IMN/IDM/SISMER

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# IODE accreditation file submitted by the French National Oceanographic Data Centre

IFREMER - SISMER

# IODE Accreditation file submitted by the French National Oceanographic Data Centre (IFREMER-SISMER)

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# Identification of the data centre requesting accreditation

IFREMER - INSTITUT FRANÇAIS DE RECHERCHE POUR L'EXPLOITATION DE LA MER
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Centre Bretagne - ZI de la Pointe du Diable - CS 10070 - 29280 Plouzané
Département « Infrastructures Marines et Numériques »
Unité « Informatique et Données Marines »
« SISMER – Système d'Information Scientifique pour la Mer »

The French National Oceanographic Data Centre is operated by **IFREMER- SISMER**.

# Context of the accreditation

The International Oceanographic Data and Information Exchange (IODE) (http://www.iode.org) programme of the Intergovernmental Oceanographic Commission (IOC) of UNESCO (http://www.ioc-unesco.org) maintains a global network of National Oceanographic Data Centres (NODCs) and Ocean Biogeographic Information System (OBIS) nodes responsible for the collection, quality control, archive, and online publication of many millions of ocean observations which are made available to Member States. In addition, it coordinates a network of marine information (library) managers.

To facilitate the exchange and dissemination of oceanographic data and services, IODE has developed the Ocean Data Portal (ODP) and manages the OBIS portal to provide seamless access to the data collections across the IODE network for data discovery, access and retrieval.

The IODE Committee has long-held the view that there is a need for a quality management framework to ensure that NODCs are established and operated according to defined principles, including adherence to agreed standards and the requirements of the IOC Oceanographic Data Exchange Policy. This will ensure NODCs are able to provide data of known quality to meet the requirements of a broad community of users. This process is based on compliance to a set of requirements that can be translated into quantitative indicators to set up standard metrics which will be part of a regular review of an NODC. Existing NODCs will need to apply for accreditation and meet the prescribed accreditation requirements.

## The IODE Quality Management Framework project

### Establishment

The Twenty-second Session of the IODE Committee (IODE-XXII) adopted Recommendation IODE-XXII.18 to establish the IODE Quality Management Framework.

### Objectives

The IODE Quality Management Framework (IODE-QMF) provides overall strategy, advice and guidance for NODCs to design and implement quality management systems (QMS) for the successful delivery of oceanographic and related data, products and services.

### Activities

The main activities of the IODE-QMF are:

- Promote accreditation of NODCs according to agreed criteria;
- Provide assistance to NODCs to establish organisational quality management systems;
- Initiate and review existing standards and Manuals and Guides with respect to the inclusion of quality management procedures and practices;
- Provide regular feedback to the IODE Committee.

## Content of the accreditation file

The submission file contains the following elements:

- The present document follows closely the IODE requirements list as given in Table 1 of IOC Manuals and Guides No 67 “IODE Quality Management Framework for National Oceanographic Data Centres” (Reed G., 2014) and provides the requested information that couldn't find place elsewhere in the quality documents structure.
- The reference of the other documents as part of the accreditation file.

# IODE Accreditation Requirements and Report Format for NODCs

## 1. Organisational framework

### 1.1. Quality Management System

| | |
|---|---|
| *1.1 Quality Management System* | *The NODC shall establish and maintain a quality manual that includes*<br>*a) the scope of the quality management system*<br>*b) documented procedures established for the quality management system*<br>*c) a description of the interaction between the processes of the quality management system.*<br>*In addition, details of any QMS accreditation attained should be stated.* |

**IFREMER–SISMER has been operating with the authentication of ISO9001:2008 Quality Management System since 2012.**

Since 2011, IFREMER has implemented a Quality Management System which resulted in a certification ISO 9001:2008 in November 2012. In December 2014, the certificate was confirmed. Qualification inspections are carried out by professional agency (AFNOR-AFAQ) each year. Translation to the ISO 9001:2015 is under preparation and new inspections will be carried out within this new QMS version in 2017.

All IFREMER activities, from general management of the institute to the coordination of scientific projects are conducted at present in the ISO 9001 QMS. That includes for example:

- IFREMER management plan: fundings, staffs …
- instrument management plan for high accuracy measurements: calibration, maintenance…
- document management plan : availability and long term preservation,
- IT management plan: security, recovery after disaster, long term preservation, availability…

Within this IFREMER general ISO 9001 QMS, and according of the SISMER role as the French National Oceanographic Data Centre, a specific Quality Management Processes is dedicated to marine data management, both for the quality assessment of data and for the quality of related services.

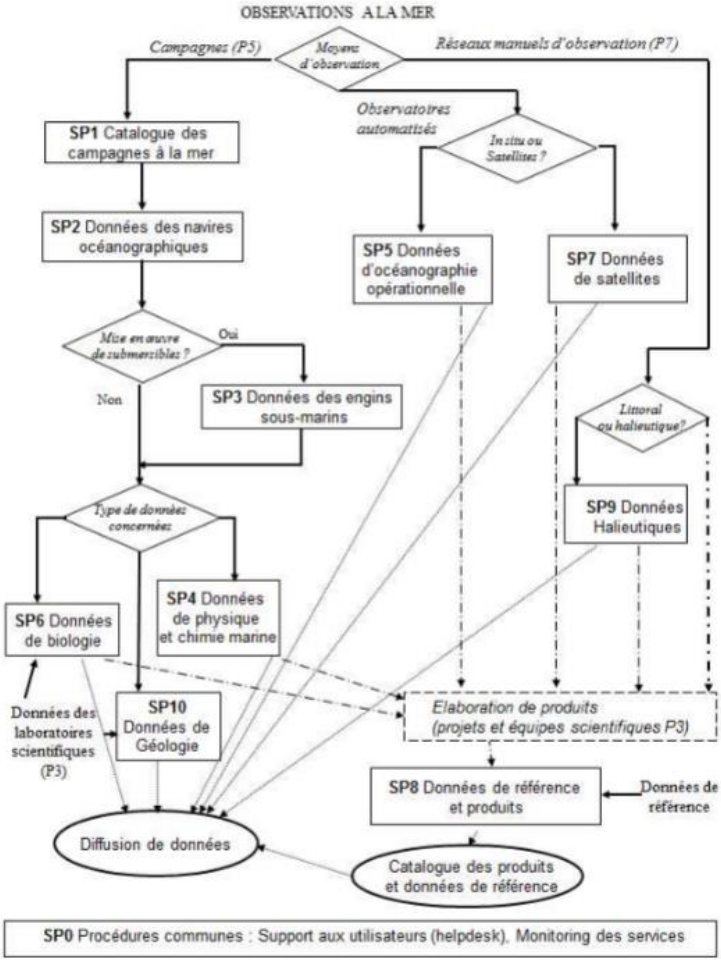



*Figure 1 - Interactions between the marine data management processes within the ISO 9001quality management system*

Quality Management Processes for marine data management include general procedures (SP0) and thematic procedures (SP1 to SP9) for all data types managed by the SISMER: physics, chemistry, biology, fishery and aquaculture monitoring, bathymetry and underwater geology.

