM duration:	24
Period of the reporting	**September 2008 – May 2009**

Partner Num.	Institution Name	PI	PI coordinates
1	DOP/UAÇ	A. Colaço	IMAR- Dept Oceanography and Fisheries-Univ of Azores, acolaco@uac.pt
2	FFCUL/CGUL	M. Miranda	Centro de Geofisica, Universidade de Lisboa, jmmiranda@fc.ul.pt
3	IPGP	M. Cannat	Equipe de Géosciences Marines. Institut de Physique du Globe de Paris. CNRS UMR 7154 cannat@ipgp.jussieu.fr
4	NOC	D. Connelly	Geochemistry Group National Oceanography Centre dpc@noc.soton.ac.uk
5	CNRS - F CNRS - C	V. Chavagnac J. Goslin	LMTG - UMR 5563 UR 154 CNRS Université Paul-Sabatier IRD Observatoire Midi-Pyrénées - chavagnac@lmtg.obs-mip.fr UMR6538 "Domaines Oceaniques" U.Bretagne Occidentale-CNRS IUEM - Jean.Goslin@univ-brest.fr
6	Univ. Bremen	C. Waldmann and M. Fabian	University of Bremen/MARUM waldmann@marum.de University of Bremen Department 5, Geosciences Sea Technics / Sensors marcus.fabian@uni-bremen.de
7	Ifremer	P.M. Sarradin	Ifremer Brest, DEEP/Laboratoire Environnement Profond BPierre.Marie.Sarradin@ifremer.fr
8	SOPAB	S. Ghiron	Océanopolis sylvain.ghiron@oceanopolis.com

Associated partners

9	UPMC-LOCEAN with P# 3	G. Reverdin	LOCEAN, Univ. Paris VI, boite 100, gilles.reverdin@lodyc.jussieu.fr
10	CVARG with P#1	Gabriela Queiroz	Centro de Vulcanologia e Avaliação de Riscos Geológicos - Universidade dos Açores - Maria.GP.Queiroz@azores.gov.pt

Executive summary

The MoMAR (Monitoring the Mid-Atlantic Ridge) project was initiated 10 years ago by the InterRidge Program to promote and coordinate long-term multidisciplinary monitoring of hydrothermal vents in the Azores region of the Mid-Atlantic Ridge This coordinated plan aims at determining the feed-backs between volcanism, deformation, seismicity, and hydrothermalism, and to understand how hydrothermal ecosystems couple with these sub-surface processes, and how this affects exchanges with the ocean.
Monitoring at Lucky Strike has started with the MoMARETO (ecology), GRAVILUCK (geodesy), and BBMoMAR (sismology and MT) experiments and will be further implemented in 2008 with the deployment of autonomous temperature probes at selected vents.
The MoMAR-D project was selected by ESONET as a demonstration mission to deploy and manage a multidisciplinary observing system at Lucky Strike during one year. Lucky Strike is a large hydrothermal field located in the center of one of the most volcanically active segment of the MAR. Monitoring this field offers a high probability of capturing evidence for volcanic events, observing interactions between faulting, magmatism and hydrothermal circulations and, evaluating their links with the dynamics of hydrothermal fauna.
We will use the SEAMON technology developed during the ASSEM EC project, with two nodes acoustically linked to a surface buoy that will ensure satellite communication to a land base station. The system will comprise 2 scientific nodes: a geophysical node moored in the Lucky Strike lava lake, and a geochemical/ecological node at the Eiffel Tower vent site. This observatory infrastructure will acquire a synchronized multidisciplinary data set, and allow us to develop solutions for sensor interoperability, shore-sensor interactive communication, data management and dissemination, and public outreach.
The project comprises two multidisciplinary ROV cruises (MoMARSAT), the first one in 2010 to deploy the acoustically-linked multidisciplinary observing system at the Lucky Strike vent field and the second one in 2010 to recover it. The study area belongs to the Portuguese ZEE and is part of a planned OSPAR “Marine Protected Area”.

Progress of the project

In January 2008, the MoMARSAT cruise proposal was submitted to the French Fleet Committee. After evaluation, the cruise has been prescheduled for the summer 2010. Unfortunately, the preliminary schedule was withdrawn and the cruise proposal had to be submitted once again to the French Fleet Committee. We are waiting for the results of this evaluation and the new 2010-2011 schedule.
Nevertheless, the first MoMAR-D plenary meeting took place in March (17-18) 2009 in Ifremer centre de Brest and gathered around 20 scientists and engineers from France, Germany and Portugal. The objectives of this meeting were:

1- The scientific and technological presentation of the different planned experiments by each partner, chair M. Cannat,
2- A description of the operational system by J. Blandin
3- The preparation of interfacing and shore trial step by J. Blandin (see Deliverable 2)
4- The preparation of the data management policy chaired by T. Carval and P.M. Sarradin, deliverable 3.
5- The preparation of the communication plan (regional, national and EU initiatives) by J. Sarrazin (deliverable 4).

This meeting allowed proposing a new planning for the interfacing and shore trial step:

- Development, adaptations and testing of sensors should be finalized by the end of December 2009.
- Integration to SEAMON is planned in January 2010.
- A test of the whole system should be carried out by the end of February 2010.
- Shipping is planned for May 2010.

A first draft of the data management policy (deliverable 3) is circulating among the partners. A final version agreed by everybody is awaited in September 2009.

Table 1: Deliverables List

	Deliverable Name	WP	Lead contractor	Due date	Actual/ Forecast delivery date
D1	Cruise proposal submission	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	01/08	01/ 2008 New one in January 2009
D2	Report Description of the operational system : interface specifications, sensors, localisation	WP2	J. Blandin (P#7)	03/09	04/2009
D3	Signed agreement Data management policy	WP3	T. Carval (P#7)	03/09	A draft version is circulating among the partners, 09/2009
D4	Communication plan	WP5	J. Sarrazin (P#7)	03/09	Delayed 07/2009
D5	On shore integration and test report	WP2	J. Blandin (P#7)	12/09	
D6	Cruise preparation file	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	03/10	
D7	Deployment of the system during the cruise	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	08/10	
D8	1 month data file	WP1-WP3	M. Cannat (P#3) T. Carval (P#7)	09/10	
D9	Report of dissemination activities	WP5	J. Sarrazin (P#7)	10/10	

Table 2: Milestones List

Milestone	Milestone name	WP	Due date	Actual/Forecast delivery date	Lead contractor
M1	**Submission of a cruise proposal to the French fleet**	**WP6**	**01/08**	**01/08 01/09**	**P#3 and P#7**
M2	Data management policy	WP2, WP3, WP5	03/ 09	Delayed 09/09	P#7
M3	On shore integration and test report	WP2	12/09		P#7
M4	Deployment of the system 20 days Cruise	WP6	08/10		P#3 and P#7

WP bar chart (planned/actual):

Starting month September 2008

					01/09												01/10							
WP#/Months	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1 planned																								
1 actual																								
2 p																								
2 a																								
3 p																								
3 a																								
4 p																								
4 a																								
5 p																								
5 a																								
6 p																								
6 a																								
7 p																								
7 a																								
Milestones																								
planned					**M1**		**M2**									**M3**							**M4**	
actual					**M1**				**M2**															

Link with ESONET main activities:

Inputs to the DM from ESONET WPs :	**Expected period mm/yy**	**Actual period mm/yy**	**Comments**
Sciences objectives WP3			Integration of MoMAR-D scientific objectives within ESONET general objectives
Standardisation and interoperability WP2			The technical choices were made taking WP2 into account
Networking WP1			The data management policy was written in accordance with ESONET specifications
Management activities			
Implementation strategies			MoMAR-D is included into a joint reply called EMSO-Fr, with Marmara and Ligurian sea, to a call for proposal by the INSU (lead M. Cannat)

Outputs of the DM activity to ESONET WPs :	**Expected period mm/yy**	**Actual period mm/yy**	**Comments**
Sciences objectives			Integration of MoMAR-D scientific objectives within ESONET general objectives
Data management policy (D3)			The data policy was written in accordance to European specifications but specifically to MoMAR-D experiment
Communication plan (D4)	2010		The communication strategy will benefit to WP7
Site management (WP4)	2010		This task will benefit to ESONET WP5 as an example of work done in an MPA
Infrastructure (WP2)			This task will benefit to ESONET WP2 and 5
ESONET letter			Presentation of MoMAR-D in ESONEWS 3

Sensors & data management plan:

This table is extracted from the data management policy (Deliverable 3) in a preliminary version
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Sensor	Experimenter	Institute	Location	Description of the data	Description of telemetry data	Time delay before delivery to the Data centre *	Time delay before public dissemination of the data
OBS		IPGP	Seamon W	Accelerations x, y, z	technical status + seismic alert		
Pressure probe	Ballu	IPGP	Seamon W	Pressure, tilt	total		
Video camera	Sarrazin	Ifremer	Seamon E	Video images	Still image		
Chemini	Sarradin	Ifremer	Seamon W	Fe concentration	Reduced data		
Aanderaa optode	Sarradin	Ifremer	Seamon E	T°, O_2	total		
Chemical analyser	Connelly	NOCS	Seamon E	Fe, Mn concentrations	Reduced data		
CTD/ADCP	Waldmann	MARUM	Seamon E	C, T°, P, current profiles	Reduced data		
GPS		Ifremer	Borel	x, y	total		
Air / wind sensor		Ifremer	Borel	Wind speed / direction Air T air P	total		
Buoy attitude		Ifremer	Borel	Tilt (x,y)	total		
GPS		IPGP	Bouée BOREL	x, y, z, t	Autonomous		
T°, P probes N= 6 to 10	Reverdin	LOCEAN	BOREL mooring line	T°, P,	Autonomous		
5 to 10 OBS		U. Lisbon	Lucky Strike	x, y, z accélérations	Autonomous		
4 OBS		IPGP	Lucky Strike	x, y, z accélérations	Autonomous		
OBM		U. Bremen	SEAMON W ?	Tilt, acceleration	Autonomous		
Methane sensor ???		NOCS - LMTG	Tour Eiffel	CH_4 concentration	Autonomous		
Fiber optic temperature sensors array		NOCS	Tour Eiffel	T°	Autonomous		
T° probes (High and low)		IPGP / Ifremer	Around LS vent field	T° (20 to 40)	Autonomous		
Current-meters		Ifremer /INSU	Mooring close to the Tour Eiffel	Current speed / direction	Autonomous		

Dissemination and outreach:

Type of school material available at the issue of the mission (photos, video, courses,…others)	Description
Development of a didactic game in progress by UAç.	

Oral presentations in international workshop and symposiums

Sarradin, P.M., M. Cannat, A. Colaço & J. Blandin.(2008) News in the MoMAR-D project. Faro, ESONET General assembly, meeting, october 2008.

Sarrazin J., J. Blandin, L. Delauney, S. Dentrecolas, J. Dupont, C. Le Gall, J. Legrand, P. Léon, J.P. Lévèque, L. Peton, P. Rodier, R. Vuillemin, P.M. Sarradin A glimpse into the deep 45 days in the life of a vent mussel assemblage. ICES International symposium, Horta (Azores, Pt), April 27-30 2009.

Colaço A. (UAç); M. Cannat (IPGP), J. Blandin (Ifremer);P.M. Sarradin (Ifremer). MoMAR-D- A technological challenge to monitor in real time Lucky Strike hydrothermal vent field. ICES International symposium, Horta (Azores, Pt), April 27-30 2009.

Publications (non referred papers)

Sarrazin J. et al. 2009, MoMAR/D: A demonstration mission to establish a multidisciplinary observatory at hydrothermal vents on the Mid-Atlantic Ridge. ESONEWS n°3

Miscellaneous

Cannat M. et al. 2009. « EMSO-Fr », réponse à l'appel d'offre pour la labellisation par l'Insu de « Sites instrumentés » en Terre Interne.

Part II

DM acronym:	MoMAR-D
DM title:	MoMAR-Demonstration
ESONET Site:	Azores- MoMAR, Lucky Strike hydrothermal field
Scientific Area(s):	SArea1 : physical oceanography processes SArea2 : hydrothermal processes SArea3 : biodiversity
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DM Start date:	September 2008
DM duration:	24
Period of the reporting	September 2008 – May 2009

Partners Management report

Partner Num.	Institution Name	PI
1	DOP/UAÇ	A. Colaço
2	FFCUL/CGUL	M. Miranda
3	IPGP	M. Cannat
4	NOC	D. Connelly
5	CNRS - F CNRS - C	V. Chavagnac J. Goslin
6	Univ. Bremen	C. Waldmann and M. Fabian
7	Ifremer	P.M. Sarradin
8	SOPAB	S. Ghiron

P#1 DOP/UAÇ

- **Work Performed** *:*

The UAç team:
- Contributed to the workpackage 1 through the D1- with input to the cruise proposal,
- Contributed to the work package 2 collaborating with FFCUL/CGUL in the preparation of stand alone OBS to be installed at the Lucky Strike vent field, and with sharing of knowledge to the type of surface buoy mooring.
-Contributed to the site management through different contacts with teams that are also working in the area and with the local authorities.
-Contributed to the WP5, by starting the development of a didactic game to the kids concerning the MoMAR region, and with the presentation on the ICES deep-sea symposium “MoMAR-D: A technological challenge to monitor the dynamics of the Lucky Strike vent ecosystem-**Ana Colaço**, M. Cannat, J. Blandin, P.M. Sarradin and the MoMAR-D partners”- on the **Deep-Sea Technology and Biotechnology Research session.**
- Contributed to the WP7- by co-leading the project with P:M: Sarradin

- **Rough Estimation of Major Cost**: The travel costs were to attend the kick off meeting (3 persons), one from the Department of Oceanography and Fisheries, and the other two from the Centre of Volcanology and Geological Risks Assessment

- **Overview of the Actual Costs**,

Type of expenditure	Actual costs(Euro) First period
Total person-months	0
Personnel costs	0
Subcontracting	0
Travels	4600
Consumables	
Other costs	
Total Costs	4600

P#2 FFCUL/CGUL
No input during this period.

P#3 IPGP

- **Work Performed** *:*

WP1 and 2: We have participated in the March 09 kick-off meeting in Brest. We have done significant work toward integration of the SEAMON-connected sensors our institute has taken responsibility for (pressure probes and OBS). We have also made progress on processing of seismic monitoring of the area in 2007-2008. These results are critical for the calibration of the seismic alert system for the SEAMON-connected OBS.
WP3: we have contributed to the MoMAR-Demo Data management policy document which is now nearly ready to be signed by all partners.
WP4: we have made progress in building the GIS database for the MoMar sites. We plan to release a simplified version of this database on a web-based interface later this year.

- **Overview of the Actual Costs**,

Type of expenditure	Actual costs(Euro) First period
Total person-months	11.5
Personnel costs	
Subcontracting	
Travels	2103,02
Consumables	9720,02
Other costs	35,00
Total Costs	11858,04

P#4 NOC

- **Work Performed** *:*

WP 1-3: Chemical Fluxes at Lucky Strike vents.
Objectives: Development, test, validation and deployment for 1 month on SEAMON of in situ chemical analysers for the measurement of Fe and Mn species.
Starting points: Existing system deployed in Scottish sea Lochs [Statham PJ et al. 2005] and in hydrothermal setting aboard the WHOI AUV ABE where it was used in plume tracking and vent location.

- **Progress towards objectives** – (short description about Tasks status; each task has to be referred as Task n.m where n is the WP number and m is a progressive number)

Task 1-3.1: Manufacturing of two duplicate devices with enhanced electronics for autonomous operation (data logging, self calibration)
New datalogger developed and tested in situ to 3600m for short term deployment (~15 hours repeated 5 times), need long term testing. The datalogger has up to 4Gb of data storage and can communicate using RS232 in real time at 1Hz for the data rate. It is low power (24V < 10mA) and has smart electronics to enable valve control and timed data acquisition.
Issues with fluidics handling slowdown the development of the sensors. Solution identified and under development and test.
contractors involved : NOCS, main research engineer: Dr Cedric Floquet

Task 1-3.2: Reagent stability enhancement, improved in situ calibration and fouling reduction techniques
PhD student working FT on characterizing the susceptibility to biofouling of the materials used to manufacture the sensors.
contractors involved : NOCS, main research engineer: Dr Cedric Floquet

Task 1-3.3: Integration to SEAMON
Not started. Likely to be RS232 com with 1Hz data rate. System will need power from DeepSea Power and light type battery (24V 32Ah). Exact power requirements not known yet.
contractors involved : NOCS, main research engineer: Dr Cedric Floquet

- **Overview of the Actual Costs,**

Type of expenditure	Actual costs(Euro) First period
Total person-months	0
Personnel costs	0
Subcontracting	0
Travels	0
Consumables	0
Other costs	0
Total Costs	0

P#5 CNRS

- **Work Performed** *:*

Contribution to WP1

- V. Chavagnac and C. Boulart participated to the kick-off meeting of the MoMAR-D program. The two-days meeting took place at IFREMER in Brest in March 2009.

- The main scientific objective of the LMTG is to determine the chemical and gas composition of hydrothermal fluids. This requires gas-tight Ti syringes which are not adapted at present for high-temperature fluid. We have therefore ordered Titanium tubing to make Ti canule onto the IFREMER multi-sampler via the mechanical workshop at the LMTG.

- **Rough Estimation of Major Cost**:
  - Travel to the kick-off meeting: 1711€
  - Consummables Ti-material : 3104€

- **Overview of the Actual Costs***,*

Type of expenditure	Actual costs(Euro) First period
Total person-months	2.0
Personnel costs	0
Subcontracting	0
Travels	1711.00
Consumables	3104.00
Other costs	0
Total Costs	4815.00

P#6 Univ. Bremen

Participation to the kick off meeting in Brest.

P# 7 Ifremer

- **Work Performed** *:*
  - Organization of the kick off meeting in Brest (WP7).
  - Submission of the cruise proposal (WP1 and 6), Deliverable 1.
  - Production of Deliverable 2 (WP2).
  - Preparation of D3 (Data management policy – WP3) and D4 (communication plan WP 5).
  - Participation to the ICES symposium in Horta.