General procedures (SP0) are mainly:

- Organisation of the support provided to data providers and to data users: user's desk, user's manuals, frequently asked questions…
- Monitoring of provided data services: availability, performance… This monitoring is partly performed automatically by a monitoring software (Open Source Icinga) according the Service Level Agreement defined or contracted for each provided service. The Service Level Agreement may include real time data management and distribution to users.

Thematic sub processes (SP1 to SP9) includes all procedures that are necessary to transfer data from observation to data centre ("from sea to shore"), to control their quality, to archive them on long term, to make them available to users (data discovery and data access).

As an example, quality checks for ocean physics and chemistry data relies on the recommendations, requirements and standards established by international organisations:

- IOC/IODE Manuals and Guides
- WMO Manuals

These requirements are completed by the requirements of international programs and conventions such as:

- World Ocean Circulation Experiment (for operation)
- ARGO Data Management Handbook
- OSPAR expert groups.

In addition, some requirements were entered in force by European Environmental directives such as:

- INSPIRE directive (discovery metadata and services)
- Water Framework Directive,
- Marine Framework Strategy Directive.

Quality checks are implemented in dedicated software which are ran in routine mode by the SISMER team (e.g. SCOOP software, which is used by several data centres).

## LINKED DOCUMENTATION

- IFREMER ISO 9001 Certificat (scanned version of the certificate in Annex I)
- ISO 9001 - IFREMER Quality Plan V2 and all related documentation (only in French, can be requested on demand at qualite@ifremer.fr)
- ISO 9001 - Manuel d'organisation IFREMER Organisation Manual V5 (only in French, can be requested on demand at qualite@ifremer.fr)
- ISO 9001 - Description of Data Management Processus (Processus P8) (only in French, can be requested on demand at qualite@ifremer.fr)
- ISO 9001 – Description of IT procedures (Processus P14) (only in French, can be requested on demand at qualite@ifremer.fr)
- IOC Manuals and Guides No 67 "IODE Quality Management Framework for National Oceanographic Data Centres" (Reed G., 2014)
- IODE Handbook (revised edition 1994)
- WMO No. 1060 - Manual on the WMO Information System
- WMO No. 1061 - Guide to the WMO Information System
- WMO No. 306 - Manual on Codes
- ARGO Data Management Handbook
- WOCE Operations Manual
- SCOOP software Manual

  More generally, SISMER data management manuals for all managed data types may be requested at sismer@ifremer.fr, if not easily found online (mostly in French language), such as:
  - Manuel d'exploitation de la banque de physique-chimie
  - Manuel d'exploitation de SeaDataNet
  - Séries temporelles : Les étapes du contrôle
  - Séries temporelles : Les étapes du contrôle des données de marégraphes (NIVMER)

## 1.2. Proof of expertise and reputation in the area of oceanographic data management

| | |
|---|---|
| *1.2 Proof of expertise and reputation in the area of oceanographic data management* | *The NODC shall describe the range and length of expertise of both the organisation and their staff. Details of datasets and products available from the NODC should also be provided. Any appropriate affiliations (e.g. national or international bodies, etc.) should be noted.* |

### 1.2.1. Context of SISMER activities

The mission of French representative at the Intergovernmental Oceanographic Commission (IOC) of UNESCO, was delegated in 1971 to the « Centre National pour l'Exploitation des Océans » (CNEXO) by the « Ministère des Affaires Etrangères » (Foreign Office). At this stage, only the management of data collected during research cruises was addressed.

After the creation of IFREMER in 1984, by merging two existing organisations (CNEXO and ISTPM), this mission was transferred to IFREMER and the "SISMER – System d'Information Scientifique pour la Mer" was created accordingly. The scope of managed data types has been extended progressively to data collected by automated in-situ observatories (such as ARGO floats), fishery and environment monitoring (in the framework of European Environmental Directives and Regional Sea Conventions) and satellites (as part of ground segments of ESA and CNES missions). These permanent commitments have been assigned, by contract ("Contrat d'objectifs Etat-IFREMER 2014-2017"), to IFREMER by the French Governmental bodies (Ministry of Research, Ministry of Environment).

At French National level, IFREMER-SISMER is now part of the recently created "Odatis - Ocean Pole" which is the Oceanographic component of the French Research Infrastructure for Earth Observation data management. CNES, CNRS, IRD, SHOM, IFREMER and several marine universities participate to Odatis.

In addition, the 7 institutes involved in operational oceanography in France (CNES, CNRS, IFREMER, IPEV, IRD, Météo-France, SHOM) decided in 2001 to join their efforts within Coriolis in order to:

- organise and maintain data acquisition in real-time and delayed mode of in-situ measurements necessary for operational oceanography,
- set up an operational in-situ data centre,
- develop and improve the technology necessary for operational oceanography.

As component of the Coriolis program, the Coriolis data centre operated by SISMER manages the ocean data observed using in-situ autonomous platforms (profiling floats, gliders, moorings, surface drifters, etc.) and ships of opportunity.

The French ocean data centre activity relies on 3 teams:

- Sismer which operates the data centre (18 equivalent full-time)
- ISI which develops the necessary software for data management and data processing (16 equivalent full-time)
- RIC which maintains the IT infrastructure (40% of this team is dedicated to data management and data processing infrastructure: 7 equivalent full-time)

Staff involved in the data centre is detailed below:

## SISMER

| Permanent Staff | | | | Non permanent | | | | Permanent support staff | |
|---|---|---|---|---|---|---|---|---|---|
| ***Engineers*** | | ***Technicians*** | | ***Engineers*** | | ***Technicians*** | | | |
| 17 | | 5 | | 3 | | 0 | | 0,5 | 0,5 |
| **Senior** | **Junior** | **Senior** | **Junior** | **Senior** | **Junior** | **Senior** | **Junior** | | |
| 10 | 7 | 5 | 0 | 1 | 2 | 0 | 0 | | |
| Ocean data management project coordination | | Cruise reports administration | | Physical oceanography and operational oceanography | | | | Finance | Administration |
| Geosciences (geology, geophysics) | | Physical oceanography and operational oceanography. Coastal and open-ocean oceanography | | Geosciences (geology, geophysics) | | | | | |
| Physical oceanography and operational oceanography. Coastal and open-ocean oceanography | | | | Projects vessels data | | | | | |
| Chemical oceanography | | | | Submarines and AUVs | | | | | |
| Satellite | | | | | | | | | |
| Deep sea environment | | | | | | | | | |
| Fisheries | | | | | | | | | |
| Cruise reports administration | | | | | | | | | |
| Web administration | | | | | | | | | |
| GIS | | | | | | | | | |
| Projects vessels data | | | | | | | | | |
| Submarines and AUV | | | | | | | | | |

## ISI

| Permanent Staff | | | | Non permanent | | | | Permanent support staff | |
|---|---|---|---|---|---|---|---|---|---|
| *Engineers* | | *Technicians* | | *Engineers* | | *Technicians* | | | |
| 11 | | 5 | | 3 | | 0 | | 0,5 | 0,5 |
| **Senior** | **Junior** | **Senior** | **Junior** | **Senior** | **Junior** | **Senior** | **Junior** | | |
| 8 | 3 | 5 | 0 | 0 | 3 | 0 | 0 | | |

## RIC

| Permanent Staff | | | | Non permanent | | | | Permanent support staff | |
|---|---|---|---|---|---|---|---|---|---|
| *Engineers* | | *Technicians* | | *Engineers* | | *Technicians* | | | |
| 16 | | 5 | | 1 | | 0 | | 0,5 | 0,5 |
| **Senior** | **Junior** | **Senior** | **Junior** | **Senior** | **Junior** | **Senior** | **Junior** | | |
| 10 | 6 | 4 | 1 | 0 | 1 | 0 | 0 | | |

LINKED DOCUMENTATION

- Journal Officiel - Décret n°67-7 du 3 janvier 1967 relatif à la création du CNEXO
- Programme d'orientation océan - août 1968 - CNEXO
- Journal Officiel - Décret n°84-428 du 5 juin 1984 relatif à la création, à l'organisation et au fonctionnement de l'IFREMER
- Contrat d'objectifs Etat-IFREMER 2014-2017
- Plan stratégique de l'IFREMER à l'horizon 2020
- Feuille de route du département IMN 2014-2017 (intranet only)
- Odatis : le pôle Océan (document projet)

### 1.2.2. Datasets and products

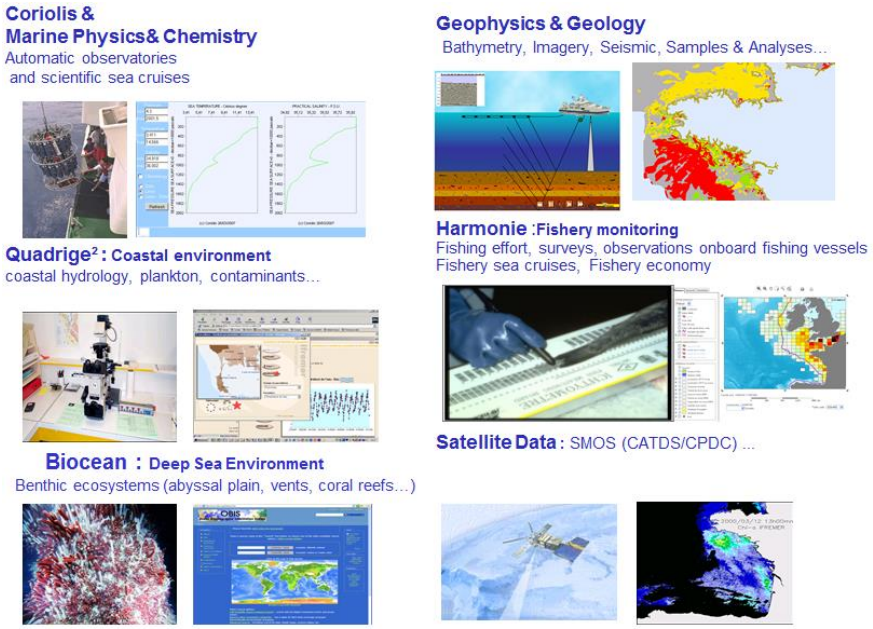



*Figure 2 - Overview of the different data types managed by SISMER*

The databases presented on Figure 2 are maintained and populated in routine mode:

- **Catalogue of French Sea Cruises** (http://campagnes.flotteoceanographique.fr/)
  The catalogue of French Sea Cruises records and preserves the descriptions of cruises (Cruise Summary Reports) and the observations collected by the instruments aboard the French Research Vessels and the underwater vehicles. This catalogue is maintained in cooperation with French fleet managers: CNRS, IPEV (Institut Polaire Français - Paul Emile Victor), IRD (Institut de Recherche et Développement) and IFREMER.
  *At present, the catalogue records more than 8200 sea cruises from 1913. 200 new cruises are recorded each year. For example, recorded bathymetry datasets cover around 1,226,777 km², and from submersibles, around 7,000 vidéos (*http://video.ifremer.fr/*) and 120,000 photos are made available.*
- **French oceanographic database** (http://www.seadatanet.org)
  The French oceanographic database records marine physics and chemistry parameters from CTD, water samples, thermosalinometers and moorings...

collected during French sea cruises or during joint cruises. *At present, are recorded around 45000 CTD stations, 47000 bottles casts, 500 hull ADCP cruises…*

LINKED DOCUMENTATION

- Rapport annuel d'activités de la Banque de Physique-Chimie (on request)
- Bilan de l'activité annuelle du projet SeaDataNet (on request)
- SCOOP : Manuel d'exploitation (on request)

- **Coriolis database for Operational Oceanography** (http://www.coriolis.eu.org/)
The Coriolis database contributes to the French operational oceanography program for the in-situ observations. The Coriolis data centre handles temperature, salinity and current parameters, and is presently extending its service to biogeochemical parameters such as oxygen, nutrients and chlorophyll.
Data sets are received from autonomous observatories *(*ARGO floats, buoys, moorings, Ship of opportunity...) and distributed to users in real time and in delayed mode. Coriolis acts since 2000 as one of the two Global Data Centre of the ARGO international programme and is the global component of the European Copernicus Marine Environmental Monitoring Services (CMEMS).
Global collections (CORA - http://www.coriolis.eu.org/Data-Products/Products/CORA) are periodically generated.
*At the end of 2015, the Coriolis database recorded more than 18.6 million of vertical profiles, 110 millions of measurements along the observatory route or drift, 445 millions of time series.*

LINKED DOCUMENTATION

- Rapport d'activités Coriolis 2015
- Documentation en ligne ARGO
- Documentation en ligne Coriolis
- Documentation sur l'exploitation de Coriolis (spécifications fonctionnelles et interfaces externes) (on request)
- SCOOP2 : Manuel d'exploitation (on demand)
- Tableaux de bord océanographie opérationnelle
- Manuel d'exploitation CORIOLIS (on request)

- **Biocean database : Benthic deep sea ecosystems**
The Biocean database records observations and measurements of the deep sea ecosystems (abyssal plains, warm and cold vents, deep coral reefs...) operated from the surface by research vessels or during submersible dives: biological sample descriptions and analyses, environmental measurements (physics, chemistry), habitats. *At present, the Biocean database describes more than 600 submersible dives when around 45,000 samples were collected.*