Oral presentations in international workshop and symposiums

Sarradin, P.M., M. Cannat, A. Colaço & J. Blandin.(2008) News in the MoMAR-D project. Faro, ESONET General assembly, meeting, october 2008.

Sarrazin J., J. Blandin, L. Delauney, S. Dentrecolas, J. Dupont, C. Le Gall, J. Legrand, P. Léon, J.P. Lévèque, L. Peton, P. Rodier, R. Vuillemin, P.M. Sarradin A glimpse into the deep 45 days in the life of a vent mussel assemblage. ICES International symposium, Horta (Azores, Pt), April 27-30 2009.

Colaço A. (UAç); M. Cannat (IPGP), J. Blandin (Ifremer);P.M. Sarradin (Ifremer). MoMAR-D- A technological challenge to monitor in real time Lucky Strike hydrothermal vent field. ICES International symposium, Horta (Azores, Pt), April 27-30 2009.

Publications (non referred papers)

Sarrazin J. et al. 2009, MoMAR/D: A demonstration mission to establish a multidisciplinary observatory at hydrothermal vents on the Mid-Atlantic Ridge. ESONEWS n°3

- **Overview of the Actual Costs**,

Type of expenditure	Actual costs(Euro) First period
Total person-months	1.7
Personnel costs	11 114,85
Subcontracting	0
Travels	
Consumables	
Other costs	7 002,35
Total Costs	18 117,20

P#8 SOPAB

Participation to the kick off meeting in Brest.

WP management report

(From 30 September 2008 to May 2009)

WP		WP leader
WP1	Scientific experiments	M. Cannat
WP2	Infrastructure of the observing system	J. Blandin
WP3	Data management	T. Carval
WP4	Site management	A. Colaço
WP5	Communication plan, Public outreach	J. Sarrazin
WP6	Cruise	P.M. Sarradin
WP7	Project management	A. Colaço, P.M. Sarradin

WORKPACKAGE	**WP1**
Full WP title	Scientific experiments
Period covered	from 30/09/2008 to May 2009
Partner organisation full name	**IPGP**
Person in charge for the report (WP Leader)	M. Cannat
Partners involved in the Work	DOP, FFCUL, NOCS, CNRS C & F, Univ. Bremen, Ifremer

Workpackage objectives and starting point
WP1. This workpackage concerns the scientific coordination of the multidisciplinary experiments planned at Lucky Strike as part of the demo mission. All demo partners are involved in this WP.

Progress towards objectives –
The experiment is still in its preparation stage, because the cruise for the initial deployment of the system has been scheduled provisionally in the summer of 2010 only. We have used the additional year to progress on technological developments made in order to insure the connection of sensor packages to the SEAMON system, but have officially launched the demo at the kick-off meeting in Brest in march 2009.

Deviations from the project work programm, and **corrective actions** taken/suggested (*identify the nature and the reason for the problem, identify partners involved)*
We will not be able to go ahead with the temperature array (partner NOC) we were hoping to deploy to monitor changes in the temperature at diffuse venting areas.

Corrective actions:
We are looking at other means to get some of these diffuse venting temperature data, including use of a sensor deployed previously in the Gulf of Cadiz.

WORKPACKAGE	**WP2**
Full WP title	Infrastructure of the observing system
Period covered	from 30/09/2008 to May 2009
Partner organisation full name	**Ifremer**
Person in charge for the report (WP Leader)	J. Blandin
Partners involved in the Work	DOP, FFCUL, IPGP, NOCS, Univ. Bremen, Ifremer

- **Workpackage objectives and starting point**

The objective of this WP is to provide the infrastructure of the deep sea observatory based on Seamon nodes and Borel buoy.

- **Work Performed** *:*

This first period was devoted to the redaction of deliverable 2. This document provides the description of the operational system in terms of interface specifications, sensors and localisation.
This document was presented during the kick off meeting in Brest as well as an actualized schedule forecasting the preparation of the infrastructure, the integration of the sensors, the shore trials of the whole system in Brest.

WORKPACKAGE	**WP3**
Full WP title	Data management
Period covered	from 30/09/2008 to May 2009
Partner organisation full name	**Ifremer**
Person in charge for the report (WP Leader)	T. Carval
Partners involved in the Work	DOP, FFCUL, IPGP, NOCS, CNRS C & F, Univ. Bremen, SOPAB

Workpackage objectives and starting point *(max 500 characters)*

i) The objective of this WP is to establish and define a data management policy and procedure agreed by all the partners. The principles to be specified are: i) the definition of the data to be acquired, ii) the procedures of control for these data and the definition of metadata in accordance with the standards recommendations on data documentation, and finally iii) the dissemination level.

ii) An important task will be to develop links between the MoMAR-D and the data management systems currently used for volcanic and seismic monitoring, and for ecosystem inventory and surveillance, at and near the Azores Islands. To this aim, we have secured the participation of colleagues from the Centro de Vulcanologia e Avaliação de Riscos Geológicos, and from the Department of Oceanography and Fisheries of the University of the Azores.

Progress towards objectives –

i) Data management principles were discussed during the first meeting in Brest (March 209). A draft document, based on documents issued from Neptune Canada, ESONET and Eurosites, has been written by T. Carval and P.M. Sarradin and is circulating amongst the partners for modifications. A final document (Deliverable 3) agreed by all the partners should be available in autumn 2009.

ii) The Centro de Vulcanologia e Avaliação de Riscos Geológicos was present in Brest for the first meeting and presented us their work.

Deviations from the project work programme,

D3 was planned in March 2009. Data management was discussed during the first MoMAR D meeting in Brest in March 2009. We have delayed the delivery of D3 in autumn 2009.

WORKPACKAGE	**WP4**
Full WP title	Site management
Period covered	from 30/09/2008 to May 2009
Partner organisation full name	**DOP UAC**
Person in charge for the report (WP Leader)	A. Colaço
Partners involved in the Work	DOP, FFCUL, IPGP, NOCS, CNRS F, Ifremer

Workpackage objectives and starting point

The MoMAR-D demonstration will undertake to comply with the MPA rules and develop a coherent experimental site management plan. This plan will include a set of rules for PI's, based on the MPA code of conduct and on the InterRidge code of conduct. These rules will aim at minimizing the impact of research on the environment, and at ensuring the compatibility of all the experiments planned.

To enforce these regulations, we will make provision in the MoMAR-D demonstration project for a coordinating MoMAR office, probably at Horta (but a centralized ESONET site management office may also be envisioned) and develop formal links with the Portuguese maritime authorities (the Hydrographic Institute), with the MPA managing authorities, and with the Azores Regional Government. Partners from the Centro de Vulcanologia e Avaliação de Riscos Geológicos, and from the Department of Oceanography and Fisheries of the University of the Azores will play a leading role in this task.

Work Performed *:* Participation to the ICES meeting in Horta.

Colaço A. (UAç); M. Cannat (IPGP), J. Blandin (Ifremer);P.M. Sarradin (Ifremer). MoMAR-D- A technological challenge to monitor in real time Lucky Strike hydrothermal vent field. ICES International symposium, Horta (Azores, Pt), April 27-30 2009.

WORKPACKAGE	**WP5**
Full WP title	Communication plan, Public outreach
Period covered	from 30/09/2008 to May 2009
Partner organisation full name	**Ifremer**
Person in charge for the report (WP Leader)	J. Sarrazin
Partners involved in the Work	DOP, FFCUL, IPGP, NOCS, Univ. Bremen, SOPAB

Workpackage objectives and starting point

Near real time transmission of data (and video images) from the vents will open new opportunities for public outreach. The public outreach strategy will include press conferences before the cruises, maintenance of a cruise web site, and organization of a live event from the vessel, with video conferences and transmission of live images from the seafloor, participation of journalists interested in making a movie out of this seafloor observatory adventure. Our plan is to have a permanent exhibit, with access to the most recent data and images from the seafloor, at the Oceanopolis aquarium in Brest. Mirror sites and exhibit material could also be set in other large aquariums in Europe.
The strategy will cover international to regional initiatives such as the production of a didactic kit, in Portuguese, on hydrothermal vents and seafloor observatories for the different school levels, in connection with in the Azores University.

Progress towards objectives –
The public outreach strategy was discussed during the first meeting in Brest in March 2009. The communication plan will be available in July 2009 (Deliverable 4).

Sarrazin J. et al. 2009, MoMAR/D: A demonstration mission to establish a multidisciplinary observatory at hydrothermal vents on the Mid-Atlantic Ridge. ESONEWS n°3

WORKPACKAGE	**WP6**
Full WP title	Cruise
Period covered	from 30/09/2008 to May 2009
Partner organisation full name	**Ifremer**
Person in charge for the report (WP Leader)	P.M. Sarradin
Partners involved in the Work	DOP, FFCUL, IPGP, NOCS, CNRS C& F, Univ. Bremen, SOPAB

Workpackage objectives and starting point

The objective of this WP is to submit a cruise proposal to the French Fleet Committee (D1). This proposal gathers 2 20 days cruises using the French ROV Victor 6000. The first cruise will be dedicated to the implementation of the observatory infrastructure in the Lucky Strike vent field, the second one to its recovery 12 month later. Site studies will be performed during both cruises.

Progress towards objectives –

In January 2008, the MoMARSAT cruise proposal was submitted to the French Fleet Committee. After evaluation, the cruise has been prescheduled for the summer 2010. Unfortunately, this preliminary schedule was withdrawn and the cruise proposal had to be submitted once again in January 2009. We are waiting for the results of this evaluation and the new 2010-2011 schedule.

Deviations from the project work programme
The MoMARSAT cruise proposal was submitted 3 times to the French Fleet committee. In June 2009, we have not got any certainty on the scheduling of the cruise in 2010 and 2011. This uncertainty led us to delay the starting date of the MoMAR-D DM (September 2008), and to slow down the shore work. With the new agenda, only the first cruise in would 2010 fit in the ESONET calendar. If the cruise is delayed once again to 2011-2012, the project will be shifted out of the ESONET time schedule setting the question of the future of the project and of the ESONET grant. In such a case, the objectives within ESONET could be reduced to a shore trial of the complete observatory infrastructure.

Deliverable
D1: Cannat M., Sarradin, P.M., Blandin, J. January 2009. MoMARSAT 1 & 2 cruise proposals

WORKPACKAGE	WP7
Full WP title	Project management
Period covered	from 30/09/2008 to May 2009
Partner organisation full name	**Ifremer and DOP**
Person in charge for the report (WP Leader)	P.M. Sarradin and A. Colaço
Partners involved in the Work	

Workpackage objectives and starting point

The objective of MoMAR-D proposal is the deployment of an acoustically-linked multidisciplinary observing system at the Lucky Strike vent field, with satellite connection to shore, and its management during 1 year.

Progress towards objectives –
The first MoMAR-D plenary meeting took place in March (17-18) 2009 in Ifremer centre de Brest and gathered around 20 scientists and engineers from France, Germany and Portugal. The objectives of this meeting were:

The scientific and technological presentation of the different planned experiments by each partner, chair M. Cannat,

- A description of the operational system by J. Blandin
- The preparation of interfacing and shore trial step by J. Blandin (see Deliverable 2)
- The preparation of the data management policy chaired by T. Carval and P.M. Sarradin, deliverable 3.
- The preparation of the communication plan (regional, national and EU initiatives) by J. Sarrazin (deliverable 4).

This meeting allowed proposing a new planning for the interfacing and shore trial step:

- Development, adaptations and testing of sensors should be finalized by the end of December 2009.
- Integration to SEAMON is planned in January 2010.
- A test of the whole system should be carried out by the end of February 2010.
- Shipping is planned for May 2010.

Deviations from the project work programme
This project is directly linked to the realization of 2 cruises to deploy and recover the observatory infrastructure. In January 2008, the MoMARSAT cruise proposal was submitted to the French Fleet Committee and prescheduled for the summer 2010. Unfortunately, this preliminary schedule was withdrawn and the cruise proposal had to be submitted once again in January 2009. We are waiting for the results of this evaluation and the new 2010-2011 schedule. In June 2009, we have not got any certainty on the scheduling of the cruise in 2010 and 2011. This uncertainty led us to delay the starting date of the MoMAR-D DM (September 2008), and to slow down the shore work. With the new agenda, only the first cruise in would 2010 fit in the ESONET calendar. If the cruise is delayed once again to 2011-2012, the project will be shifted out of the ESONET time schedule setting the question of the future of the project and of the ESONET grant. In such a case, the objectives within ESONET could be reduced to a shore trial of the complete observatory infrastructure.

Sarradin, P.M., M. Cannat, A. Colaço & J. Blandin.(2008) News in the MoMAR-D project. Faro, ESONET General assembly, meeting, October 2008.

- A **tabular overview of budgeted person-months and actual person-months** by workpackage (budgeted person –months to be taken from "Effort breakdown" Excel file)

P#		WP1	WP2	WP3	WP4	WP5	WP6	WP7	Total
P#1	DOP/UAÇ and CVARG-UAç								
	Total planned	2	0.5		2	2.5	3	1	**11**
	Planned from 30/09/2008 to May 2009	0,5	0.5	0	1	1	0	0.3	**3.3**
	Actual from 30/09/2008 to May 2009	**0,5**	**0.5**	**0**	**1**	**1**	**0**	**0.5**	**3.5**
P#2	FFCUL/CGUL								
	Total planned	3	0.5	0.5	0.5	0.5	2		**7**
	Planned from 30/09/2008 to May 2009								
	Actual from 30/09/2008 to May 2009								
P#3	IPGP								
	Total planned	19	10	4	2	1	10		**46**
	Planned from 30/09/2008 to May 2009								
	Actual from 30/09/2008 to May 2009	**5**	**5**	**1**	**0.5**	**0**	**0**	**0**	**11.5**
P#4	NOC								
	Total planned	16.5	4	0.5	0.5	0.5	3		**25**
	Planned from 30/09/2008 to May 2009	0	0	0	0	0	0	0	**0**
	Actual from 30/09/2008 to May 2009	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
P#5	CNRS - C								
	Total planned	9.5		0.5			2		**12**
	Planned from 30/09/2008 to May 2009	2							
	Actual from 30/09/2008 to May 2009	**2**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	CNRS - F								
	Total planned	8		0.5	0.5		2		**11**
	Planned from 30/09/2008 to May 2009								
	Actual from 30/09/2008 to May 2009	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
P#6	Univ. Bremen								
	Total planned	3	2	0.5		0.5	2		**8**
	Planned from 30/09/2008 to May 2009								
	Actual from 30/09/2008 to May 2009	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
P#7	Ifremer								
	Total planned	6	12.5	1.5	0	1	15	1	37
	Planned from 30/09/2008 to May 2009								

P#		WP1	WP2	WP3	WP4	WP5	WP6	WP7	Total
	Actual from 30/09/2008 to May 2009	**0.3**	**0.7**	**0.1**	**0.2**		**0.1**	**0.1**	**1.7**
P#8	SOPAB								
	Total planned					0.5	0.5		**1**
	Planned from 30/09/2008 to May 2009								
	Actual from 30/09/2008 to May 2009	**0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
	Total								
	Total planned	**68**	**30.5**	**9**	**6.5**	**7**	**41**	**2**	**164**
	Planned from 30/09/2008 to May 2009								
	Actual from 30/09/2008 to May 2009	**7.8**	**6.2**	**1.1**	**1.7**	**1**	**0.1**	**0.6**	**18.5**

ESONET Demonstration Missions

MoMAR-D

Periodic Activity Report

P.M. Sarradin and A. Colaço

1st July 2009 – 31 December 2009

DEEP LEP 10 XX

Part I

DM acronym:	MoMAR-D
DM title:	MoMAR-Demonstration
ESONET Site:	Azores- MoMAR, Lucky Strike hydrothermal field
Scientific Area(s):	SArea1 : physical oceanography processes SArea2 : hydrothermal processes SArea3 : biodiversity
Technological Area(s):	TArea1 : interoperability, data transmission, power supply
DM Start date:	September 2008
DM duration:	24
Period of the reporting	**1st July 2009 -31 December 2009**

Partner Num.	Institution Name	PI	PI coordinates
1	DOP/UAÇ	A. Colaço	IMAR- Dept Oceanography and Fisheries-Univ of Azores, acolaco@uac.pt
2	FFCUL/CGUL	M. Miranda	Centro de Geofisica, Universidade de Lisboa, jmmiranda@fc.ul.pt
3	IPGP	M. Cannat	Equipe de Géosciences Marines. Institut de Physique du Globe de Paris. CNRS UMR 7154 cannat@ipgp.jussieu.fr
4	NOC	D. Connelly	Geochemistry Group National Oceanography Centre dpc@noc.soton.ac.uk
5	CNRS - F CNRS - C	V. Chavagnac J. Goslin	LMTG - UMR 5563 UR 154 CNRS Université Paul-Sabatier IRD Observatoire Midi-Pyrénées - chavagnac@lmtg.obs-mip.fr UMR6538 "Domaines Oceaniques" U.Bretagne Occidentale-CNRS IUEM - Jean.Goslin@univ-brest.fr
6	Univ. Bremen	C. Waldmann and M. Fabian	University of Bremen/MARUM waldmann@marum.de University of Bremen Department 5, Geosciences Sea Technics / Sensors marcus.fabian@uni-bremen.de
7	Ifremer	P.M. Sarradin	Ifremer Brest, DEEP/Laboratoire Environnement Profond Pierre.Marie.Sarradin@ifremer.fr
8	SOPAB	S. Ghiron	Océanopolis sylvain.ghiron@oceanopolis.com

Associated partners

9	UPMC-LOCEAN with P# 3	G. Reverdin	LOCEAN, Univ. Paris VI, boite 100, gilles.reverdin@lodyc.jussieu.fr
10	CVARG with P#1	Gabriela Queiroz	Centro de Vulcanologia e Avaliação de Riscos Geológicos - Universidade dos Açores - Maria.GP.Queiroz@azores.gov.pt

Executive summary

The MoMAR (Monitoring the Mid-Atlantic Ridge) project was initiated 10 years ago by the InterRidge Program to promote and coordinate long-term multidisciplinary monitoring of hydrothermal vents in the Azores region of the Mid-Atlantic Ridge This coordinated plan aims at determining the feed-backs between volcanism, deformation, seismicity, and hydrothermalism, and to understand how hydrothermal ecosystems couple with these sub-surface processes, and how this affects exchanges with the ocean.