LINKED DOCUMENTATION

- Documentation en ligne concernant Biocean (intranet only)
- Manuel utilisateur GESCOL (Logiciel de gestion des collections faunistiques) (intranet only)
- Spécifications de la gestion de la classification taxonomique de la base BIOCEAN (DSF de Bioclass) (intranet only)
- Manuel utilisateur du site intranet Biocean (intranet only)
- Spécifications DONENV (intranet only)

- Description du Site Internet Biocean (www.IFREMER.fr/isi/biocean)
- Biocean, le CoML et OBIS - Accès aux données taxinomiques de Biocean sur internet
- Recensement des espèces nouvelles dans la base Biocean
- Manuel utilisateur Sealog (on request)
- Memento Sealog (on request)
- Manuel administrateur Sealog (on request)

- **Quadrige database : Coastal ecosystems and coastal environment monitoring**
  The Quadrige database records observations and measurements (plankton, of the coastal ecosystems operated both for research studies and for environmental monitoring within the framework of European environmental directives) from the surface by research vessels or during submersible dives: biological sample descriptions and analyses, environmental measurements (physics, chemistry), habitats.

- **Harmonie database : Fishery monitoring and fishing-related ecosystems** (http://sih.ifremer.fr/)
  The Harmonie database records observations on fish stocks and fishing related ecosystems made during sea-cruises, in particular, during sea cruises conducted in application of the European directives and Regional Sea Conventions. This data base records also the results of surveys (fishing efforts, catching, fishing techniques, economy of fishing sector) for all fishing vessels (French vessels, vessels operating in French EEZ). These surveys are conducted for all categories of fishing vessels from coastal ones (87% of French fishing fleet) to large ones.
  The Harmonie system generates, on a regular basis, periodic products and indicators that are used for scientific studies and public decision (stock assessments…).
  *At present, Harmonie records data from 1980 up to the present period: 7,600 fishing vessels, 15 millions of fishing vessel position and activity (from Vessel Monitoring System), around 300,000 log books, 250,000 sales notes from fishing markets and 8,000 results of surveys (economy, fishing techniques…)*

  LINKED DOCUMENTATION
  - Fiches de procédures liées à l'exploitation du SIH (on request)
  - Note de traitement des flux SIPA (on request)
  - Bulletins d'exploitation (on request)
  - Bulletins d'anomalies techniques (on request)
  - Bulletins d'anomalies thématiques (on request)
  - Bulletins de contrôle qualité SACAPT (on request)
  - Bulletins du guichet Harmonie (on request)
  - Manuels d'utilisation de quelques outils (on request)
  - Documentation du SIH (chrono) (on request)
  - Charte de gestion de la documentation (on request)

- **The Geological database**
  Since 2003, the SISMER manages the Brest Marine Geological Data Base that records the descriptions of physical samples (rocks, cores…) which are curated in the Brest geological library and the analyses done for these samples: chemistry, sieve analyses…
  *At the end of 2015, the SISMER Geological databases described more than 23,000 sampling operations conducted during 460 sea cruises and recorded more than 64,000 samples descriptions and 47,000 analyses.*

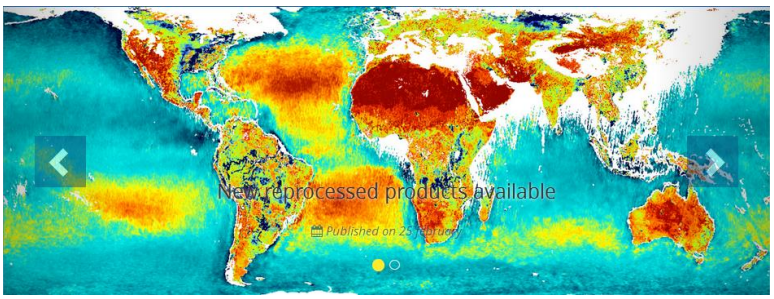
LINKED DOCUMENTATION

- Rapport d'activité annuel de la Banque de Géologie Marine Brestoise (BGMB) (on request)
- Manuel Utilisateur du module d'archivage des fichiers GM et de chargement de leurs données dans la BGMB (on request)
- Manuel Utilisateur des interfaces BGMB(on request)
- Manuel Utilisateur du module d'import / export de métadonnées BGMB(on request)
- Manuel Utilisateur du module d'archivage des fichiers REBENT dans la BGMB (on request)
- Dictionnaire de Données BGMB (on request)
- Manuel d'installation et d'Exploitation des interfaces (on request)
- NAUTILUS - Connecteurs BGMB (on request)
- Catalogue des campagnes : Affichage des prélèvements géologiques et biologiques (on request)

- **Satellite Data Production Centre for SMOS mission** (https://www.catds.fr/)
  The overall objective of the Data Production Centre for the SMOS (Soil Moisture Ocean Salinity) satellite mission is to routinely process and distribute in near real time Level3 and Level4 Soil Moisture and Salinity products in collaboration with CNES, ESA and CESBIO.

LINKED DOCUMENTATION

- Documentation de référence pour le CATDS-CPDC (on request)
- Contrat CNES / ESA (ICD) (on request)
- Procédures d'exploitation (on request)
- Manuel de retraitement (on request)
- Bilans mensuels d'exploitation (on request)
- Compte-rendu de la REVEX CATDS du 08 décembre 2015 (on request)




- **The Spatial Data Infrastructure Sextant** (http://sextant.ifremer.fr)
  Sextant manages and makes available geospatial information: maps, satellite and airborne imagery, models outputs… (vector and raster). This geographic information is reference data for marine studies and public decision for various disciplines: marine physics, biology, geology. Sextant has set up online services which are compliant with ISO and OGC standards (19115 family for metadata, Catalogue service for the Web, WMS, WFS, WCS…).
  *At present, Sextant records around 8,000 geographical coverages, organized in 110 catalogues of metadata (7,000 metadata entries).*

LINKED DOCUMENTATION

- Sextant : Guide de saisie des métadonnées
- Documents de formation Sextant (on demand)

- Saisie des métadonnées sous ArcGIS 10.1
- Guide d'administration Sextant (on demand)
- Guide d'utilisation Sextant
- Rédiger une fiche de métadonnées depuis la « Vue Sextant » (on demand)
- Manuel d'utilisation de Liferay (on demand)
- Rapport d'activités Sextant 2015

- **SEANOE - SEA scieNtific Open data Edition** (http://www.seanoe.org)
  SEANOE is the service provided by SISMER to publish marine scientific data, to get permanent identifiers (Digital Object Identifier) for the published data sets and to make them easily citable and online accessible. Seanoe is recognized as a permanent archive for data cited in scientific papers published by several peer review publications.

  LINKED DOCUMENTATION
  - Manuel d'aide au dépôt (intranet only)
  - Mise en place d'un système de dépôt et de publication de jeux de données marines - Spécification générale (intranet only)
  - Pages Wiki d'assistance technique SISMER (administration de SEANOE) (intranet only)
  - DOIs for ocean data, general principles and selected examples (ARGO, French cruises)

### 1.2.3. Participation to international projects and programs

Next to the permanent national commitments listed in the chapter 1.2.2, it is worth noting that SISMER is currently actively involved in the following European and international initiatives. The role of SISMER in recent international and European projects is listed hereafter:

| Framework programme | Dates | Project / Programme name | Role of SISMER |
|---|---|---|---|
| EU H2020 | 2016 – 2020 | SeaDataCloud | Project coordinator, Work Packages leader, Regional coordinator for the North Atlantic products |
| EU- H2020 - Copernicus | 2015-2025 | Copernicus Marine Environmental Monitoring Services (CMEMS) | Partner, Coordinator of the in-situ data management system, In-Situ and Satellite data provider, Task leader (product catalogue) |
| EU H2020 | 2017 – 2021 | Marinet 2 | Partner, Task Leader (data management) |
| EU H2020 | 2015 – 2018 | JERICO next | Partner, Task Leader (data management) |
| EU H2020 | 2015 – 2018 | ODIP II | Partner, Work Package leader |
| EU H2020 | 2015 – 2019 | AtlantOS | Partner, Work Package leader |
| EU H2020 | 2015 – 2019 | EnvRIplus | Partner, Task Leader |
| EU H2020 | 2015 – 2020 | MOCCA | Partner |
| EU FP7 | 2011 – 2015 | SeaDataNet | Project coordinator, Work Package leader, Regional coordinator for the North Atlantic products |
| EU FP7 | 2012 – 2015 | ODIP | Partner, Work Package leader |
| EU FP7 | 2011 – 2015 | JERICO | Partner, Task Leader |
| EU FP7 | 2010 – 2013 | FixO3 | Partner |
| EU DGMARE | 2013 – 2016 | EMODnet bathymetry | Partner, Work Package leader, Regional Coordinator |

| | | | |
|---|---|---|---|
| EU DGMARE | 2013 – 2016 | EMODnet Chemistry | Partner, Regional coordinator for the North Atlantic products |
| EU DGMARE | 2013 – 2016 | EMODnet MedSea CheckPoint | Partner, Work Package leader |
| EU DGMARE | 2016 – 2019 | EMODnet Atlantic CheckPoint | Project coordinator, Workpackage leader |
| EU-GMES | 2010-2015 | MyOcean | Partner, Coordinator of the in-situ data management system, Satellite data provider |
| IODE | | GOSUD | Co-Chair |
| IODE | | GTSPP | Participant |

Two of the projects listed above demonstrate particularly the involment of SISMER in the global oceanographic data management:

- SeaDataCloud, which is the current project to upgrade and maintain the SeaDataNet infrastructure, which networks 56 partners and more than 100 pan-European data centres (NODC and other marine related data centres) from 35 countries. This infrastructure provides, via a single common web portal, services to data users: discovery, visualisation, data download … on top of the distributed data centres. It also provides tools both for data users and for data managers : metadata generation using ISO 19115 family of standards, quality control tool compliant with IOC/IODE and JCOMM standards, data formats conversions, geospatial analyses, …
  It assembles large data collections in physics, chemistry, biology and, via linked projects such as EMODNET, bathymetry and seismics.
  SeaDataCloud, in collaboration with IODE Project Office, also organizes training sessions to encourage the adoption of IODE standards and best practice, and to ease the use of provided tools.
- Copernicus Marine Environmental Monitoring Services, led by Mercator Ocean, which aims to provide regular and systematic core reference information on the state of the physical oceans and regional seas. The observations and forecasts produced by the service support all kind marine applications.
  In this framework, SISMER operates the global in-situ database which collects and distributes in real-time data from several observations systems such as ARGO array of floats. It exchanges on a regular basis data to/from other operational oceanography data centres (regional and global ones), and via Meteorological Agencies, to the WIS/GTS. SISMER, in cooperation with regional experts, is also regional leader in charge of qualifying data for the North Atlantic.

LINKED DOCUMENTATION

- SeaDataNet web site : www.seadatanet.org
- Rapport d'activité SeaDataNet 2015 (on demand)
- Copernicus Marine Environmental Monitoring Services web site: marine.copernicus.eu
- Rapport d'activités Coriolis 2015

### 1.2.4. Relationships with non academic marine bodies

SISMER information systems are also part of French governmental institutional networks (French Ministery of Environment, European Commission: DG-ENVironment, DG-MARtime Affairs) which aims to implement the obligations related to data management within European Environmental Directives:

- The Water Framework Directive (Coastal monitoring data),
- The Inspire Directive (Environmental data from public bodies),

- The Marine Framework Strategy Directive,
- The Common Fisheries Policy.

In this scope, SISMER collects from and provides data to professional organisations (e.g. fishermen, aquaculture).

It also collaborates with other institutes such as the French Hydrographic Office (SHOM), the French Met Office (Meteo France). It had permanent relationships with JCOMMOPS which is located in the same building.

### 1.3. Commitment to provide sufficient resources for NODC operations

| | |
|---|---|
| *1.3 Commitment to provide sufficient resources for NODC operations* | *The NODC shall provide evidence that it is hosted by a recognized institution to ensure long-term stability and sustainability. Sufficient funding, including staff resources, IT resources and a budget for attending meetings, should be provided, ideally for a 3 to 5 year period.* |

SISMER is hosted by IFREMER which is one of the major oceanographic institutions in Europe. SISMER is part of the "IT and Marine Databases Unit" which includes several other components:

- **The IT service**, in charge of the administration of the servers (databases, disks, computing), the telecommunication networks, the data safeguarding and long term preservation… This service is in charge of the continuous maintenance of all the hardware dedicated to data management,
- **The marine information system development service,** in charge of the development and continuous maintenance of software used by the SISMER data centre.

At total, 35 permanent positions, and around 5 temporary positions, are presently engaged in the data management staff, both for in-situ data and remote sensing data management. Due to new managed data types, this staff has been increasing of one permanent position a year for the last five years.

The total recurrent budget has been set around 2.5M€ during the last years including hardware renewal and maintenance, software development and maintenance, software licences, network (internet connection…) expenses…, but excluding salaries. This budget is expected to be stable for the coming years, during the next IFREMER / Ministery of Research contractual strategic plan.

LINKED DOCUMENTATION

- Organigramme de l'unité IDM (French version only)
- Plan de gestion des services IDM (intranet only)

### 1.4. Commitment to return data holdings to originators, or lodging with an alternative repository, if the NODC becomes unsustainable

| | |
|---|---|
| *1.4 Commitment to return data holdings to originators, or lodging with an alternative repository, if the NODC becomes unsustainable* | *A long-term stewardship plan should be available including:*<br>• *A statement on how the NODC is funded and for how long.*<br>• *Action to be taken in the event that the NODC becomes unsustainable* |

Data management is included in IFREMER mandate (cf. §1.2). As a consequence, SISMER has been mainly funded by IFREMER since its creation. Since 2016, SISMER is now included in the

"Odatis - Ocean Pole" which is the Oceanographic component of the French Research Infrastructure for Earth Observation data management. Beeing included in a French Research Infrastructure, directly linked to the French Ministery of Research, provides an additional guarantee of long term sustainability of the SISMER data centre.