Monitoring at Lucky Strike has started with the MoMARETO (ecology), GRAVILUCK (geodesy), and BBMoMAR (sismology and MT) experiments and will be further implemented in 2008 with the deployment of autonomous temperature probes at selected vents.

The MoMAR-D project was selected by ESONET as a demonstration mission to deploy and manage a multidisciplinary observing system at Lucky Strike during one year. Lucky Strike is a large hydrothermal field located in the center of one of the most volcanically active segment of the MAR. Monitoring this field offers a high probability of capturing evidence for volcanic events, observing interactions between faulting, magmatism and hydrothermal circulations and, evaluating their links with the dynamics of hydrothermal fauna.

We will use the SEAMON technology developed during the ASSEM EC project, with two nodes acoustically linked to a surface buoy that will ensure satellite communication to a land base station. The system will comprise 2 scientific nodes: a geophysical node moored in the Lucky Strike lava lake, and a geochemical/ecological node at the Eiffel Tower vent site. This observatory infrastructure will acquire a synchronized multidisciplinary data set, and allow us to develop solutions for sensor interoperability, shore-sensor interactive communication, data management and dissemination, and public outreach.

The project comprises two multidisciplinary ROV cruises (MoMARSAT), the first one in 2010 to deploy the acoustically-linked multidisciplinary observing system at the Lucky Strike vent field and the second one in 2010 to recover it. The study area belongs to the Portuguese ZEE and is part of a planned OSPAR “Marine Protected Area”.

Progress of the project

In January 2008, the MoMARSAT cruise proposal was submitted to the French Fleet Committee. After evaluation, the cruise has been prescheduled for the summer 2010. Unfortunately, the preliminary schedule was withdrawn and the cruise proposal had to be submitted once again to the French Fleet Committee.

The cruise is now scheduled in September 2010, on the Pourquoi pas ? with the ROV Victor 6000. Due to logistic constraints of the fleet, the duration of the first cruise was reduced from 19 to 13 days to implement the observatory infrastructure on Lucky Strike.

After the meeting in Brest in March 2009 and the final definition of the observatory, this period was used to start the technological work. The design and building of the sensors and nodes is in progress as well as the software adaptation of the sensors to the SEAMON technology. The objective is to start the trial step in Brest in Spring 2010. Shipping is planned during Summer 2010.

In parallel, a draft of the data management policy is circulating among the partners (see draft of D3).

The MoMAR-D project was presented during the 4th International symposium on Chemosynthetic Based Ecosystems in Okinawa (Jpn), the ESONET All region workshop in Paris, the ESONET Best practices workshop in Brest and the Ocean Biology Observatory Workshop in Mestre (It).

The next 6 month period will be devoted to the on shore integration and trial of the system in Ifremer in Spring 2010.

D3 and D4 will be finalized before the cruise.

The cruise preparation reports (Agreement to work in the Portuguese waters and Technological description of the cruise) will be delivered to the French Fleet in March 2010.

Table 1: Deliverables List

	Deliverable Name	WP	Lead contractor	Due date	Actual/ Forecast delivery date
D1	Cruise proposal submission	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	01/08	01/ 2008 New one in January 2009
D2	Report Description of the operational system : interface specifications, sensors, localisation	WP2	J. Blandin (P#7)	03/09	04/2009
D3	Signed agreement Data management policy	WP3	T. Carval (P#7)	03/09	A draft version is circulating among the partners, 06/2010
D4	Communication plan	WP5	J. Sarrazin (P#7)	03/09	Delayed 07/2010
D5	On shore integration and test report	WP2	J. Blandin (P#7)	12/09	Delayed 06/2010
D6	Cruise preparation file	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	03/10	
D7	Deployment of the system during the cruise	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	08/10	
D8	1 month data file	WP1-WP3	M. Cannat (P#3) T. Carval (P#7)	09/10	
D9	Report of dissemination activities	WP5	J. Sarrazin (P#7)	10/10	

Table 2: Milestones List

Milestone	Milestone name	WP	Due date	Actual/Forecast delivery date	Lead contractor
M1	**Submission of a cruise proposal to the French fleet**	**WP6**	**01/08**	**01/08** **01/09**	**P#3 and P#7**
M2	Data management policy	WP2, WP3, WP5	03/ 09	Delayed 06/10	P#7
M3	On shore integration and test report	WP2	12/09	Delayed 06/10	P#7
M4	Deployment of the system 20 days Cruise	WP6	08/10		P#3 and P#7

WP bar chart (planned/actual):

Starting month September 2008

					01/09												01/10							
WP#/Months	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**	**13**	**14**	**15**	**16**	**17**	**18**	**19**	**20**	**21**	**22**	**23**	**24**
1 planned																								
1 actual																								
2 p																								
2 a																								
3 p																								
3 a																								
4 p																								
4 a																								
5 p																								
5 a																								
6 p																								
6 a																								
7 p																								
7 a																								
Milestones																								
planned					**M1**		**M2**									**M3**							**M4**	
actual					**M1**				**M2**													**M2 &3**		

Link with ESONET main activities:

Participation to international symposiums and workshops:

- ESONET All region workshop in Paris, October 2009,
- ESONET Best practices workshop in Brest, October 2009,
- 4th International symposium on Chemosynthetic Based Ecosystems in Okinawa (Jpn), July 2009,
- Ocean Biology Observatory Workshop in Mestre (It), September 2009.

Inputs to the DM from ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments
Sciences objectives WP3			Integration of MoMAR-D scientific objectives within ESONET general objectives Participation to the 4th CBE symposium in Okinawa
Standardisation and interoperability WP2			The technical choices were made taking WP2 into account
Networking WP1			The data management policy was written in accordance with ESONET specifications Participation to the Ocean Biology Observatory Workshop in Mestre (It), September 2009
Management activities			
Implementation strategies			MoMAR-D is included into a joint reply called EMSO-Fr, with Marmara and Ligurian sea, to a call for proposal by the INSU (lead M. Cannat)

Outputs of the DM activity to ESONET WPs :	Expected period mm/yy	Actual period mm/yy	Comments
Sciences objectives			Integration of MoMAR-D scientific objectives within ESONET general objectives Participation to the ESONET Best practices workshop in Brest, October 2009
Data management policy (D3)			The data policy was written in accordance to European specifications but specifically to MoMAR-D experiment
Communication plan (D4)	2010		The communication strategy will benefit to WP7
Site management (WP4)	2010		This task will benefit to ESONET WP5 as an example of work done in an MPA
Infrastructure (WP2)			This task will benefit to ESONET WP2 and 5
ESONET letter			Presentation of MoMAR-D in ESONEWS 3

Sensors & data management plan:

This table is extracted from the data management policy (Deliverable 3) in a preliminary version
.

Sensor	Experimenter	Institute	Location	Description of the data	Description of telemetry data	Time delay before delivery to the Data centre *	Time delay before public dissemination of the data
OBS		IPGP	Seamon W	Accelerations x, y, z	technical status + seismic alert		
Pressure probe	Ballu	IPGP	Seamon W	Pressure, tilt	total		
Video camera	Sarrazin	Ifremer	Seamon E	Video images	Still image		
Chemini	Sarradin	Ifremer	Seamon W	Fe concentration	Reduced data		
Aanderaa optode	Sarradin	Ifremer	Seamon E	T°, O_2	total		
Chemical analyser	Connelly	NOCS	Seamon E	Fe, Mn concentrations	Reduced data		
CTD/ADCP	Waldmann	MARUM	Seamon E	C, T°, P, current profiles	Reduced data		
GPS		Ifremer	Borel	x, y	total		
Air / wind sensor		Ifremer	Borel	Wind speed / direction Air T air P	total		
Buoy attitude		Ifremer	Borel	Tilt (x,y)	total		
GPS		IPGP	Bouée BOREL	x, y, z, t	Autonomous		
T°, P probes N= 6 to 10	Reverdin	LOCEAN	BOREL mooring line	T°, P,	Autonomous		
5 to 10 OBS		U. Lisbon	Lucky Strike	x, y, z accélérations	Autonomous		
4 OBS		IPGP	Lucky Strike	x, y, z accélérations	Autonomous		
OBM		U. Bremen	SEAMON W ?	Tilt, acceleration	Autonomous		
Methane sensor ???		NOCS - LMTG	Tour Eiffel	CH_4 concentration	Autonomous		
Fiber optic temperature sensors array		NOCS	Tour Eiffel	T°	Autonomous		
T° probes (High and low)		IPGP / Ifremer	Around LS vent field	T° (20 to 40)	Autonomous		
Current-meters		Ifremer /INSU	Mooring close to the Tour Eiffel	Current speed / direction	Autonomous		

Dissemination and outreach:

Type of school material available at the issue of the mission (photos, video, courses,…others)	Description
Development of a didactic game in progress by UAç.	

Oral presentations in international workshop and symposiums

Blandin J. & P.M. Sarradin. Deployment and recovery of a non cabled system with data transmission capacity : The MoMAR case. ESONET Best practices workshop, octobre 2009-Brest.

Colaço Ana (IMAR/DOP-Uaç), M. Cannat (IPGP), J. Blandin (IFREMER),P.M. Sarradin (IFREMER) and the MoMAR-D partners. MoMAR-D: A technological challenge to monitor the dynamics of the Lucky Strike vent ecosystem. ESONET All region workshop-Paris- 5-7 October.

CuvelierD., A first decadal study (1994-2008) of community dynamics on an Atlantic hydrothermal edifice as revealed by high-resolution video image analysis A first decadal study (1994-2008) of community dynamics on an Atlantic hydrothermal edifice as revealed by high-resolution video image analysis. 4th International symposium on Chemosynthetic Based Ecosystems in Okinawa (Jpn), July 2009,

Gauthier O, J Sarrazin, PM Sarradin. 2009. Development of an automated protocol to analyse the temporal dynamics of hydrothermal ecosystems from video imagery and temperature time-series part II: Untangling spatio-temporal temperature variations, first insights from a novel approach. European Sea Observatory Network of Excellence 2nd Best Practices Workshop, Ifremer, Brest, France, 8-9 octobre.

Mercier G., J Sarrazin, PM Sarradin. 2009. Development of an automated protocol to analyse the temporal dynamics of hydrothermal ecosystems from video imagery and temperature time-series part I: Automated image processing. European Sea Observatory Network of Excellence 2nd Best Practices Workshop, Ifremer, Brest, France, 8-9 octobre.

Sarradin P.M. (IFREMER), Ana Colaço (IMAR/DOP-Uaç), M. Cannat (IPGP), J. Blandin (IFREMER), and the MoMAR-D partners. Implementing the Azores Node. ESONET All region workshop-Paris- 5-7 October.

Sarradin P.M. (IFREMER), Ana Colaço (IMAR/DOP-Uaç), M. Cannat (IPGP), J. Blandin (IFREMER), J. Sarrazin and the MoMAR-D partners.The MoMAR-D project : A challenge to monitor the Lucky Strike hydrothermal vent in real time. Poster. Ocean Biology Observatory Workshop, Mestre (It), September 2009, 16-18.

Sarradin P.M., **M. Waeles, C. Le Gall, P. Rodier, J. Sarrazin, D. Cuvelier, F. De Busseroles, R. Riso.** Heterogeneity of habitats within a single hydrothermal edifice, MAR. 4th International symposium on Chemosynthetic Based Ecosystems in Okinawa (Jpn), July 2009.

Sarrazin J., **C. Le Gall, L. Peton, PM Sarradin.** A glimpse into the deep: Mussel community changes and environmental dynamics at Tour Eiffel, MAR. 4th International symposium on Chemosynthetic Based Ecosystems in Okinawa (Jpn), July 2009,

Publications

Larkin, K.E., Ruhl, H.A., Bagley, P., Benn, A., Bett, B.J., Billett, D.S.M., Boetius A., Chevaldonné,P., Colaço, A., Copley, J., Danovaro, R., Escobar-Briones, E., Glover A., Gooday, A.J, Hughes,J.A., Kalogeropoulou, V., Kelly-Gerreyn, B.A., Kitazato H., Klages, M., Lampadariou, N., Lejeusne, C., Perez, T., Priede., I.G., Rogers A., Sarradin, P.M, Sarrazin, J., Soltwedel, T., Soto, E.H., Thatje, S., Tselepides, A., Tyler, P.A., van den Hove, S., Vanreusel, A., Wenzhöfer, F. 2009: Benthic biology time-series in the deep sea: Indicators of change. OceanObs'09 benthic time-series white paper

Glover, A G, A J Gooday, D M Bailey, D S M Billett, P Chevaldonné, A Colaço, J Copley, D Cuvelier, D Desbruyères, V Kalogeropoulou, M Klages, N Lampadariou, C Lejeusne, N C Mestre, G L J Paterson, T Perez, H A Ruhl, J Sarrazin, T Soltwedel, E H Soto, S Thatje, A Tselepides, S Van Gaever, and A Vanreusel, Climatic and geological drivers of long-term temporal change in deep-sea ecosystems, Advances in Marine Biology, (**submitted**).

Colaço A.; M. Cannat , J. Blandin ;P.M. Sarradin (subm). MoMAR-D- A technological challenge to monitor in real time Lucky Strike hydrothermal vent field. ICES Journal of Marine Science

Ruhl H.A., Karstensen J., Géli L., Colaço A., Lampitt R., André M. (**subm**). Societal need for improved understanding of climate change, anthropogenic impacts, and geohazrd warning drive development of ocean observatories in European Seas. Progress in Oceanography

Cuvelier, D, Sarrazin J., Colaço A., Copley J. T., Glover A., Tyler P., Serrão Santos R., and Desbruyères D. (**Subm**) Community dynamics over 14 years at the Eiffel Tower hydrothermal edifice on the Mid-Atlantic Ridge. Journal of Limnology and Oceanography

Part II

DM acronym:	MoMAR-D
DM title:	MoMAR-Demonstration
ESONET Site:	Azores- MoMAR, Lucky Strike hydrothermal field
Scientific Area(s):	SArea1 : physical oceanography processes SArea2 : hydrothermal processes SArea3 : biodiversity
Technological Area(s):	TArea1 : interoperability, data transmission, power supply
DM Start date:	September 2008
DM duration:	
Period of the reporting	1 July-31 December 2009

Partners Management report

Partner Num.	Institution Name	PI
1	DOP/UAÇ	A. Colaço
2	FFCUL/CGUL	M. Miranda
3	IPGP	M. Cannat
4	NOC	D. Connelly
5	CNRS - F CNRS - C	V. Chavagnac J. Goslin
6	Univ. Bremen	C. Waldmann and M. Fabian
7	Ifremer	P.M. Sarradin
8	SOPAB	S. Ghiron

P#1 DOP/UAÇ

- **Work Performed** *:*
- **Rough Estimation of Major Cost**:

Overview of the Actual Costs, **P#1 DOP/UAÇ**

• **Work Performed** *:*

The UAç team:

- Contributed to the :

WP4:

- Contributed to the site management through different contacts with teams that are also working in the area and with the local authorities. At the 22nd of December 2009 the European Communitty integrated the Lucky Strike and Menez Gwen hydrothermal vents on the list of sites of Community importance for the Macaronesian biogeographical region.

WP5:
- Conception of a didactic game.
- Participation on the SCOR Workshop on Ocean Biology Observatories in Mestre
- Submission of the scientific publications:

Larkin, K.E., Ruhl, H.A., Bagley, P., Benn, A., Bett, B.J., Billett, D.S.M., Boetius A., Chevaldonné,P., Colaço, A., Copley, J., Danovaro, R., Escobar-Briones, E., Glover A., Gooday, A.J, Hughes,J.A., Kalogeropoulou, V., Kelly-Gerreyn, B.A., Kitazato H., Klages, M., Lampadariou, N., Lejeusne, C., Perez, T., Priede., I.G., Rogers A., Sarradin, P.M, Sarrazin, J., Soltwedel, T., Soto, E.H., Thatje, S., Tselepides, A., Tyler, P.A., van den Hove, S., Vanreusel, A., Wenzhöfer, F. 2009: Benthic biology time-series in the deep sea: Indicators of change. *OceanObs'09 benthic time-series white paper*

-Glover, A G, A J Gooday, D M Bailey, D S M Billett, P Chevaldonné, A Colaço, J Copley, D Cuvelier, D Desbruyères, V Kalogeropoulou, M Klages, N Lampadariou, C Lejeusne, N C Mestre, G L J Paterson, T Perez, H A Ruhl, J Sarrazin, T Soltwedel, E H Soto, S Thatje, A Tselepides, S Van Gaever, and A Vanreusel, Climatic and geological drivers of long-term temporal change in deep-sea ecosystems, Advances in Marine Biology, (submitted).

-Colaço A.; M. Cannat , J. Blandin ;P.M. Sarradin (subm). MoMAR-D- A technological challenge to monitor in real time Lucky Strike hydrothermal vent field. *ICES Journal of Marine Science*

-Ruhl H.A., Karstensen J., Géli L., Colaço A., Lampitt R., André M. (subm). Societal need for improved understanding of climate change, anthropogenic impacts, and geohazrd warning drive development of ocean observatories in European Seas. *Progress in Oceanography*

-Cuvelier, D, Sarrazin J., Colaço A., Copley J. T., Glover A., Tyler P., Serrão Santos R., and Desbruyères D. (Subm) Community dynamics over 14 years at the Eiffel Tower hydrothermal edifice on the Mid-Atlantic Ridge. *Journal of Limnology and Oceanography*

-Contributed to the site management through different contacts with teams that are also working in the area and with the local authorities.