In addition, several data collections managed by SISMER are already replicated in other national or international data centres, even if the master copy of data collections resides at SISMER:

- Metadata (metadata catalogues such as Cruise Summary reports, Common Data Index, … ) are replicated at European level within the SeaDataNet European infrastructure,
- Physical and chemical oceanographic data managed at SISMER are periodically included in the World Ocean Data Base maintained by the IOC/IODE World Data Centre A,
- Operational oceanography data, such as ARGO data, are continoulsly replicated in other regional or global data centres, according to the data management plans of the related international programmes,
- Bathymetry data sets, when publically available, are provided to the French Oceanographich Office (SHOM), the General Bathymetric Chart of the Oceans (GEBCO) and to the European Marine Observation and Data Network
- Parts of data linked to the exploitation of ocean resources and environment such as coastal environmental data, fishery monitoring data and geological data are transmitted to National and European legal repositories in accordance with national and European regulations.

In case of SISMER (or IFREMER) complete failure and according to the French regulation, all information and scientific data will be transferred to the French national repository for research data (CINES - Centre Informatique National de l'Enseignement Supérieur) which is mandated for long term preservation of Research data.

### 1.5. Provide national reports to the IODE Committee

| | |
|---|---|
| *1.5 Provide national reports to the IODE Committee* | *The NODC shall provide a national report to each session of the IODE Committee in accordance with the standard format provided.* |

Since 1971, French NODC has been actively participating to the sessions of IODE Committee and commits to report in a timely fashion its activities – and any other relevant information if needed – in conformity with IODE rules and practices. In the future, IDM-SISMER will continue to support the activities of IODE and submit national reports as required.

In addition, as the SeaDataNet coordinator, SISMER has informed about SeaDataNet activities, when usefull.

## 2. Quality control and maintenance

### 2.1. Adherence to IODE Standards and Best Practice

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|---|---|
| *2.1 Adherence to IODE Standards and Best Practice* | *The NODC must provide evidence of adherence to IODE recommended standards and best practice to ensure the quality of exchanged data. For more information see IODE/JCOMM Ocean Data Standards (http://www.oceandatastandards.org) and the JCOMM Catalogue of Practices and Standards (http://www.oceandatapractices.net/)* |

Since its creation in 1971, the BNDO “Bureau National des Données Océaniques” renamed into SISMER in 1990, is the designated National Oceanographic Data Centre for France (French NODC) for the International Oceanographic Data Exchange program (IODE) of UNESCO Intergovernmental Oceanographic Commission, following the former BNDO). As such it conforms to the IODE recommended standards and best practice to ensure the quality of exchanged data.

IODE manual and guides have been used for the implementation of the data centre and the main procedures developed for data management, quality assessment and international exchange, the main supportive documents were:

- Guide for establishing a National Oceanographic Data Centre, IOC, Manuals and guides, n°05, 1975
- Manual on International Oceanographic Data Exchange, IOC, Manuals and guides n°09, 1991
- Manual of quality control procedures for validation of oceanographic data, IOC, Manuals and guides n°26, 1993

## 2.2. Maintain a discovery metadata catalogue

| | |
|---|---|
| *2.2 Maintain a discovery metadata catalogue* | *The NODC shall maintain a discovery metadata catalogue that will store metadata about their datasets. ISO 19115 (Geographic Information - Metadata) is the international standard that sets out a number of metadata fields for describing spatial information datasets. ISO 19139 (Geographic Information - Metadata - XML schema implementation) is the standard that aims to define an XML encoding for the metadata elements defined in ISO 19115. The ISO 19115 metadata standard (or a profile) is to be used to generate metadata records.* |

SISMER manages well documented environmental data stored in its different databases assuring long-term preservation of the data and metadata. All public data can be easily downloaded from the IFREMER data portal (http://data.ifremer.fr for the French version or http://en.data.ifremer.fr for the English version). Non-public data are also described on the data portal and can be accessed under specific conditions. SISMER encourages timely the free and unrestricted access to data for non-commercial use.

Furthermore, SISMER is an active member of the SeaDataNet infrastructure and as such most of the physical, chemical, geophysical and geological data that it manages are distributed via SeaDataNet portal under standardized formats (http://www.seadatanet.org/Data-Access) and also available via the Ocean Data Portal (ODP) of IOC/IODE (http://www.oceandataportal.net/portal/).

In SeaDataNet, data and metadata are described as XML files based on the ISO-19115, ISO-19139 content models.

SISMER provides descriptions for the following SeaDataNet catalogues:

- EDMO – European Directory of Marine Organisations
  - 431 French / 3,691 total descriptions
- EDMED - European Directory of Marine Environmental Datasets
  - 237 French / 4,061 total descriptions
- EDMERP - European Directory of Marine Environmental Research Projects
  - 161 French / 2,961 total descriptions
- EDIOS - European Directory of the initial Ocean-observing Systems

  - 27 French / 362 total descriptions of observing programmes
- CSR – Cruise Summary Reports
  - 6,630 French / 47,606 total descriptions
- CDI – Common Data Index
  - 483,068 French /1,826,000 total descriptions

These descriptions are updated regularly by a manual transfer to the SeaDataNet portal catalogues (EDMO, EDMED, EDMERP and EDIOS) or by regular automatic harvesting of the metadata (CSR and CDI)

SISMER also develops and manages Sextant, the spatial data infrastructure for marine environments. Since 2006, Sextant has been accessible online and can therefore be used by all IFREMER's partners, and by the general public. Since 2008, Sextant has continued to evolve within the framework of the INSPIRE European directive. Sextant aims to collect and make available a catalogue of referential data from marine environments. Sextant is therefore a support for marine studies and decision-making in environmental issues such as biodiversity, marine renewable energy, coastal management, fishing, coastal and deep-sea environments, exploration and exploitation of the seabed, etc. This approach is perfectly adapted to the implementation of the "Grenelle de la Mer" marine environmental summit, and its continuation within the European commission's Green Paper "Marine Knowledge 2020".
As it meets ISO and OGC standards, Sextant is compatible with geographic information portals. Via interoperable services, Sextant data is accessible from several sources such as:

- French National Geocatalogue
- European Inspire Geoportal

LINKED DOCUMENTATION

- SERVEUR - Dictionnaire des données (on request)
- Manuel d'exploitation de SeaDataNet 2 (intranet only)
- Saisie des métadonnées sous ArcGIS 10.1. Selon les normes et standards d'interopérabilité ISO 19115 et ISO 19139, et exportation vers Sextant Version 5
- Guide administration Sextant (on request)
- Guide utilisation Sextant

## 2.3. Ensure data are collected according to defined quality principles and accepted procedures

| | |
|---|---|
| *2.3 Ensure data are collected according to defined quality principles and accepted procedures* | *The NODC should be able to advise on data collection procedures and should be able to direct data collecting organisations to appropriate standards, where these exist. Provide details of data guidelines used for the collection of data.* |

Data archived at SISMER originated from different sources:

- *Measurements made on-board the French research vessels by acquisition system*
  For data collected on-board the IFREMER fleet, SISMER is involved in the quality process for data collection by its participation in a working group involving technicians and data managers. This working group defines guidelines for the data collected by acquisition systems in order to ensure the implementation of procedures that aim to produce data at a minimum expected level of quality.
- *Measurements made by autonomous platforms sent automatically in NRT to SISMER*

These measurements are mainly performed in the frame of operational oceanography programs. The recommendations issued by the EuroGoos Data Management Exchange and Quality Working group (EuroGoos Data MEQ) are applied:

- Recommendations for in-situ data Near Real Time Quality Control
- Real Time Quality Control of biogeochemical measurements
- Recommendations for enhancing Data Management Exchange and Quality for operational oceanography (2015)
- Recommendations for a Pan-European data management system for operational oceanography (2010)

In addition for some specific platforms (ARGO floats, gliders, etc.), specific procedures have been adopted at the project level and are strictly applied at SISMER level:

- ARGO quality control manual for CTD and trajectory data, version 3, December 15th 2015: http://dx.doi.org/10.13155/33951
- Bio-ARGO quality control Manual for biogeochemical data, version 1.0, March 1st 2016: http://dx.doi.org/10.13155/40879
- Bio-ARGO quality control manual for Chlorophyll-A concentration, version 1.0, December 2014: http://dx.doi.org/10.13155/35385
- EGO Users Manual v1.2
- EGO data management best practices v1.0
- GOSUD http://www.gosud.org/Documents/Format-and-templates

- *Measurements made in research laboratories after data collection at sea*

By its former involvement in the ICES working group on Marine Data Management (now moved to the ICES operational group, Data and Information - DIG), SISMER has contributed to the development of guidelines to assist those involved in the collection, processing, quality control and exchange of various types of (mainly) physical oceanographic data, for example, Moored Current Meter, Shipborne ADCP, Seasor, Chlorophyll and Nutrient data. These guidelines have been adopted by the ICES Data Centre and are also recommended by SISMER (http://ices.dk/publications/library/Pages/default.aspx Data guidelines).

Each guideline addresses the data and metadata requirements of a specific data type. They cover three main areas:

- What the data collector should provide to the data centre (e.g. collection information, processing, etc.),
- How the data centre handles data supplied (e.g. value added, quality control, etc.),
- What the data centre can provide in terms of data, referral services and expertise back to the data collector.

LINKED DOCUMENTATION

- Plan qualité livrable Navigation (Navire) (on request)
- Plan qualité livrable Acoustic Doppler Current Profiler (on request)
- Plan qualité livrable Sondeur multifaisceaux (on request)

### 2.4. Description of quality control procedures applied to data

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|---|---|
| *2.4 Description of quality control procedures applied to data* | *The NODC should provide descriptions of quality control procedures and algorithms that are used to process data. This should include references to the quality flag system used.* |

SISMER has developed a quality control software (SCOOP) used mainly for the chemical and physical data measured as vertical profiles, time series or trajectories part of the Near Real Time of Delayed data flows received at the data centre. This software was first created in 1995 based on the IODE recommendations (Manual of quality control procedures for validation of oceanographic data, IOC, Manuals and guides n°26, 1993). Since then, 2 versions of the software have been published (SCOOP$^2$ in 2006 and SCOOP$^3$ in 2016). The software stamps all numerical values of the data files (metadata values like latitude, longitude, date, bottom depth and data values) with a quality flag of the SeaDataNet flag scale. Procedures and algorithms are described in the software specification document.

The SCOOP software proceed into 2 major steps, metadata and data are firstly automatically checked and flagged and secondly visually and manually checked by a French NODC's operator who validates or rejects the flags resulting of the first step. Metadata values (date, latitude, longitude, bottom depth) flagged for quality, and can be changed (in that case original data are kept and the quality indicates that the metadata has been corrected), data measurements are never changed but only flagged for quality.

For geophysical data IFREMER CARAIBES/GLOBE software is used for quality checks of the bathymetry, the magnetism and the gravimetry data. Data are not flagged, but bad data are detected in the raw data and filtered when distributed under MGD77 format.

For some data types such as fishery monitoring data, species related data, remote sensing data, SISMER performs mainly consistency checks (compliancy of the formats of provided files, of the common vocabularies to use…). Quality assesments of data are delegated to ad-hoc expert groups. However, results of these assesments are collected and recorded within metadata and/or data.

Feedback from data users are also collected and analysed. Keeping track of these feedback using the Quality fields of the extension of the ISO 19115 standard (ISO 19115 – 3 and related substandards) is presently under tests at SISMER within some EMODNET European projects (Emodnet Sea Basin Checkpoints).

Linked documentation

- Manuel de contrôle qualité des données de géosciences (on request)
- Séries temporelles : Les étapes du contrôle (on request)
- Séries temporelles : Les étapes du contrôle des données de marégraphes (NIVMER) (on request)
- Manuel utilisation du logiciel SCOOP (on request)
- Dossier de spécification du logiciel SCOOP3 (on request)

## 3. User access and communication

### 3.1. Committed to, and focus on, customer service

| | |
|---|---|
| *3.1 Committed to, and focus on, customer service* | *The NODC should be committed to customer service and should provide information on:*<br>• *Response times to enquiries for data and information* |

| | |
|---|---|
| | • *Description of aimed service level for responding to user requests (if these not available online).*<br>• *Whether an Enquiries or Help Desk is available*<br>• *Details of surveys of customer satisfaction undertaken* |

SISMER operates a help-desk service (Service Desk - SD) which provides its customers/end users with information and support related to data, data delivery, software related to data… The service desk is based on ITIL (Information Technology Infrastructure Library) and part of the ISO 9001 certification.

The service desk relies on an in-house tracking system, with several email entry points (SLAs Service Level Agreements according to the ITIL definitions). It is based on a SQL database and a user interface. Each of these email entry point is related to one of the data system/project described in §1.2.2 of this document. It is operated on working hours from Monday to Friday; each working day one French-NODC staff member is responsible of the service desk. The service desk planning is prepared 3 months in advance.

A service desk Wiki is available, describing procedures and answers to the main known or predictable requests. This Wiki is updated regularly by French NODC staff, adding new procedures or updating existing ones.