WP7:

Co-leading the project with P:M: Sarradin

• **Rough Estimation of Major Cost**:

• **Overview of the Actual Costs**,
Type of expenditure
During this period no major costs were performed

Actual costs(Euro)
Second period

Type of expenditure	**Actual costs(Euro) First period**
Total person-months	

Personnel costs	0
Subcontracting	0
Travels	0
Consumables	108
Other costs	0
Total Costs	108

P#5 CNRS - F : LMTG, Toulouse

- **Work Performed** *:*

Cedric Boulart participated to the ESONET meeting in Paris the 5 – 7 October 2009.

- **Work Performed** *:*

We have bought the electronic/optical- material from *Nomadics* to build the main structure of the dissolved methane in-situ sensor. We have also received from the ENS Chimie de Lyon (J.-P. Dutasta) a large quantity of the supra-molecule “Cryptophane-A” which is specially adapted to methane and which is the base of the sensor. We have build, in parallel, a bench-top set-up necessary to calibrate the methane sensor at atmospheric pressure. We are now in the phase of integrating the different component of the methane sensor using the infrastructure of the LAAS (Toulouse) before starting the first tests of methane detection in water at atmospheric pressure.

- **Rough Estimation of Major Cost**: *5748€*
- **Overview of the Actual Costs***,*

Type of expenditure	Actual costs(Euro) First period
Total person-months	1
Personnel costs	
Subcontracting	
Travels	396
Consumables	
Other costs	5352
Total Costs	5748.00

P# 7 Ifremer

- **Work Performed** *:*

A draft of the Data management policy is circulating among the partners and will be finalized before the cruise.

The MoMAR-D project was presented during the 4th International symposium on Chemosynthetic Based Ecosystems in Okinawa (Jpn), the ESONET All region workshop in Paris, the ESONET Best practices workshop in Brest and the Ocean Biology Observatory Workshop in Mestre (It).

A post doctoral grant was submitted and accepted by Ifremer and the European project Hermione. The PI are Pierre-Marie Sarradin (Ifremer), Jozée Sarrazin (Ifremer) and Grégoire Mercier (Télécom Bretagne).

Elaboration of a video processing platform to analyze the temporal dynamics of hydrothermal ecosystems.

Located on oceanic ridges, hydrothermal ecosystems are characterized by strong physico-chemical gradients and the presence of a unique fauna, sustained by microbial chemosynthesis. Several studies have shown that the spatial distribution and composition of vent faunal assemblages were strongly correlated to geological, physical and chemical processes at different spatial and temporal scales, but almost no data are available on the temporal dynamics of these ecosystems. The major objective of this post-doctoral research position is to develop a video processing platform to analyze the temporal dynamics of hydrothermal ecosystems. This data along with the abiotic data measured within the vent environment will be analyzed and compared using multivariate statistics. Finally, all the data will be further processed through a GIS that will allow for a graphical representation of all of the observed temporal variations. More specifically, we are looking to answer the following questions : (i) What biological and geological data can be automatically extracted from video imagery to feed the temporal database and (ii) what are the different scales of variations linking environmental changes and the dynamics of the fauna in hydrothermal ecosystems ?

The acquired data will be used to better understand the influence of abiotic variations on deep-sea animal communities. This post-doc will be one of the first using the new "deep-sea observatory" approach. Expected results may then provide fundamental knowledge on the functioning of deep-sea ecosystems. This project is part of the European programmes ESONET (2008-2011) and HERMIONE (2009-2012) of the 6th and 7th PCRD respectively.

- **Rough Estimation of Major Cost**:
  - **Consumables and spare parts for the ecology node.**
  - **Personnel costs :** **Development of the sensors for the ecology node**
    Adaptation of the Seamon technology for the project
    Participation to symposiums
- **Overview of the Actual Costs**,

Type of expenditure	Actual costs(Euro) First period
Total person-months	384
Personnel costs	17 308 €
Subcontracting	0
Travels	
Consumables and spares	16 284 €
Other costs	10 904 €
Total Costs	44 496€

Communications :

Ana Colaço (IMAR/DOP-Uaç), M. Cannat (IPGP), J. Blandin (IFREMER),P.M. Sarradin (IFREMER) and the MoMAR-D partners. MoMAR-D: A technological challenge to monitor the dynamics of the Lucky Strike vent ecosystem. ESONET All region workshop-Paris- 5-7 October.

P.M. Sarradin (IFREMER), Ana Colaço (IMAR/DOP-Uaç), M. Cannat (IPGP), J. Blandin (IFREMER), and the MoMAR-D partners. Implementing the Azores Node. ESONET All region workshop-Paris- 5-7 October.

J. Blandin & P.M. Sarradin. Deployment and recovery of a non cabled system with data transmission capacity : The MoMAR case. ESONET Best practices workshop, octobre 2009-Brest.

P.M. Sarradin (IFREMER), Ana Colaço (IMAR/DOP-Uaç), M. Cannat (IPGP), J. Blandin (IFREMER), J. Sarrazin and the MoMAR-D partners.The MoMAR-D project : A challenge to monitor the Lucky Strike hydrothermal vent in real time. Ocean Biology Observatory Workshop, Mestre (It), September 2009, 16-18.

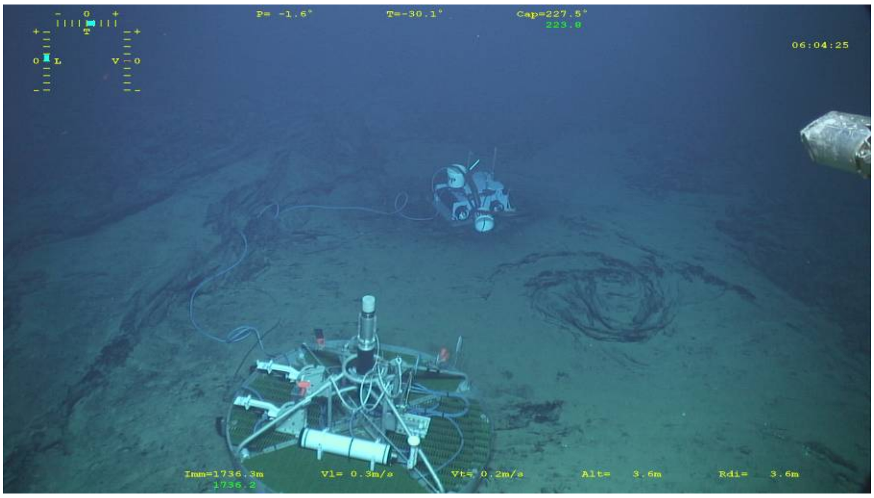
Mercier G., J Sarrazin, PM Sarradin. 2009. Development of an automated protocol to analyse the temporal dynamics of hydrothermal ecosystems from video imagery and temperature time-series part I: Automated image procesing. European Sea Observatory Network of Excellence 2nd Best Practices Workshop, Ifremer, Brest, France, 8-9 octobre.

Gauthier O, J Sarrazin, PM Sarradin. 2009. Development of an automated protocol to analyse the temporal dynamics of hydrothermal ecosystems from video imagery and temperature time-series part II: Untangling spatio-temporal temperature variations, first insights from a novel approach. European Sea Observatory Network of Excellence 2nd Best Practices Workshop, Ifremer, Brest, France, 8-9 octobre.

Project contract no. 036851

ESONET
European Seas Observatory Network

Instrument: **Network of Excellence (NoE)**
Thematic Priority: **1.1.6.3 – Climate Change and Ecosystems**
Sub Priority: **III – Global Change and Ecosystems**



SEAMON West deployed on the Lucky Strike Lava lake.
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ESONET WP4 - Demonstration Missions

MoMAR-D
Final activity report

Due date of deliverable: 1 March 2011
Actual submission date: April 2011

Start date of project: September 2008 Duration: 24 months
Organisation name of lead contractor for this deliverable: **Ifremer / IMAR**
Lead authors for this Final Report: **P.M. Sarradin, A. Colaço**

Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	X

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Table of Content

Section 1: General information

DM acronym:	MoMAR-D
DM title:	MoMAR-Demonstration
ESONET Site:	Azores- MoMAR, Lucky Strike hydrothermal field
Scientific Area(s):	SArea1 : physical oceanography processes SArea2 : hydrothermal processes SArea3 : biodiversity
Technological Area(s):	TArea1 : interoperability, data transmission, power supply
DM Start date:	September 2008
DM duration:	24
Period of the reporting	Final report

Partner Num.	Institution Name	PI	PI coordinates
1	DOP/UAÇ	A. Colaço	IMAR- Dept Oceanography and Fisheries-Univ of Azores, acolaco@uac.pt
2	FFCUL/CGUL	M. Miranda	Centro de Geofisica, Universidade de Lisboa, jmmiranda@fc.ul.pt
3	IPGP	M. Cannat	Equipe de Géosciences Marines. Institut de Physique du Globe de Paris. CNRS UMR 7154 cannat@ipgp.jussieu.fr
4	NOC	D. Connelly	Geochemistry Group National Oceanography Centre dpc@noc.soton.ac.uk
5	CNRS - F CNRS - C	V. Chavagnac J. Goslin	LMTG - UMR 5563 UR 154 CNRS Université Paul-Sabatier IRD Observatoire Midi-Pyrénées - chavagnac@lmtg.obs-mip.fr UMR6538 "Domaines Oceaniques" U.Bretagne Occidentale-CNRS IUEM - Jean.Goslin@univ-brest.fr
6	Univ. Bremen	C. Waldmann and H. Villinger	University of Bremen/MARUM waldmann@marum.de University of Bremen Department 5, Geosciences Sea Technics / Sensors vill@uni-bremen.de
7	Ifremer	P.M. Sarradin	Ifremer Brest, DEEP/Laboratoire Environnement Profond Pierre.Marie.Sarradin@ifremer.fr
8	SOPAB	S. Ghiron	Océanopolis sylvain.ghiron@oceanopolis.com

Associated partners

9	UPMC-LOCEAN with P# 3	G. Reverdin	LOCEAN, Univ. Paris VI, boite 100, gilles.reverdin@lodyc.jussieu.fr
10	CVARG with P#1	Gabriela Queiroz	Centro de Vulcanologia e Avaliação de Riscos Geológicos - Universidade dos Açores - Maria.GP.Queiroz@azores.gov.pt

Table 1: Deliverables List

	Deliverable Name	WP	Lead contractor	Due date	Actual/ Forecast delivery date
D1	Cruise proposal submission	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	01/08	01/ 2008 New one in January 2009
D2	Report Description of the operational system : interface specifications, sensors, localisation	WP2	J. Blandin (P#7)	03/09	04/2009
D3	Signed agreement Data management policy	WP3	T. Carval (P#7)	03/09	Draft version 04/2011
D4	Communication plan	WP5	J. Sarrazin (P#7)	03/09	04/2011
D5	On shore integration and test report	WP2	J. Blandin (P#7)	12/09	04/2011
D6	Cruise preparation file	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	03/10	05/2010
D7	Deployment of the system during the cruise	WP6	M. Cannat (P#3) J. Blandin and P.M. Sarradin (P#7)	08/10	10/2010
D8	1 month data file	WP1-WP3	M. Cannat (P#3) T. Carval (P#7)	09/10	04/2011
D9	Report of dissemination activities	WP5	J. Sarrazin (P#7)	10/10	04/2011

Table 2: Milestones List

Milestone	Milestone name	WP	Due date	Actual/Forecast delivery date	Lead contractor
M1	Submission of a cruise proposal to the French fleet	WP6	01/08	01/08 01/09	P#3 and P#7
M2	Data management policy	WP2, WP3, WP5	03/ 09	Delayed 04/2011	P#7
M3	On shore integration and test report	WP2	12/09	Delayed 05/10	P#7
M4	Deployment of the system 20 days Cruise	WP6	08/10	10/2010	P#3 and P#7

Section 2. Executive summary:

THE MOMAR-D- PROJECT: A CHALLENGE TO MONITOR THE LUCKY STRIKE HYDROTHERMAL VENT FIELD IN REAL TIME.

Hydrothermal circulation at mid-ocean ridges is a fundamental process that impacts the transfer of energy and matter from the interior of the Earth to the crust, hydrosphere and biosphere. The unique faunal communities that develop near these vents are sustained by chemosynthetic micro-organisms that use the hot fluid chemicals as a source of energy. Environmental instability resulting from active mid-ocean ridge processes create changes in the flux, composition and temperature of emitted vent fluids and influence the associated hydrothermal communities.
The MoMAR (which stands for Monitoring the Mid-Atlantic Ridge) project was initiated 10 years ago by the InterRidge Program to promote and coordinate long-term multidisciplinary monitoring of hydrothermal vents at MAR. It aims at studying vent environmental dynamics from geophysics to microbiology. More recently, the MoMAR area has been chosen as one of the 11 key sites of the European project ESONET NoE. MoMAR-D was selected as a demonstration mission to deploy and manage a deep sea observatory at Lucky Strike for one year. Monitoring this large hydrothermal field, located in the centre of one of the most volcanically active segment of the MAR, will offer a high probability of capturing evidence for volcanic events, observing interactions between faulting, magmatism; hydrothermal circulation and, evaluating their impact on the ecosystem.

The observatory infrastructure is composed of two Sea Monitoring Nodes (SEAMON) acoustically linked to a surface relay buoy (BOREL), ensuring satellite communication to the land base station in Brest (France). The entire system was deployed during the MoMARSAT cruise (The Pourquoi Pas ? /Victor6000, http://www.ifremer.fr/momarsat2010/) in October 2010. A first SEAMON node, dedicated to large scale geophysical studies, was moored in the centre of the large lava lake present in the Lucky Strike vent field. This node hosts an Ocean Bottom Sismometer (OBS) and a permanent pressure gauge (JPP) that were connected underwater using wet matable connectors. A second node was deployed at the base of the Tour Eiffel active edifice to study the links between faunal dynamics and variations of physico-chemical factors. This node is composed of a High Definition (HD) video camera, 6 LED lights, an Aanderaa optode (oxygen, temperature) and two in situ chemical analysers. These two nodes communicate via underwater acoustics to a BOREL buoy that is moored on the ocean surface within acoustic range of the SEAMON stations. This buoy is equipped with two identical and back up data transmission channels to ensure uninterrupted data flow. Scientific and technical data (including a low-resolution photo) are transmitted daily to the data centre in Brest. Autonomous instruments (OBS, ocean bottom tiltmeter, current meters, particle trap, colonisation experiments and temperature probes) were also deployed in the LS vent field. They will store their data for the whole duration of the experiment (1 year). Treatment of data sets will be conducted in two stages: in near real time for the subset that is transmitted through the SEAMON system; and after the 12 months for the whole data set. The near real time data will serve both as support for scientific interpretation, and as an indicator that an event is occurring. Volcanic (eruption, underground diking event, or rapid degassing of the magma chamber), tectonic (displacement along axial faults), or hydrothermal events are all expected to occur on the MAR. Understanding the impact of these events on biological communities is one of our key objectives. The data can be viewed online, according to ESONET data policy and European directives (now, temporary access through http://www.ifremer.fr/WC2en/allEulerianNetworks). The system will be recovered and redeployed in summer 2011.

Section 3. Work Description

The project is structured into seven workpackages. Management constitutes a specific work package (WP7), coordination was be done by A. Colaço from the DOP/UAÇ and P.M. Sarradin from Ifremer.

WP		WP leader
WP1	Scientific experiments	M. Cannat
WP2	Infrastructure of the observing system	J. Blandin
WP3	Data management	T. Carval
WP4	Site management	A. Colaço
WP5	Communication plan, Public outreach	J. Sarrazin
WP6	Cruise	P.M. Sarradin
WP7	Project management	A. Colaço, P.M. Sarradin

3.1 WP1 Scientific experiments – M. Cannat

Monitoring at Lucky Strike aims at determining the feed-backs between volcanism, deformation, seismicity, and hydrothermalism, and to understand how the hydrothermal ecosystem couples with these sub-surface processes. Experiments planned at the Lucky Strike vent field as part of this demonstration mission belong to 5 thematic packages exploring the dynamics of the geosphere, its impact on the hydrothermal fluid temperature and composition, and on the associated fauna and finally the exchange with the ocean.

The experimental design combines autonomous instruments which will store data over the duration of the mission, and instruments connected to shore via the SEAMON system [Blandin J. & Rolin J.F.. 2005]. Two SEAMON nodes will be deployed in the Lucky Strike vent field, one to the west of the lava lake primarily for geophysical instruments (the "geophysical node"), and one at the bottom of the Tour Eiffel edifice in the east, primarily for fluid chemistry and ecology (the "Tour Eiffel node"). A site survey will be performed before the implementation and after the recovery of the observatory infrastructure to validate the time series obtained during 12 months and to increase the spatial representativeness of the time series.

3.1.1 Thematic Package 1:Seismicity and hydrothermal activity

Hydrothermal circulations are primarily controlled by the permeability structure of the substratum, and by the distribution of heat sources. Mid ocean ridges, and particularly slow-spreading ones, are active extensional areas where cracks, fissures and faults play a major role to control the spatial and temporal evolution of permeabilities [Wilcock and Delaney, 1996]. Cracking and displacements along faults are expressed by seismicity. Magmatic events such as dyking, and other forms of magma displacement within the crust, control the distribution of heat sources, and may also trigger seismicity. Tectonic and magmatic seismic events have specific characteristics, particularly in terms of the stochastic distribution of magnitudes. Seismic monitoring of hydrothermal fields and their surroundings is therefore an efficient method to study the tectonic and magmatic events that likely control hydrothermal dynamics. The link between seismicity and vent fluid temperatures has been used before as a powerful constraint on numerical models of the permeability distribution at hydrothermal sites in the Pacific [Sohn et al., 1998; Wilcock, 2004]. We plan to adopt a similar monitoring and modelling approach at Lucky Strike.

The local seismicity record will be processed to determine hypocenter locations and to model magnitude and focal mechanisms. Excellent characterization of near site seismic velocity structure is available for this purpose from the SISMOMAR cruise [Seher et al., in prep]. Interpretation will be reinforced by integrating these local data with the regional hydrophone seismicity record (J. Goslin et al.). Tidal forcing on fluid temperatures will also be analyzed, and modelled in terms of crustal permeability [Schultz and Elderfield, 1997].

The experimental design consists in arrays of OBSs (Ocean Bottom Seismometer), and of temperature probes to monitor fluid temperature. Four autonomous OBSs will be deployed around the Lucky Strike volcano, complementing the autonomous Broad-band OBS station operated since 2007 and for 3 years by the NERIES program (Crawford and Singh).

One modified OBS (IPGP) and a subset of temperature probes will be connected to the SEAMON system. T° data will be sent to shore on a near-real time basis. Only a subset of the seismic data will be sent via satellite. Our objective is to obtain near-real time information on the level and intensity of seismic activity to serve as a guide for our strategy of shore-sensors interactions (ex: increase sampling rate of fluid chemical sensors or video camera in the event of a seismic crisis).

#	Partners	Work performed	Deviation
3	IPGP	Deployment of autonomous T probes Deployment of 4 autonomous OBS Deployment of 1 OBS on SEAMON East Coordination of the deployment	T probes were not connected
2	FFCUL/CGUL	Deployment of 4 autonomous OBS	
5	CNRS-C	regional hydrophone seismicity record	

3.1.2 Thematic Package 2: Vertical deformation of the seafloor at the Lucky Strike volcano

Vertical deformation on active terrestrial volcanoes varies with the type of volcano, and with its state in the eruptive cycle. Surface deformation and mass movements are used at terrestrial volcanoes as powerful constraints on models of magmatic and tectonic processes [e.g. Poland, 2006]. In a seafloor spreading context, strong extensional tectonics are superimposed on these volcanic cycles. The deformation of active volcanoes in non-marine spreading rift contexts is often in the order of a few centimeters per year, as seen for instance in Iceland [Jouanne et al., 2006; Sturkell et al., 2006]. It can, however, also be of the order of 1 meter or more, in dyke injection crisis such as the recent one in Ethiopia [Kendall et al., 2005], or the 1978 crisis in the Asal rift [Ruegg et al., 1979]. The tectonic setting at Lucky Strike presents many similarities with that of the Ehiopian-Afar rift system, vertical motions associated with volcanic events could therefore have the same order of magnitude.

A linear array of 10 geodetic benchmark, and one autonomous pressure sensor, has been deployed at Lucky Strike in 2006. As part of the MoMAR-D project, we plan to collect continuous pressure data both on the volcano summit, and at the base of the volcano to monitor its deformation by a differential analysis. We will investigate the links between these vertical motions and tectonic and hydrothermal activity by integrating vertical ground motion information with seismic data, and with fluid temperature and chemistry data.

The volcano summit pressure gauge will be connected to the SEAMON system for near real time data transmission. We will also collect data from an autonomous GPS station installed on the SEAMON buoy, in order to get the best continuous estimate of the sea surface height above the volcano. A series of temperature sensors along the mooring line (see § 2.5 Physical oceanography) will be useful to convert the sea level variations (buoy vertical movements) into pressure changes. This will be used to discriminate in the pressure signal a vertical motion from a sea level change.

Pressure data will be complemented by tiltmeter data acquired with the OBM of the University of Bremen. This instrument is an integration of existing parts of the Bremen Ocean Bottom Tiltmeter and the Bremen Ocean Bottom Accelerometer (OBA), which are currently deployed at the Logatchev Hydrothermal Vent Field at Mid-Atlantic Ridge (Fabian and Villinger, 2007) and already collected excellent data over almost one year. The OBM will have the sensors of OBT and OBA, a high resolution absolute pressure-gauge and a temperature data logger. The data will be collected by a low-power high-resolution data logger, which is able to locally store data on a non volatile CompactFlash card and can also transfer the data via an external interface to a sensor network.

Finally, the experimental design also includes repeated measurements of the Lucky Strike array of geodetic benchmarks. These have been measured for the first time during GRAVILUCK06, with an estimated precision better than ±1 cm. We therefore plan to measure the Lucky Strike array in 2008 and during the MoMAR-D recovery cruise in 2010.

#	Partners	Work performed	Deviation
3	IPGP	Deployment of 1 JPP on SEAMON East Deployment of 1 autonomous JPP Instrumentation of the buoy (GPS) Geodetic benchmarks measurements	To be done in 2012
6	U. Bremen	Deployment of an autonomous OBM	The OBM is autonomous

3.1.3 Thematic Package 3: Chemical fluxes at Lucky Strike vents

The behaviour of chemical species in hot hydrothermal fluid end-members provides critical information on fluid rock interactions in the hydrothermal cell, and on the conditions of these interactions [Charlou et al. 1991]. These are susceptible to change with time, due to geological processes (volcanism, tectonics), or to instabilities inherent to the hydrothermal system [Baker et al. 1995]. Our planned experimental design aims at a good integration between fluid characteristics and their evolution through time, and the ecological approach developed in § 2.1.4. For that purpose, we favour a small scale deployment of sensors, centred on the "ecology" node at Tour Eiffel. We will deploy a set of chemical sensors, some of which will be connected to SEAMON for near real time data transmission. This will include an in situ chemical analyser developed for the measurement of Fe and Mn species.

Under the MoMAR-D project, two duplicate devices will be manufactured and characterised, and new electronics constructed that will provide enhanced autonomous operation (e.g. data logging and self calibration), and interface directly with the SEAMON node. In addition, methods for long term operation (e.g. reagent stability enhancement, improved in situ calibration and fouling reduction techniques) will be developed – previous deployments have all been of short duration. The long term deployment of these sensors is novel, and particularly so in a hydrothermal setting. Networked operation is preferred, but autonomous operation is equally possible.

In addition, we will perform repeated sampling of the hot vent and diffuse fluids and analyze their composition (traces and major elements, stable and radiogenic isotopic ratios, gases, including methane) on board the ship or back on shore depending on the elements. Fluid sampling will also occur during the Bathyluck cruise in the same area (2008). Time-series data from the connected sensors and geochemical data on discrete fluid samples will be analyzed jointly with in situ geochemical data collected as part of the ecology experiments.

#	Partners	Work performed	Deviation
4	NOCS	Deployment of a iron manganese chemical analyser connected to Seamon West	The Mn analyser was not deployed, breakdown during the cruise
5	CNRS - F	Sampling of the hot vent and diffuse fluids Development of an in situ CH_4 sensor	
7	Ifremer	Sampling of diffuse fluids Fe chemical analyser, O_2 optode connected to SEAMON W	

3.1.4 Thematic Package 4: Ecology at Lucky Strike vents

Several studies in these ecosystems have shown that they were strongly dependant upon geological and geochemical processes happening at different scales. The spatial distribution of the fauna was correlated to fluid characteristics, to the concentrations of chemicals (methane, sulphide), to the type of substratum and also, to water depth [Sarradin et al. 1999; Sarrazin et al. 1999; Desbruyères et al. 2000, Le Bris et al. 2003]. In response to this variability, the biological communities present different spatial organizations characterized by the presence of gradients and of aggregative structures that vary from the segment to the structure scale.

TEMPO [Sarrazin et al. 2007] is a long-term imaging module equipped with a deep-sea video camera and two LED lights. An efficient biofouling protection is installed on the camera port hole and on the lights. A CHEMINI Fe in situ analyzer and 3 temperature probes are coupled to the TEMPO module to monitor environmental changes in parallel to community dynamics. The whole system is powered by a SEAMON node [Blandin et al. 2005]. The objective within MoMAR-D is to duplicate this experiment on the same mussel assemblage at the basis of the Tour Eiffel hydrothermal edifice with the added benefit of a near real time connection to shore, allowing for transmission of a subset of the data (mainly chemical data), with the possibility to modify sampling rates during the experiment. The bandwidth limitation constrained by the use of acoustic transmission will not allow us to transmit video imagery. However, the transmission of still images will be tested at a low frequency.

The characterization, distribution and evolution of the microfauna is also an important aim of deep sea hydrothermal ecosystem studies. For the MoMAR-D project, we plan to deploy a set of microbial colonization devices in the immediate vicinity of chemical and temperature sensors, around the Tour

Eiffel SEAMON ecology node. These devices can be deployed by ROV and are simple boxes containing standard mineral substrates.

The experimental design will rely on the acquisition of time series using the Tempo module and a network of autonomous probes deployed on selected mussel assemblages. Site studies will combine 3D reconstruction of the edifice to be studied by Tempo, characterization of the chemical gradients (pH, T, flow rate, dissolved and particulate organic matter and metals, methane) prevailing in the environment of selected mussel assemblages and sampling.

Finally, a mooring gathering a sediment trap and current meter will be deployed for one year close to the Eiffel Tower active edifice to study the possible influence of the vent fluid on the ocean chemical balance and to tackle the question of the timing of reproduction in the hydrothermal organisms. The purpose is to examine the composition (especially biological) and the flux of the settling hydrothermal particles emitted by an active vent. We will compare the diversity of organisms as well as temporal fluctuation of larvae production.

#	Partners	Work performed	Deviation
1	DOP/UAC	Deployment of colonization experiments Biological sampling	
3	IPGP	Deployment of microbial colonization modules	
7	Ifremer	Deployment of an observation module connected to SEAMON W Deployment of a particle trap Deployment of colonization experiments Biological sampling Video survey of Tour Eiffel	

3.1.5 Thematic Package 5: Physical oceanography

Lucky Strike, as most segments of the Mid Atlantic ridge south of the Azores, is a site of active internal wave generation, as well as complicated local circulation influenced by bathymetry, as well as mixing, both near the seamounts and in the semi-enclosed deep basins along the ridge. The measurements collected in 2006-2007 provide an interesting first view of the internal waves in the area, the flow between the deep basins, and where mixing takes place, in particular in the channel to the east of Lucky Strike. We are lacking information closer to the summit and the center of the segment, which would stride a longer period.

We plan to equip the surface BOREL buoy mooring of the SEAMON infrastructure both with a GPS, and with a set of T (and P) autonomous probes, recording at relatively high frequency (1 minute). This set of long-term data will also be used for geodesy (see § 2.1.2).

We also plan to document the local time variation of water flow patterns close to the SEAMON Tour Eiffel ecology node using a CTD/ADCP instrument package that has been assembled to that purpose during the EXOCET/D project. We plan to upgrade this system for autonomous deployment over a longer period (6-12 months). This will involve extending the capability of the existing data logger, augmenting the energy supply, and improving the synchronization between the CTD and the ADCP. A new mechanical frame will be designed that allows for free flushing of the CTD sensors, an open range of the acoustic transducers of the ADCP while all systems being well protected during the deployment and recovery phase.

#	Partners	Work performed	Deviation
6	U Bremen	Deployment of an autonomous CTD/ADCP instrument package (5 days)	The system was not connected and moored only 5 days
9	UPMC-LOCEAN	Deployment of an oceanographic mooring	The system was not installed on the BOREL mooring line to protect its integrity.

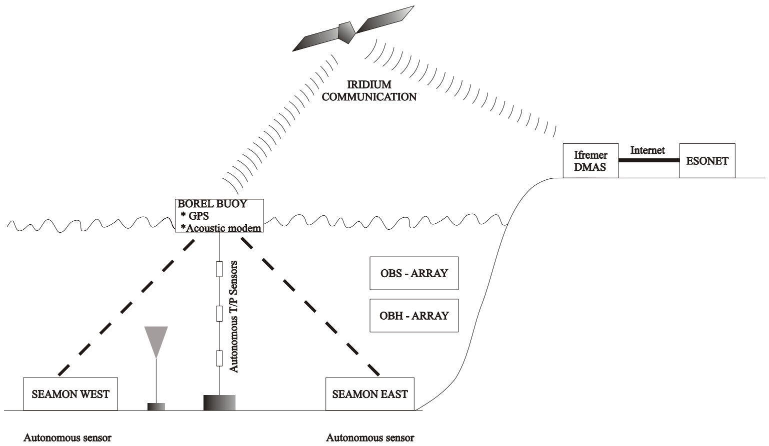
3.2 WP2 Observatory infrastructure

The SEAMON (Sea Monitoring Node) technology was developed during the ASSEM project [Blandin, J. et al. 2005]. It is an integrated system that provides a set of sensors with energy, data acquisition capabilities and several data communication channels. Those can be local communication with an ROV or manned submersible, for underwater installation and maintenance purposes, acoustic communication to a passing-by ship for partial data recovery, or communication to a permanent installation on shore via a buoy (BOREL) moored in the vicinity and acting as a relay between acoustic and satellite segments.

We plan to install 2 SEAMON nodes during the MoMARsat10 cruise:

- SEAMON-East will be devoted to thematic experiments 4 (Ecology) and 3 (Vent fluid chemistry). It will hold the video camera, the chemical sensors and the CTD/ADCP package. This node will be moored at the basis of the active hydrothermal edifice Tour Eiffel, to carry on the work done by the TEMPO station during the MoMARETO cruise.
- SEAMON-West will be devoted to thematic experiments 1 (Seismicity and hydrothermal activity) and 2 (Seafloor deformation). It will be connected to the pressure probe, to one OBS and one OBM, and to T-Probes. This second node will be moored in the western part of the fossil lava lake, near the present location of the pressure probe installed in 2006.

The BOREL Buoy acts as a data transmission relay. For reliability reasons, the system comprises two redundant communication channels, each composed of an acoustic modem (Evologics), a local interface and management electronic unit and an Iridium modem. Energy sources are also redundant. Two local sensors interfaces are also available on the buoy. The buoy position is transmitted to shore every 6 hours. Data transmitted by the sensors through the SEAMON Node and the buoy will be received on shore every 6 hours from the sea, controlled, and archived. Furthermore, interrogation of sensors and modification of functioning parameters is possible at any time from shore. Finally, the transmission of alarms generated on the seabed may be implemented under conditions to be defined.



Sketch of the MoMAR-D experiment

#	Partners	Work performed	Deviation
3	IPGP	Connection of an OBS and a JPP on SEAMON East Implementation of a GPS on the buoy	
4	NOCS	Connection of a chemical analyser to SEAMON West	
7	Ifremer	Preparation and installation of the 2 nodes Integration of the sensors Deployment of the nodes Deployment of the BOREL buoy Periodic checking of the BOEL and communication status Connection of the ecological module to SEAMON W	
	FCUL	Deployment of autonomous OBS	

3.3 WP3 Data management (T. Carval)

Data management and dissemination is a key task in the implementation of a multidisciplinary long term observatory. Principles of data management and dissemination were discussed at the beginning of the MoMAR-D project (Spring 2008) to obtain a formal participant agreement. The data management policy and procedure was defined taking benefit of the experience gained by Neptune Canada. The principles to be specified are: i) the definition of the data to be acquired, ii) the procedures of control for these data and the definition of metadata in accordance with the standards recommendations on data documentation, and finally iii) the dissemination level. The framework for this discussion is defined in the ESONET Description of Work. Data management procedures should be fully compatible with international recommendations and standards in order to improve interoperability with other systems and to ease comparison with other datasets: ISO standards for metadata, COI/WMO standards for quality flag scale. During the project, SISMER will collect, archive and distribute the data (in real time and after the recovery) according to the MoMAR-D data policy.

The MoMAR-D demonstration will also produce data from autonomous sensors or complementary site studies. These data will also be archived and part of the demonstration will be to design appropriate procedures for control and dissemination of these data. Site survey data acquired during the cruises will be available through the BIOCEAN database.

An important task of our data management WG will be to develop links between the MoMAR-D data management system, and the data management systems currently used for volcanic and seismic monitoring, and for ecosystem inventory and surveillance, at and near the Azores Islands. To this aim, we have secured the participation of colleagues from the Centro de Vulcanologia e Avaliação de Riscos Geológicos, and from the Department of Oceanography and Fisheries of the University of the Azores.

Scientific integration of collected data sets will be conducted in two stages: in near real time for the subset of data transmitted through the SEAMON system; and after the 12 months of the demonstration for the whole data set. The near real time data will serve both as support for scientific interpretation, and as an indicator that an "event" is occurring. Events at Lucky Strike may be volcanic (eruption, underground dyking event, or rapid degassing of the magma chamber), tectonic (displacement along axial faults), or hydrothermal. The response or the impact of these events on biological communities (micro organism bloom, composition, structure,) is one of the key scientific questions behind this proposal.

One objective of the MoMAR-D project was to demonstrate our capacity to manage a deep sea observatory. The project allowed us to write a draft data management policy, taking into account the specificity of our prototype instrumentation. This draft version will be discussed and validated after the first recovery of the system in June 2011. Anyhow, we have set the main principles of data access.

Data transfer is a key stage in the project. The development was performed by Ifremer including the coding / decoding steps of the data for their transfer (MOMAR-D: Format des trames de données IRIDIUM, J. Legrand, T. Bescond, RDT/EIM/10-032), the collection and archiving steps and the data validation by the scientists. This phase of data transfer is currently under progress at each step.

Finally, a subset of data can be viewed through the temporary internet site : http://www.ifremer.fr/WC2en/allEulerianNetworks.

#	Partners	Work performed	Deviation
	all	Participation to the elaboration of the data management policy Scientific integration of the data	Draft version Delayed 2011
3	IPGP	Data transfer and validation	
4	NOCS	Data transfer and validation	The analyser is not working
7	Ifremer	Elaboration of the data management procedures Data transfer, archive and distribution	 In progress
10	CVARG	Links with volcanic and seismic monitoring in the Azores	Delayed to the second cruise

3.4 WP4 Site management – A. Colaço

The growing interest and the increased number of science activities at the MoMAR vent fields have led the Portuguese and Regional administration to propose, in 2006, the area as a Marine Protected Area (MPA) within the OSPAR network. This proposal followed a workshop organized in Horta in 2002 [Santos et al, 2003], to reconcile the requirements for an MPA, with the constraints of the MoMAR project and other on-going research activities. The Lucky Strike vent field in particular, is identified in the MPA proposal «with the aim of promoting knowledge, monitoring and conservation of an area that best represents species, habitats and ecological processes in deep-sea hydrothermal vents in the OSPAR area, while enabling sustainable scientific research and promoting education and environmental public awareness and interest ».

The MoMAR-D demonstration will undertake to comply with the MPA rules and develop a coherent experimental site management plan. This plan will include a set of rules for PI's, based on the MPA code of conduct and on the InterRidge code of conduct. These rules will aim at minimizing the impact of research on the environment, and at ensuring the compatibility of all the experiments planned. In this context, we also plan to devote one dive to clean the area around our experimental network of the abundant non-native material left over the years of scientific work. As the procedure to recover old dead weight are not validated yet, this dive has been delayed to 2011.

To enforce these regulations, we will make provision in the MoMAR-D demonstration project for a coordinating MoMAR office, probably at Horta (but a centralized ESONET site management office may also be envisioned) and develop formal links with the Portuguese maritime authorities (the Hydrographic Institute), with the MPA managing authorities, and with the Azores Regional Government. Partners from the Centro de Vulcanologia e Avaliação de Riscos Geológicos, and from the Department of Oceanography and Fisheries of the University of the Azores will play a leading role in this task. This objective has been delayed to the EMSO PP project.

#	Partners	Work performed	Deviation
1	DOP UAC	coordinating MoMAR office	Delayed, EMSO PP ?
3	IPGP	coordinating MoMAR office	Delayed, EMSO PP ?
7	Ifremer	coordinating MoMAR office cleaning dive	Delayed, EMSO PP ? MoMARSAT 2011
10	CVARG	Links with volcanic and seismic monitoring in the Azores	Delayed to the second cruise

3.5 WP5 Communication plan, Public outreach - J. Sarrazin

The communication plan was prepared in collaboration with the leading b institutions of the project (IPGP, IMAR and Ifremer). The first press release before the cruise was available on the following web sites :

- http://www.insu.cnrs.fr/a3596,campagne-momarsat-2010-sources-hydrothermalesatlantique-
- sous-observation-pendant-toute-annee.html
- http://www2.cnrs.fr/presse/communique/2006.htm
- http://www.ipgp.fr/pages/040405.php?langue=2

During the Momarsat cruise, 2 press releases were written on board the vessel describing the work performed, and translated in English and Portuguese. A press release was also written by Evologics, the provider of the acoustic modems.

- http://www.evologics.de/en/news.html?newsman_news_id=36

The cruise was presented to the general public in specific web site daily updated. The coordination of the editorial team was done by J. Sarrazin, with the help of other scientists and engineers on board. The web site was available in English and Portuguese. The translation in English has been subcontracted, the Portuguese version has been done by A. Colaço.

- http://www.ifremer.fr/momarsat2010/

The report of the dissemination action is presented in D4.

#	Partners	Work performed	Deviation
1	DOP UAC	Conception of a didactic game General public dissemination	
	IPGP	General public dissemination	
	Ifremer	General public dissemination Coordination of the communication plan Coordination of the cruise web site	
	All	Participation to symposiums and workshops	

3.6 WP6 Cruise – P.M. Sarradin

The MoMARsat cruise was held on the research vessel Pourquoi pas ? with the ROV Victor6000 from the 1st to the 10th of october 2010. The port calls were on the Faïal Island (Azores). The recovery of the system is scheduled in summer 2011.

The following table gathers the list of scientists onboard involved in the MoMAR D project.

	Name	Institute	
1	Sarradin, Pierre Marie	Ifremer DEEP	Chief scientist
2	Blandin, Jérôme	Ifremer RDT	Coordination infrastructure
3	Escartin , Javier	IPGP	Coordination Geology / Geophysics
4	Colaço, Ana	IMAR DOP	
5	Sarrazin, Jozée	Ifremer DEEP	
6	C. Le Gall	Ifremer DEEP	
7	P. Briand	Ifremer DEEP	
8	Michael Aron	Ifremer DEEP	
9	Aumond Virginie	IUEM / Ifremer	
10	Khripounoff, A.	Ifremer DEEP	
11	Legrand, Julien	Ifremer RDT	
12	Bescond Tanguy	Ifremer RDT	
13	Gérard Guyader	Ifremer RDT	
14	Pascal Pichavant	Ifremer RDT	
15	Blin Alexandre	IPGP	
16	Barreyre, Thibaut	IPGP	
17	Christophe Courrier	IPGP	
18	Romuald Daniel	IPGP	
19	Lecomte, Benoît	IPGP	
20	Rommevaux Jestin, Céline	IPGP	
21	Louranço Antonio	LOCEAN	
22	Cedric Boulart	LMTG, Toulouse	
23	Valérie Chavagnac	LMTG, Toulouse	
24	Ricarda Dziadek	Univ. Bremen	
25	Ambra Milani	NOC, Southampton	
26	Cedric Floquet	NOC, Southampton	
27	Carlos Corela	FFCUL/CGU Lisbon	

The list of operations performed during the cruise is listed in the following table.

Day	Date	hh :mm	Operation
		08 :30	Transit to Lucky Strike,
2	02/10/2010	16 :00	Trial of the acoustic releases (1000m)
3	03/10/2010	05 :00	Mooring OBSP01, OBSP04, OBSP03, OBSP02, OBSP06, OBSP05
		08 :30	Mooring NASA1
		10 :00	**Dive 414-1**
4	04/10/2010	08 :40	Recovery NASA1
		09 :50	**End Dive 414-1**
		11 :10	Mooring SEAMON W
		14 :50	Mooring e OBS/JPP
		18 :10	Mooring NASA2

		20 :10	**Dive 415-2**
5	05/10/2010	8 :33	Recovery of the buoyancy of SEAMON W
		09 :50	**End dive 415-2**
		11 :20	Recovery NASA2
		12 :50	Recovery of the buoyancy of OBS/JPP
		14 :30	Mooring SEAMON E
		18 :13	Mooring NASA3
		20 :00	Mooring SEAMON E, 2nd trial
6	06/10/2010	00 :40	**Dive 416-3**
		19 :10	**End dive 416-3**
7	07/10/2010		Bad weather, no dive, CTD casts
8	08/10/2010		Bad weather, no dive, OBS localisation, CTD casts
9	09/10/2010		Bad weather, no dive,
		8 :00	Recovery of OBS C3 and C1
		13 :00	Localisation of OBS3
		14 :30	Recovery of OBS C2 and D2
		18 :00	**Dive 417-4**
10	10/10/2010	16 :00	Mooring Particle trap
		18 :00	Mooring OBT
11	11/10/2010	17 :00	**End dive 417-4**
		18 :30	Localisation of OBS P05, P04, P01, P02, P03, P06
12	12/10/2010	03 :30	CTD casts
		08 :00	Recovery of NASA3
		10 :15	Mooring of the BOREL buoy
		12 :20	Recovery of OBS C4,
		14 :50	Recovery of OBS C7
		17 :00	Mooring NASA4
		18 :00	repatriation on medical grounds, transit to Horta
13	13/10/2010	9 :00	landing, Horta, transit to Lucky Strike
14	14/10/2010	01 :00	**Dive 418-5**
			Recovery NASA4
			Recovery of the buoyancy of SEAMON E
			Recovery of the buoyancy of OBT
			Recovery of 2 oceanographic Moorings
			Mooring of NASA5
			Recovery of NASA5
15	15/10/2010	9 :00	**End dive 418-5**
		9 :30	Moorings OBS1 et 6
		10 :30	Deployment oceanographic Mooring
		14 :00	Transit to Horta
16	15/10/2010	8 :00	Horta, end of cruise

#	Partners	Work performed	Deviation
	all	Participation to the cruise	
	IPGP	Coordination of the cruise proposal and of the cruise	
	Ifremer	Coordination of the cruise proposal and the cruise Coordination of the infrastructure deployment	

3.7 WP7 project management

#	Partners	Work performed	Deviation
1	DOP UAC	Management of the MoMAR-D project	
	IPGP	Overall coordination of the project Coordination of the cruise proposal and of the cruise	
	Ifremer	Coordination of the project, the cruise proposal and the cruise Management of the MoMAR-D project	

Section 4. Data Management

The aim of data management is to collect, control, archive and distribute the signals recorded by the sensors in association with relevant metadata such that they become useful data. Each partner of MoMAR-D will benefit from sharing resources and knowledge from the level of sensor development and deployment through to data transfer, processing and security.

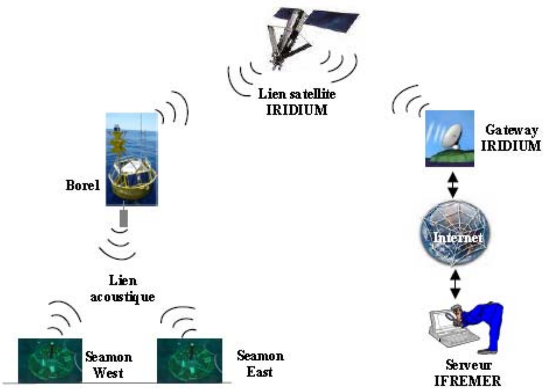
4.1 Data management policy

In the framework of MoMAR-D, we have started to write a data management policy specific to our project, mainly using prototype sensors. The purpose of this data management policy is to maintain an inventory of the different data that will be acquired during the MoMAR-D project, and to define their distribution level so as to *reconcile the objective of large dissemination of the data with the interests and intellectual property rights of investigators who conceive experiments, secure funding and deploy instruments on the seafloor*. This document is largely based on EuroSITES and Neptune Canada data policy manuals.

The MoMAR-D project is partly financed as a Demonstration Mission (WP4) by the ESONET NoE. It is closely related to associate projects such as Neptune Canada observatory and EuroSITES observatories. The MoMAR-D data management policy is written specifically to take into account the specificity of the MoMAR-D project i.e. the combination of various deep-sea measuring **prototypes** around an observatory infrastructure. Nevertheless, it should be compliant with the data policy of these 3 larger projects (ESONET NoE, Neptune Canada and EuroSITES).

4.2 Data management

The real time data transmitted daily by the Borel buoy are collected in the Coriolis data base in Ifremer centre de Brest. The first part of the work was dedicated to the description of the data format to be transferred from the deep sea nodes to the Ifremer data base. This format is presented in “MOMAR-D: Format des trames de données IRIDIUM”, J. Legrand, RDT/EIM/10-002.
The second part of the work was the qualification of the data transfer step done in collaboration between the Ifremer server, the scientists and the engineers responsible of the transmission equipment. In the same time, scientists started to validate the data.
As this part is currently under progress, data are not yet available on line for all the partners.



Schematic pathway of the data transfer step .

4.3 Conclusion:

At the end of the project, the data management policy is not finalized yet. The final stage will be attained when the first set of data will be recovered in 2011. The objective of the MoMAR-D partners is to organize a scientific project to confront all the data obtained and to start their integration. The level of data access will also be discussed during this data integration step with all the partners.
Finally, a subset of data can be viewed through the temporary internet site: http://www.ifremer.fr/WC2en/allEulerianNetworks.

Section 5. Results

5.1 Context

The objective of the MoMAR-D project was to contribute to the implementation of the Azores node through a 1 year deployment of an acoustically-linked multidisciplinary observing system at the Lucky Strike vent field, with satellite connection to shore.

Monitoring at Lucky Strike aims at determining the feed-backs between volcanism, deformation, seismicity, and hydrothermalism, and to understand how the hydrothermal ecosystem couples with these sub-surface processes. Experiments planned at the Lucky Strike vent field as part of this demonstration mission belong to 5 thematic packages exploring the dynamics of the geosphere, its impact on the hydrothermal fluid temperature and composition, and on the associated fauna and finally the exchange with the ocean.

5.2 Deployment

The observatory infrastructure is composed of two Sea Monitoring Nodes (SEAMON) acoustically linked to a surface relay buoy (BOREL), ensuring satellite communication to the land base station in Brest (France).

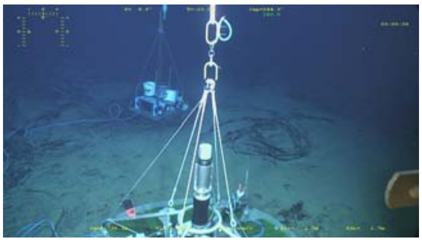
The first part of the project was dedicated to the development and adaptation of the interfaces between the various sensors and the monitoring nodes, followed by a trial period on shore a few weeks before the cruise.

The entire system was finally deployed during the MoMARSAT cruise (The Pourquoi Pas ? /Victor6000, http://www.ifremer.fr/momarsat2010/) in October 2010.

The first SEAMON node, dedicated to large scale geophysical studies, was moored in the centre of the large lava lake present in the Lucky Strike vent field. This node hosts an Ocean Bottom Sismometer (OBS) and a permanent pressure gauge (JPP). SEAMON and the sensor module were moored from the Pourquoi pas?. The sensor module was deployed near the SEAMON and was connected underwater using wet matable connectors by the ROV VICTOR6000.

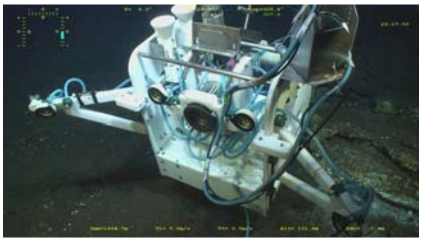
The OBS JPP sensor module

Underwater connexion of the OBS JPP module.



Seamon East was deployed on the lava lake

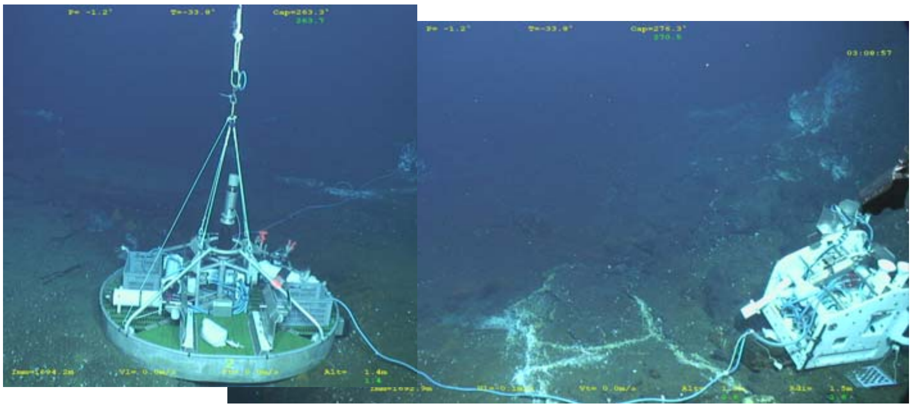
The second node was deployed at the base of the Tour Eiffel active edifice to study the links between faunal dynamics and variations of physico-chemical factors. This node is composed of two sensor modules. The first one is an ecological module (TEMPO) constituted of a High Definition (HD) video camera, 6 LED lights, an Aanderaa optode (oxygen, temperature) and an in situ chemical analyser measuring Total Dissolved Iron. The second one is an other chemical in situ analyser aimed at the measurement of Iron concentrations in diffuse hydrothermal fluids. The two sensor modules were connected to SEAMON onboard, and moored attached to the SEAMON structure. On the bottom, the sensor modules were precisely deployed by the submersible in front of a mussel bed for TEMPO, on a small crack for the chemical analyser. The deployment of TEMPO was controlled in situ using a prototype of underwater WIFI link. Using this link, we were able to transmit the first video sequences acquired by the camera during the deployment on board and hence to validate the exact position of the system and the quality of the image recorded.



The TEMPO ecological module

The IronMan chemical analyser deployed on small cracks.

These two nodes communicate via underwater acoustics to a BOREL buoy that is moored on the ocean surface within acoustic range of the SEAMON stations. This buoy is equipped with two identical and back up data transmission channels to ensure uninterrupted data flow. The acoustic modems were chosen after the COMMODAC/ESONET trials and come from EVOLOGICS. Scientific and technical data (including a low-resolution photo) are transmitted daily to the data centre in Brest via IRIDIUM / RUDICS satellite transmission. The energy of the buoy is insured by lead batteries recharged by solar energy.



Seamon West was deployed at the base of the Tour Eiffel active edifice.

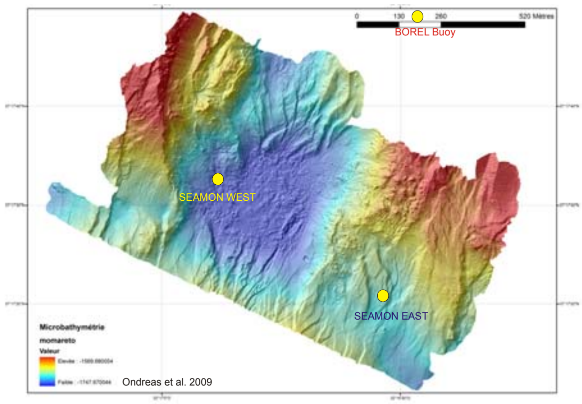
The first result of the cruise was the validation of the deployment procedure used to deploy the different components of the observatory. The 2 SEAMON nodes and the geophysics module were moored using the cable of the vessel. They were equipped with an additional buoyancy to reach a weight of ca 40 kg in water. On the bottom, Victor performed the precise deployment and connection operations.

The connection of the sensors to the nodes was validated using the two methods tried during the cruise. The geophysics module was successfully connected in situ to SEAMON West using a wet matable connector. This underwater connection is particularly valuable when the parcels are large. The second alternative used on SEAMON East is an onboard connection of the sensors. This method can be used only if the sensor packages are small enough to be installed and moored on the Station.

The deployment of the sensor was validated using 2 different communication links. A CLSI link was installed on both SEAMON nodes allowing checking the functioning of the sensors. A WIFI link was adapted to the Tempo camera to transmit the images acquired in real time to the ROV during the deployment. These 2 communication systems were essential tools during the deployment.

The Borel buoy was deployed at mid cruise, within acoustic range of the 2 nodes. The position of the buoy was chosen to optimize the acoustic transmission and to minimize the constraints for the ROV dives.

The Borel buoy was moored North of the lava lake.



Bathymetric map of the hydrothermal field Lucky Strike with the position of the 2 SEAMON and the BOREL buoy.

Autonomous instruments (OBS, ocean bottom tiltmeter, current meters, particle trap, colonisation experiments and temperature probes, see table below) were also deployed in the LS vent field. They will store their data for the whole duration of the experiment (1 year).

To complete and validate the observatory approach, we have pursued the site survey characterization of the Lucky Strike vent field speaking of fluid chemistry, characterization of the fluid / seawater mixing zone, faunal distribution and colonization studies. To achieve that work, several samples (water, microbial and faunal samples) were collected, as well as video transects. This part of the work will be continued in 2011.

Position of the instruments deployed during the MoMARSAT 2010 cruise

Instrument	Latitude	Longitude	depth m
Seamon E	37°17.3260N	032°16.5333W	1696
TEMPO	37°17.3260N	032°16.5333W	1696
IronManS	37°17.3260N	032°16.5333W	1696
Seamon W	37°17.4686N	032°16.8001W	1740
OBS-JPP	37°17.4686N	032°16.8001W	1740
Borel buoy	37°18.0424N	032°16.5848W	Surface
Particle trap	37°17.276N	32°16.538W	1710
Incubator LSTE2	37°17.3880 N	32°16.6000W	1692
Incubator LSLL5	37 17.5689 N	32 16.895W	1729
Incubator LSCyp1	37 17.4469 N	32 16.8606W	1739
Oceanographic mooring	37°17.1’ N	32°16.5’W	970-1696
12 Colonisation substrates	37°17.3260N	032°16.5333W	1696
Trap and SMAC	37°17.3260N	032°16.5333W	1696
OBS13	37° 18.277N	32° 22.512W	1782
OBS6	37° 17.102N	32° 17.849W	1791
OBS12	37° 18.025N	32° 15.481W	1710
OBS8	37° 18.404N	2° 17.395W	1820
OBS4	37° 17.990N	32° 11.224W	1344
OBS11	37° 16.779N	32° 16.226W	1733
OBS D1	37°19.3000 N-	32°16.639 W	
OBS D2	37°17.918 N	32°19.426 W	
OBS D3	37°17.565 N-	32°17.288 W	
OBS D4	37°16.967 N-	32°14.476 W	
Temperature probes			
HT WH0006AD10	37°17.4419 N	32° 16.9274W	1720
HT WH0006BD10	37°17.4419N	32° 16.9274W	1720
HT WH0007AD10	37°17.3847N	32° 16.6422W	1684
HT WH0007BD10	37°17.3847N	32° 16.6422W	1684
HT WH0010AD10	37°17.447N	32° 16.918W	1723

HT WH0010BD10	37°17.447N	32° 16.918W	1723
HT WH0012AD10	37°17.5286N	32° 16.5027W	1614
HT WH0012BD10	37°17.5286N	32° 16.5027W	1614
HT WH0013AD10	37°17.283N	32° 16.532W	1701
HT WH0013BD10	37°17.283N	32° 16.532W	1701
HT WH0014AD10	37°17.28N	32° 16.534W	1700
HT WH0014BD10	37°17.28N	32° 16.534W	1700
LT WL00001D10	37°17.3291N	32° 16.5277W	1694
LT WL00002D10	37°17.2822N	32° 16.5426W	1701
LT WL00003D10	37°17.3324N	32° 16.5352W	1695
LT WL00004D10	371°7.435N	32° 16.932W	1720
LT WL00005D10	37°17.2917N	32° 16.5365W	1702
HT NH29007D10	37°17.5249N	32° 16.5018W	1616
HT NH30006D10	37°17.3813N	32° 16.8628W	1709
HT NH30008D10	37°17.4475N	32° 16.8601W	1738
HT NH30010D10	37°17.4469N	32° 16.8606W	1738
HT NH30015D10	37°17.5092N	32° 16.6601W	1728

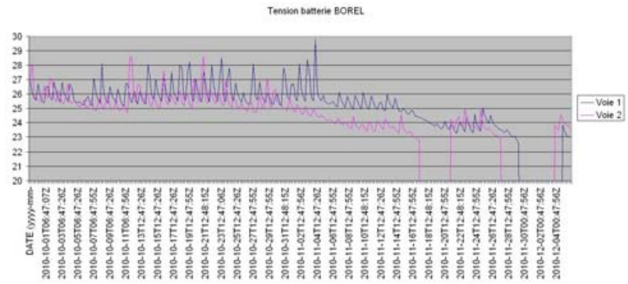
5.3 Preliminary results

The deployment of the 2 nodes was done during the Dive 415, on 2010/10/04 and 05. The Borel buoy was moored the 2010/10/12 and the data transmission started immediately. The table below presents the status of the sensors deployed and connected to the node or to the buoy.

	Institute	Description	Period of the transmitted data	Results
SEAMON West				
JPP	IPGP	2 Permanent Pressure gauges	15 min	The first channel is transmitting
OBS	IPGP	Seismometer	6 h	Data transmitted only after the 11/25
Technical data	Ifremer	Intensity, current , energy	1 day	OK
Seamon East				
SMOOVE	Ifremer	HD camera	1 day	1 snapshot every day
CHEMINI	Ifremer	Fe analyser	12 h	Transmission is OK, but the sensor is not sampling correctly
Optode	Ifremer	O_2, T°C	15 min	OK
IronMan	NOCS	Fe analyser 2 ways		Mechanical problem, the 2 sensors were disconnected
Technical data	Ifremer	Intensity, current , energy	1 day	OK
Buoy				
Technical data	Ifremer	Intensity, current , energy	6 h	OK
GPS	IPGP		6 h	Incomplete data

A problem of battery recharge was detected on the BOREL buoy after one month. During cloudy periods, the recharge system based on photovoltaic cells was undersized. Transmission was not possible during these periods but started again following the weather.

A snapshot of the mussel assemblage studied by Tempo is sent every day.



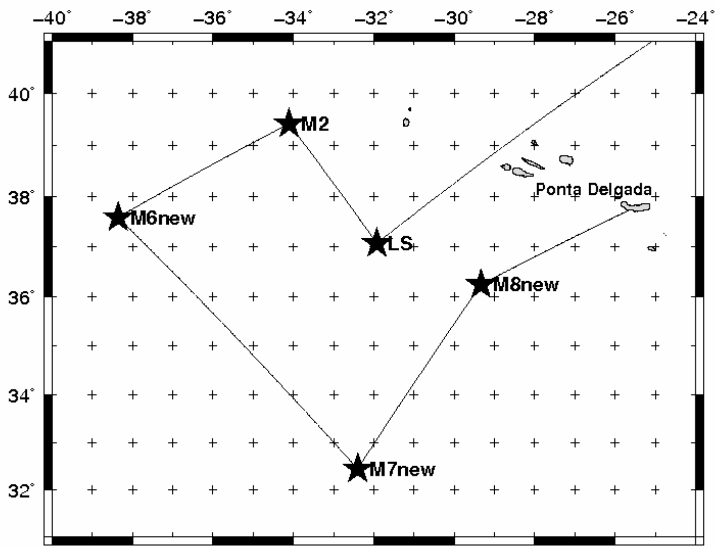
The energy recharge of the BOREL batteries was undersized during the cloudy weather periods.

Data transmitted are stored in Ifremer. The final step of data decoding and validation are currently in progress. Part of the data can be viewed online, according to ESONET data policy and European directives http://www.ifremer.fr/WC2en/allEulerianNetworks.

Treatment of data sets will be conducted in two stages: in near real time for the subset that is transmitted through the SEAMON system; and after the 12 months for the whole data set. The near real time data will serve both as support for scientific interpretation, and as an indicator that an event is occurring. Volcanic (eruption, underground diking event, or rapid degassing of the magma chamber), tectonic (displacement along axial faults), or hydrothermal events are all expected to occur on the MAR. Understanding the impact of these events on biological communities is one of our key objectives.

5.4 The HYDROBS-MOMAR Experiment (IUEM)

The main objective of the HYDROBS-MOMAR cruise was to increase the length of the hydroacoustic data series of observation over the MoMAR area, at a regional scale. We deployed 5 hydrophones (Figure 1) during the first week of August 2010 (from the 1st to the 8th) for one year around the MoMAR area. This experiment is complementary to the MoMARSAT project and leaded by IUEM.



Map showing the localization of the five hydrophones. Four hydrophones (M2, M6new, M7new and M8new) are located around the MoMAR area, the fifth one is located near the Lucky Strike Segment (LS).

The detection and localization of the numerous low-magnitude earthquakes occurring along active oceanic ridges provide important insights into the various magmatic, tectonic or hydrothermal processes which generate theses earthquakes. However, these processes mainly generate low-magnitude seismic events that are not detected - or in any case, poorly located- by land-based seismological global networks. The deployment of autonomous hydrophone arrays, moored within the SOFAR channel, a wave-guide in which acoustic waves propagate over long distances with little attenuation, overcomes this difficulty: hydrophone arrays have shown their capability to detect and precisely locate (< 2 km) typically 30 to 40 times more events than those listed in global catalogs. The interpretation of acoustic data recorded by two large hydrophone arrays deployed north of the Azores (the SIRENA array) and south of 35°N (the "South Azores" array) has evidenced the low seismicity rate of most of the section of the Mid-Atlantic Ridge which encompasses the MoMAR area: only very few seismic swarms were observed, separated by long periods of quiescence. Acoustic data recorded by the first array dedicated to the monitoring of the MoMAR area (the four-instrument MARCHE array) shows an important magmatic activity where only few tectonic swarms are observed.

In the following table, are listed the coordinates, the depth and the line length of each hydrophones after ranging.

HYDROBS-MOMAR	Latitude	Longitude	Ranging	Depth	Line length
LS	31°55.210' E	037°04.810' N	After deployement	2170 m	1100 m
M2	39°25.280' N	034°06.380' W	After deployment	3670 m	2700 m
M6new	37°35.570' N	038°21.610' W	After deployment	3871 m	2900 m
M7new	32°27.170' N	032°27.300' W	After deployment	3529 m	2400 m
M8new	36°15.030'N	029°19.850' W	After deployment	3470 m	2500 m

The depth of the sea at the mooring sites is ca 3500 to 4000 m, therefore the line length for the hydrophones to be located in the SOFAR channel is around 3000 except for the LS mooring located near the ridge at 2000 m with a line length of 1100.

Expected results

The mooring of five instruments in the south and west of the Azores Plateau (LS, M2, M6new, M7new and M8new) is specifically designed to achieve long-term acoustic monitoring at the regional scale of the MoMAR area. The catalog of this seismogenic zone will be extended to a 3-year period since 2010 and a period of 5 years taking into account the MARCHE cruise and the HYDROBS-MOMAR2 cruise scheduled for 2012. A catalog with many years of observations will characterize the deformation process-related accretion and, therefore, it will be possible to establish an energy balance of the oceanic ridge in the MoMAR region. Moreover, the MoMAR site offers the possibility to correlate results of seismic catalogs with other methods implemented in this area including, OBS catalog of the BBMOMAR and BATHYLUCK experiments and the microbathymetry, magnetism and gravimetry from BATHYLUCK, and physicochemical measurements near the hydrothermal vents: all these results correlated will bring new insights to a global geodynamic model of ridges.

Section 6. Conclusion and perspectives

The objectives of the MoMAR-D project were to deploy and manage a multidisciplinary observatory in the Lucky Strike vent field, during 1 month.

The observatory infrastructure is composed of two Sea Monitoring Nodes (SEAMON) acoustically linked to a surface relay buoy (BOREL), ensuring satellite communication to the land base station in Brest (France). The system was deployed during the MoMARSAT cruise (The Pourquoi Pas ? /Victor6000, http://www.ifremer.fr/momarsat2010/) in October 2010. A first SEAMON node, dedicated to large scale geophysical studies, was moored in the centre of the large lava lake present in the Lucky Strike vent field. This node hosts an Ocean Bottom Sismometer (OBS) and a permanent pressure gauge (JPP). A second node was deployed at the base of the Tour Eiffel active edifice to study the links between faunal dynamics and variations of physico-chemical factors. This node is composed of a High Definition (HD) video camera, 6 LED lights, an Aanderaa optode (oxygen, temperature) and two in situ chemical analysers. These two nodes communicate via underwater acoustics to a BOREL buoy that is moored on the ocean surface within acoustic range of the SEAMON stations. Scientific and technical data are transmitted daily to the data centre in Brest.

This first deployment highlighted also a few technical problems linked either to the functioning of some sensors or to the energy consumption of the nodes and buoy.

Autonomous instruments (OBS, ocean bottom tiltmeter, current meters, particle trap, colonisation experiments and temperature probes) were also deployed in the LS vent field. They will store their data for the whole duration of the experiment (1 year).

Treatment of data sets will be conducted in two stages: in near real time for the subset that is transmitted through the SEAMON system; and after the 12 months for the whole data set. The near real time data will serve both as support for scientific interpretation, and as an indicator that an event is occurring. Volcanic (eruption, underground diking event, or rapid degassing of the magma chamber), tectonic (displacement along axial faults), or hydrothermal events are all expected to occur on the MAR. Understanding the impact of these events on biological communities is one of our key objectives. The data can be viewed online, according to ESONET data policy and European directives (now, temporary access through http://www.ifremer.fr/WC2en/allEulerianNetworks).

In January 2010, it was decided to extend the deployment of the observatory for 1 year. The system will be recovered during the Momarsat 2 cruise, planned in summer 2011. The instruments, nodes and buoy will be maintained during the first part of the cruise and deployed at the end. The maintenance of the system will also concern the following points to improve or correct : i) the functioning of the chemical analysers (Chemini and Ironmans), ii) the data transmission (OBS and JPP), iii) the energy recharge on the buoy and finally iv) the reduction of the energy consumption of the whole system.

The recovery should be done in 2012 within the EMSO framework.

Section 7. Dissemination and outreach

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Sarradin P.M., A Colaço, M. Cannat, J. Blandin,and the MoMAR-D partners (2010). MoMARSAT : A first integrated observatory to monitor the dynamics of the Lucky Strike vent (eco)system. Oral presenttaion, ESONET General Assembly, Marseille 13-16 december 2010.

Sarrazin J., C. Le Gall, L. Peton, PM Sarradin. A glimpse into the deep: Mussel community changes and environmental dynamics at Tour Eiffel, MAR. 4th International symposium on Chemosynthetic Based Ecosystems in Okinawa (Jpn), July 2009,

Sarrazin J., J. Blandin, L. Delauney, S. Dentrecolas, J. Dupont, C. Le Gall, J. Legrand, P. Léon, J.P. Lévèque, L. Peton, P. Rodier, R. Vuillemin, P.M. Sarradin A glimpse into the deep 45 days in the life of a vent mussel assemblage. ICES International symposium, Horta (Azores, Pt), April 27-30 2009.

Sieben V.J., C. F. A. Floquet, The development of autonomous microfluidic sensors for nutrient and trace metal detection. Challenger 2010, SENSOR workshop, Microfluidic and sensor technology for oceanographic application and environmental science applications.(invited talk)

Publications (non referred papers)

Sarrazin J. et al. 2009, MoMAR/D: A demonstration mission to establish a multidisciplinary observatory at hydrothermal vents on the Mid-Atlantic Ridge. ESONEWS n°3

Ricardo Serrão Santos , Raul Bettencourt e Ana Colaço (in press). Os Campos Hidrotermais e a sua Biosfera. Proceedings of the Conference: Congresso dos Mares da Lusofonia - Comissão D. Carlos – 100 Anos. Lisboa

Miscellaneous

Cannat M. et al. 2009. « EMSO-Fr », réponse à l'appel d'offre pour la labellisation par l'Insu de « Sites instrumentés » en Terre Interne.

Public outreach (The communication plan is detailed in D4)

Colaço, A.- supervision of a 10º grade student's group project on "Ethics on Hydrothermal vent Ecosystems Research and Exploitation" as part of the Philosophy course at Manuel de Arriaga Highschool (May-June 2010)

Colaco, A. - lecture on "OÁSIS DO MAR PROFUNDO- Deep-Sea Oasis" at the workshop "Explorando o Oceano na Escola" (Exploring the Ocean in School). The objective of this workshop was to give background information on ocean conservation to highschool teachers in the Azores. The workshop was part of the collaborative project "Ocean Exploration in the International Education Community" (EXPLORE) among the IMAR/DOP-UAz, Oceanoscópio - private agency of Marine Education, Ocean Technology Foundation (USA) and the National Oceanic and Atmospheric Administration (USA) (19-05-2010)

Colaço, A. Oásis do Mar profundo. Encerramento das XV Olimpiadas do Ambiente. 8 de Maio, Horta, Faial. [invited talk].

Colaço, A. -Tecnologia Marinha – Universidade Sénior da Horta "Mar dos Açores: caracterização, investigação, usos e conservação" (1:30h)

Colaço, A. -Diversidade de habitats - ambientes oceânicos – Universidade Sénior da Horta "Mar dos Açores: caracterização, investigação, usos e conservação" (1:30h)

Serrão Santos, R.- Os Açores e a Fronteira do Mar Profundo. Seminário "Os Açores na Geopolítica do Atlântico" (Comemorações do 17º Aniversário do Comando Operacional dos Açores), 25-26 Janeiro, Ponta Delgada, Portugal (invited speaker).

Serrão Santos, R.- Hands on Hot Deep Seafloor - Advances in the Deep-sea Research in the Azores: Scenarios on Blue Biotechnology from Extremophyles. Conference The Atlantic: An Ocean of Opportunities, 28 of January, Brussels, Belgium (invited speaker).

Serrão Santos, R.- Os Campos Hidrotermais e a sua Biosfera. II Congresso dos Mares da Lusofonia - Comissão D. Carlos – 100 Anos -, Centro Cultural de Cascais, 21 – 22 de Outubro, Cascais, Portugal (invited speaker).

Serrão Santos, R.- Potencialidades e Recursos Naturais do Espaço Marítimo Português do Mar Profundo. IV Seminário de Secção: Gestão e Ordenamento das Actividades Litorâneas Potencialidades e Recursos do Espaço Marítimo Português, Academia de Marinha, 30 de Novembro, Lisboa, Portugal (invited speaker).

Serrão Santos, R.- Lucky Strike, Menez Gwen & Rainbow MPAs Rationale and Design. Workshop on Design of MPAs for Hydrothermal Vent and Cold Seep Ecosystem: Potentially Threatened by Human Activities in the Deep Sea. CRESCO, 1st to 4th of June, Dinard, France (invited participant).

Serrão Santos, R.- Prospecção e Exploração dos Fundos Marinhos: A Nova Fronteira. Conferência "Jornal Expresso" Portugal e o Mar, a nossa aposta no século XXI, Hotel 'The Oitavos', 21 de Outubro, Cascais, Portugal (invited speaker).

Serrão Santos, R.- DOP - Universidade dos Açores: Onde as Ciências do Mar se Aprofundam. A Investigação Científica no Espaço Marítimo Português Cinquenta Anos do Instituto Hidrográfico. Academia de Marinha, 28 de Setembro, Lisboa, Portugal (invited speaker).

Serrão Santos, R.- Deeper than Light: Touching the Bottom of the Ocean. 2nd International School Congress – Natural Resources, Sustainability and Humanity, Braga, 5-8 May, Braga, Portugal (invited speaker).

Project contract no. 036851

ESONET

European Seas Observatory Network

Instrument: **Network of Excellence (NoE)**
Thematic Priority: **1.1.6.3 – Climate Change and Ecosystems**
Sub Priority: **III – Global Change and Ecosystems**

AOEM Demonstration Mission

Periodic Reports

Start date of project: **March 2007** Duration: **48 months**

Start date of the Demonstration Mission: July 2009 Duration: **8 months**

Project co-funded by the European Commission within the Sixth Framework Programme (2002-2006)		
Dissemination Level		
PU	Public	
PP	Restricted to other programme participants (including the Commission Services	
RE	Restricted to a group specified by the consortium (including the Commission Services)	
CO	Confidential, only for members of the consortium (including the Commission Services)	

ESONET Demonstration Missions

Request of additional information
Update of planned activities and financial issues

Please send this form back to esonet-coordinator@ifremer.fr
NB: this intends to summarise information in no more than 10-11 pages.

Reference info and documents of ESONET NoE are available on http://wwz.ifremer.fr/esonet_emso

Contact references

DM acronym:	AOEM (Arctic Ocean ESONET Mission)
DM title:	Arctic Ocean ESONET Mission – combining ARCOONE (Arctic Operational Oceanography Network in ESONET) and MASOX (Monitoring Arctic Seafloor – Ocean Exchange).
Coordinator name + address, Email, telephone, fax	Professor Ian Wright National Oceanography Centre, Southampton European Way Southampton, SO14 3ZH UK Tel: + 44 23 8059 6017 Fax: + 44 23 8059 6554 Mobile: + 44 777 0538 133 Email: i.wright@noc.soton.ac.uk
ESONET Site:	Arctic Ocean
Scientific Area(s):	SA1, Geosciences (cold seeps and vents, fluid flow, gas hydrates and carbon release); SA2, Physical Oceanography (changes in Arctic seas related to biogeochemisty, global change affect upper-ocean circulation); and SA3, Biogeochemistry (aspect of biogeochemistry sensitive to global change, feedback of global change).
Technological Area(s):	TA1, Underwater sensors; TA2, Observatory capabilities; TA3, Sea operations and telemetry buoys; and TA4, Data Management and infrastructure.
Key words: (scientific topics, technology topics,)	Arctic Ocean, Fram Strait, western Svalbard shelf, operational oceanography, acoustic tomography, hydrate dissociation, seafloor lander observatory
Estimated DM Start date:	1 July 2009
Estimated DM duration:	31 October 2010 (16 months)

Partner Num.	Partner Institution Name	Principal Investigator (PI) for the Demo Mission	PI coordinates (Address, Email, Telephone, fax..)
1.	Alfred Wegener Institute for Polar	Dr Eberhard Fahrbach,	Postfach 12 01 61, 27515 Bremerhaven,

	and Marine Research		Germany Tel : +49 471 4831-1820 Fax : +49 471 4831-1797 Email: eberhard.fahrbach@awi.de
2.	The Foundation for Research and Technology – Hellas	Dr Emmanuel Skarsoulis	P.O. Box 1385, GR - 711 10, Heraklion, Crete, Greece Tel : +30-2810-391776 Fax : +30-2810-391801 Email: eskars@iacm.forth.gr
3.	Leibniz Institute of Marine Sciences, Sciences	Professor Christian Berndt	East Shore Campus, Wischhofstr. 1-3, D-24148 Kiel, Germany Tel: + 49 431-600-2273, Fax: + 49 431-600-2922 Email: cberndt@ifm-geomar.de
4.	Nansen Environmental and Remote Sensing Center	Dr Stein Sandven	Thormoehlensgate 47, N-5006 Bergen, Norway Tel : +47 5520 5838 Fax : +47 5520 5801 Email: stein.sandven@nersc.no
5.	University of Tromsø	Professor Jürgen Mienert	NO- 9037 Tromsø, Norway Tel : + 47 776 44446 Fax : + 47 77645600 Email: jurgen.mienert@uit.no

WP /Activity num.	WP/Activity name	Leader Institution	Tasks short description	Related Deliverables
WP1	Sensor / lander integration	Connelly, NOC	This work-package will lead final design of the observatory infrastructure, integration of the sensors, power management, data and sensor synching, data transmission, and onshore trials and validation. WP1 will coordinate with WP3.1 and 3.2 over experiments and fidelity of time-series recording. This work-package will coordinate with WP4.1 and 4.2 about data transfer technology and data formats and protocols.	D3, D5
WP2	Operational oceanography	Sandven, NERSC	This work-package will analyse possible scenarios for combining different data sets for operational oceanography data transfer from the an integrated multidisciplinary observatory. Requirements for operational data delivery (schedules, data quality, sampling frequency, pre-processing and averaging of data, etc.) will be collected from potential users and assessed in terms of their feasibility. The work-package will define the feasible ocean water column deliverables achievable from the cabled network.	D10
WP3.1	Geophysical experiments	Berndt, IFM-GEOMAR	This work-package will undertake a three-fold experiment; 1, Frequent swath bathymetry surveys will assess the variability of the acoustic signature of the bubble plumes in the water column ; 2, Monitor thermal signal of fluids expelled from the sediment ; 3, Monitor the micro-seismological expression of hydrate dissociation and fluid escape.	D6, D7,
WP3.2	Geochemical and flux experiments	James, NOC	This work-package address two key questions ; 1, Assess where the methane comes from and the relative contributions from dissociation of gas hydrate and migration of methane from a deep (thermogenic) source ; 2, Establish what chemical transformations occur within the sediments and the water column.	D6, D7
WP4.1	Data transfer technology	Fahrbach, AWI	This work-package will design, plan and test the functionality of an optimal network of interfaces and intermediate links (fiber optic cables, acoustic modems, gliders) for transfer of data from different moorings (oceanographic, acoustic tomography) in Fram Strait to land. A range of technical solutions will be assessed for possible application in building interfaces between moored system instruments and water column measurements.	D8

WP4.2	Data transfer formats / protocols	Skarsoulis, FORTH	This work-package will evaluate formats and protocols used for transfer of data streams from other existing operational oceanographic observatories for applicability to the diverse oceanographic and acoustic data sets delivered from Fram Strait moorings via intermediate acoustic links to the cabled node. The evaluation of results from WP4.2 will define data formats and protocols for pre-processing, compression, transfer and storage of oceanographic and acoustic data from Fram Strait moorings and platforms via the cabled observatory.	D9
WP5	Acoustic network	Sanden, NERSC	This work-package will define and design an integrated acoustic network for acoustic tomography, acoustic navigation of gliders and floats and for passive listening of human activities and marine mammals. The ACOBAR project provides a net of low frequency sources in the Fram Strait optimized and used for acoustic tomography and navigation of underwater vehicles (gliders and floats). This work-package will provide a review of the state of art capability of acoustic navigation in ice-covered oceans, and outline the requirements of an optimized acoustic navigation system using different frequency bands.	D10
WP6	Public out-reach	Sands, NOC	This work-package will conduct the science and public outreach component of the project. A dedicated website with ongoing project results and reports will be developed and maintained hosting the AOEM project. Key actions will be the development and maintenance of a project website that will have descriptions of research objectives, technology development, and near real-time data feeds from different sensor suites, and continue the case for a sustained and cabled observatory network in Fram Strait – western Svalbard.	D2
WP7	Project management	Wright, NOC	This work-package will deal with the overall organisation and coordination of the AOEM project, coordinated through a single steering committee comprising the WP leaders and at least one representative from each institute partner (including sub-contracting parties of Institute of Marine Research, Bergen and Geophysical Institute of University of Bergen (UiB).	D1, D4, D13

AOEM Deliverable Num.	Deliverable Name	Responsible Institution	Delivery Month
D1	Submission of Norwegian *RV G.O. Sars* cruise proposal	NOC (with IMR Bergen sub-contractors)	September 2009
D2	AOEM project website available on the web	NOC	September 2009
D3	Final design of MASOX observatory and interface specifications, sensors, and interoperability.	NOC (with IMR Bergen sub-contractors)	October 2009
D4	Signed MASOX partner IP agreement and data management policy	NOC	October 2009
D5	Report of onshore MASOX sensor integration and testing	NOC (with IMR Bergen sub-contractors)	May 2009
D6	MASOX cruise preparation file and cruise plan	NOC	July 2010
D7	Deployment of MASOX lander and / buoy system	NOC	August 2010
D8	Final report on available technical solutions for data transfer from Fram Strait moorings to land	AWI	July 2010
D9	Formats and protocols applicable for oceanographic and acoustic data transfer from the Fram Strait moorings to land.	FORTH	July 2010
D10	Final report on feasible ocean water column deliverables achievable from the cabled network and requirements of user community	NERSC	July 2010
D11	Final report on design of the acoustic network for acoustic tomography, underwater navigation and passive listening system in the Fram Strait	NERSC	July 2010
D12	Final ARCOONE report on a design of integrated multidisciplinary observatory linked to land, its	AWI	October 2010

	operational functionality and results of field testing of its selected components		
D13	Final MASOX report of mission results and dissemination activities.	NOC	October 2010

Miliestone Num.	Milestone Description	Month
M1	MASOX project team hold inaugural “kick-off” meeting.	March 2009
M2	Reconnaissance heat-flow measurements of western Svalbard site.	July 2009
M3	Submission of Norwegian *RV G.O. Sars* cruise proposal.	August 2009
M4	MASOX team meet to finalise design of lander and sensor integration.	September 2009
M5	AOEM project website available with MASOX and ARCOONE project information.	September 2009
M6	AOEM Steering Group meeting to review the DM progress.	May 2010
M7	Integration of MASOX lander and sensor suite completed and ready for deployment.	June 2010
M8	ARCOONE evaluation and defining of technical solutions completed.	July 2010
M9	ARCOONE and MASOX fieldwork in Fram Strait and western Svalbard completed.	September 2010
M10	ARCOONE final workshop combined with the Arctic ROOS Annual Meeting.	October 2010
M11	Final ARCOONE system design reports available.	October 2010
M12	Final MASOX meeting and activity report available.	October 2010

WP bar chart (planned):

modify the table extension if needed and insert the estimated time extension of each workpackage

WP#	1 Jul 09	2 Aug 09	3 Sep 09	4 Oct 09	5 Nov 09	6 Dec 09	7 Jan 10	8 Feb 10	9 Mar 10	10 Apr 10	11 May 10	12 Jun 10	13 Jul 10	14 Aug 10	15 Sep 10	16 Oct 10
1																
2																
3.1																
3.2																
4.1																
4.2																
5																
6																
7																
Milestones	M2	M3	M4, M5								M6	M7	M8		M9	M10, M11, M12

Link with Esonet Main activities: *please list which ESONET NoE WPs inputs are expected to your Demo Mission and when*

Inputs from ESONET WPs :	Estimated starting month:	Estimated ending month	Comments
Advice / linkage from WP7 about web-page development and design	1 Aug 2009	30 Sept 2009	
Advice / guidance from WP3 on best practice for MASOX observatory design.	1 Aug 2009	31 Oct 2009	
Advice / guidance from WP6 on surveying end-user requirements for Fram Strait operational oceanography.	1 Aug 2009	31 Jul 2010	
Advice / guidance from WP1 on data formats and protocols for hybrid acoustic / cabled transmission.	1 Aug 2009	31 Jul 2010	

Outputs to ESONET WPs :	Starting date: dd/mm/yy	Ending date: dd/mm/yy	Comments
Website built and web-link given to WP7	1 Aug 2009	30 Sept 2009	AOEM deliverable D2.
Presentation of AOEM project at 2nd All Regions ESONET Workshop for WP4.	1 Oct 2009	7 Oct 2009	Present and chair 2nd All Regions ESONET Workshop within Arctic WG2 Session
Final design of MASOX observatory for WP2 and WP3.	1 Aug 2009	31 Oct 2009	AOEM deliverable D3
Interoperability and testing report of MASOX sensors and lander system for WP2 and WP3.	1 Nov 2009	31 May 2010	AOEM deliverable D5
MASOX cruise plan for WP3 and WP4.	1 May	31 July 2010	AOEM deliverable D6
Report of technical solutions for oceanographic data	1 Aug 2009	31 July 2010	AOEM deliverable D8

transfer in Fram Strait moorings to land for WP3.			
Formulation of data formats and protocols applicable for Fram Strait acoustic data transfer for WP1 and WP2.	1 Aug 2009	31 July 2010	AOEM deliverable D9
Report on feasible operational oceanography from Fram Strait cabled network for WP3 and WP6	1 Aug 2009	31 July 2010	AOEM deliverable D10
Report on acoustic network design for Fram Strait tomography for WP3.	1 Aug 2009	31 July 2010	AOEM deliverable D11
Final report of ARCOONE sub-project for WP2, WP3, WP4, and WP5.	1 Sep 2010	31 Oct 2010	AOEM deliverable D12
Final report of MASOX sub-project for WP2, WP3, and WP4.	1 Sep 2010	31 Oct 2010	AOEM deliverable D13

Sensors & data management plan: *please list the measurements that your Demo Mission will perform, their characteristics and the accessibility*

Measured parameters	**Depth range of the measurements**	**Sampling/storage/acquisition frequency**	**Access restriction / unrestriction** (esonet partners, public, immediately or delayed, to raw data, processed data …)	**Comments**
Current Speed	2000	Once per hour, 1 year of data	Partners immediately, public delayed	
Current direction	2000	Once per hour, 1 year of data	Partners immediately, public delayed	
Oxygen	2000	Every 30 seconds 1 year of data storage	Partners immediately, public delayed	
Turbidity	2000	Every 30 seconds 1 year of data storage	Partners immediately, public delayed	
Salinity	2000	Every 30 seconds 1 year of data storage	Partners immediately, public delayed	
Depth	2000	Once per hour 1 year of data storage	Partners immediately, public delayed	
Seawater temperature	2000	Every 2 minutes 1 year of data storage	Partners immediately, public delayed	
Sediment temperature	2000	Every 15 minutes at every 10cm depth through 90 cm	Partners immediately, public delayed	
Bubble streams	2000	Acoustic tracking, switched on when bubbles detected	Partners immediately, public delayed	
Seismicity	2000	Continuous recording with 1 year of data storage	Partners immediately, public delayed	

Please note that some guide lines will be issued from the Esonet Best Practice workshop

Dissemination and outreach: *please describe in a synthetic way which kind of material will be available for your Demo Mission according to the mentioned categories*

School material that would be available at the issue of the mission: -photos, video, courses, … -others	Website with synopsis of research objectives, technology development, and near real-time data feeds from different sensor suites, and blog sites during research cruises in 2010, 2011, and 2012, and access to photos and video clips, and podcasts.
Dissemination through collaborations with aquaria, museum, sciences centres,	Dissemination will occur in participation with the Virtual Institute of Sustained Observing (VISO), the Norwegian through collaborations with the Norwegian ARCTOS network, regular news items on the NOC and AWI websites, the University of Southampton Science Open days and secondary school out-reach, and through ESONET WP7.

Financial issues: *please update the financial budget according to the recently allocated ESONET allowance*

1/ please compile the attached budget request form (split the budget to each involved partner on 3 months periods) (see Annex 1) comments: The spend profile for the AOEM Demonstration Mission is detailed in the attached Annex 1.
2/ do you intend to sub-contract any activity to some non-Esonet partners? Y/[redacted] The Institute of Marine Research, Bergen will be sub-contracted within the MASOX sub-project to the value of €105,000 to integrate sensors and IMR lander infrastructure. The University of Bergen will be sub-contracted within the ARCOONE sub-project to the value of €38,000.
3/ is an exchange of personnel foreseen? or any collaborative work of an engineer/researcher/technician to an institute different from the origin institute? (implying travel + journey longer than 1 week) ? [redacted]/N
4/ other

Budget distribution: *please indicate the budget distribution per partner and WP*

	WP1	WP2	WP3.1	WP3.2	WP4.1	WP4.2	WP5	WP6	WP7	Total
Partner#1 (coordinator) National Oceanography Centre, UK (with sub-contract to IMR Bergen)	45,000		52,000	52,000				10,000	5,000	164,00
Partner#2 Alfred Wegener Institute for Polar and Marine Research, Germany					40,000		33,770	5,000	3,000	81,770
Partner#3 Foundation for Research and Technology – Hellas, Greece						57,480				57,480
Partner#4 Leibniz Institute of Marine Sciences, Sciences, Germany (with sub-contract to IMR Bergen)	30,000		42,000	43,000					3,000	118,00
Partner#5 Nansen Environmental and Remote Sensing Centre, Norway (with sub-contract to Geophysical Institute of University of Bergen, UiB).		95,750								95,750
Partner#6 University of Tromsø, Norway (with sub-contract to IMR Bergen)	40,000		20,000	20,000					3,000	83,000
Total	115,000	95,750	114,000	115,000	40,000	57,480	33,770	15,000	14,000	600,00

Any comment or additional information you judge useful:

There are no further comments.