Emails addressed to all entry points are received by the service desk assistant of the day, an automatic reply is sent immediately to the end user, the assistant will then response to the query as soon as possible as presented in Figure 3. Each query is identified by a unique ticket-ID in the system.

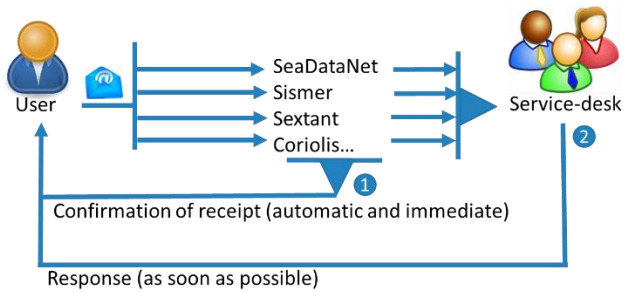


*Figure 3 – Work-flow for data request coming in SISMER service desk*

The Service Desk (SD) in then organised with 3 levels of support, as presented in Figure 4:

- Level 1 provides basic support to simple and Wiki documented queries; level 1 can reroute the query to level 2 or level 3 depending on the context and the complexity of the query;
- Level 2 support has a broader understanding of one or several specific projects; level 2 can reroute the query to level 3 depending on the context and the complexity of the query;
- Level 3 usually has the most expertise on a specific problem, software…

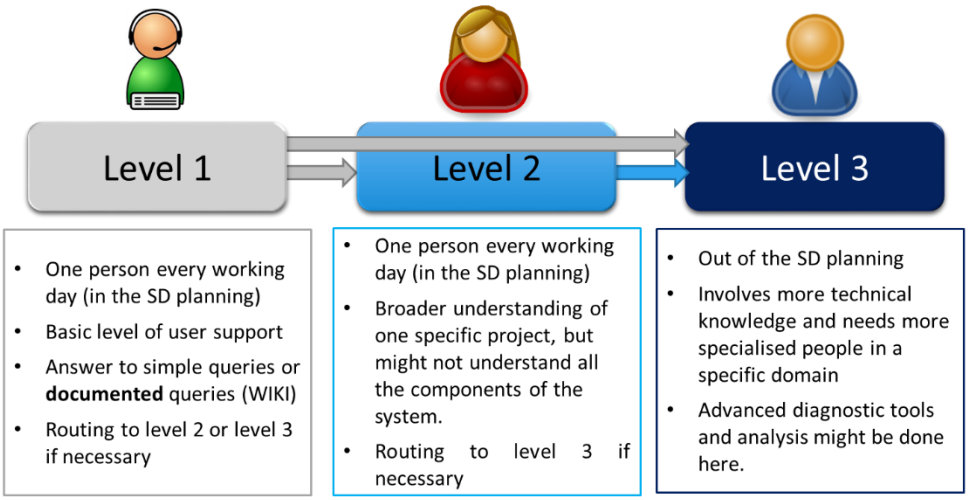


*Figure 4 – Service desk: 3 levels of support*

Every 3 months, a survey on the still open questions is performed. Once a year a global statistic report on the service desk activity in produced giving information such as number of requests per type, the mean delays for answering to requests, the number of still open requests per staff member… Example of statistical graphs is presented in Figure 5.

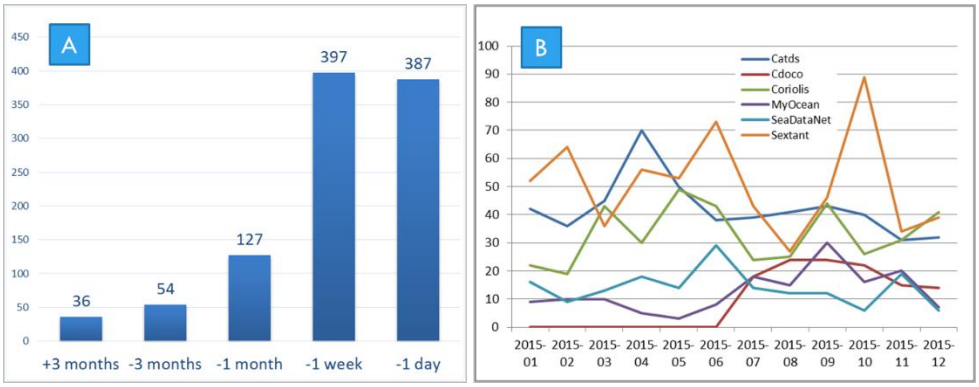


*Figure 5 – Example of statistics on the service desk*

In some case, more specific reports per project using the helpdesk are produced on a monthly basis.

A comprehensive customer satisfaction survey has never took place for the whole service desk. Nevertheless, in 2014, for one specific project concerning the fisheries, questions about the helpdesk service were asked concerning its efficiency, reactivity and welcome. This questions were embedded in a more global survey concerning the data management of fisheries data in IFREMER.

The result of this survey (Figure 6) shows that most of the end users were satisfied or very satisfied with the service desk.

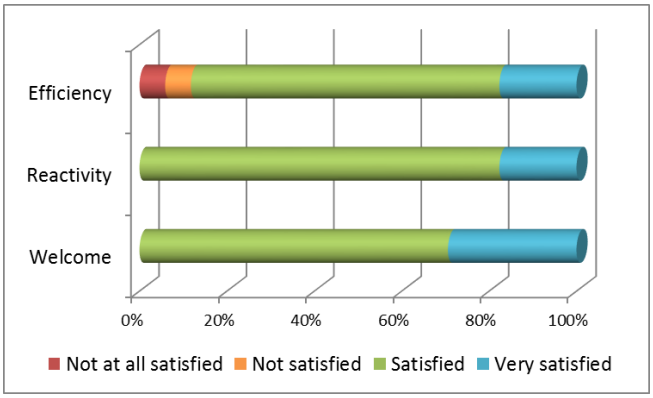


*Figure 6 – User survey on the Fishery service desk*

In the frame of ISO 9001 certification review, some of our service desk projects will launch this kind of survey in the near future.

Linked documentation

- Manuel du guichet d'assistance Sismer (on request)
- Manuel du guichet Heldesk (on request)

## 3.2. Committed to raising awareness of the holdings and promoting the use of the data

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|---|---|
| *3.2 Committed to raising awareness of the holdings and promoting the use of the data* | *Describe facilities available at the NODC for the data Discovery-Access-Retrieval including details of how the data can be searched (e.g. online metadata catalogue or data portal)*<br>*The NODC should provide information on:*<br>• *Data products available*<br>• *Linkages with other organisations who use the data for generation of products*<br>• *Current projects aiming to increase and promote data use*<br>• *Statistics/metrics indicating data usage* |

### 3.2.1. Data Discovery-Access-Retrieval

SISMER gives access to all data managed at IFREMER through its web portal of portals http://data.ifremer.fr. It allows data discovery using search criteria or predefined data request as presented on Figure 7.

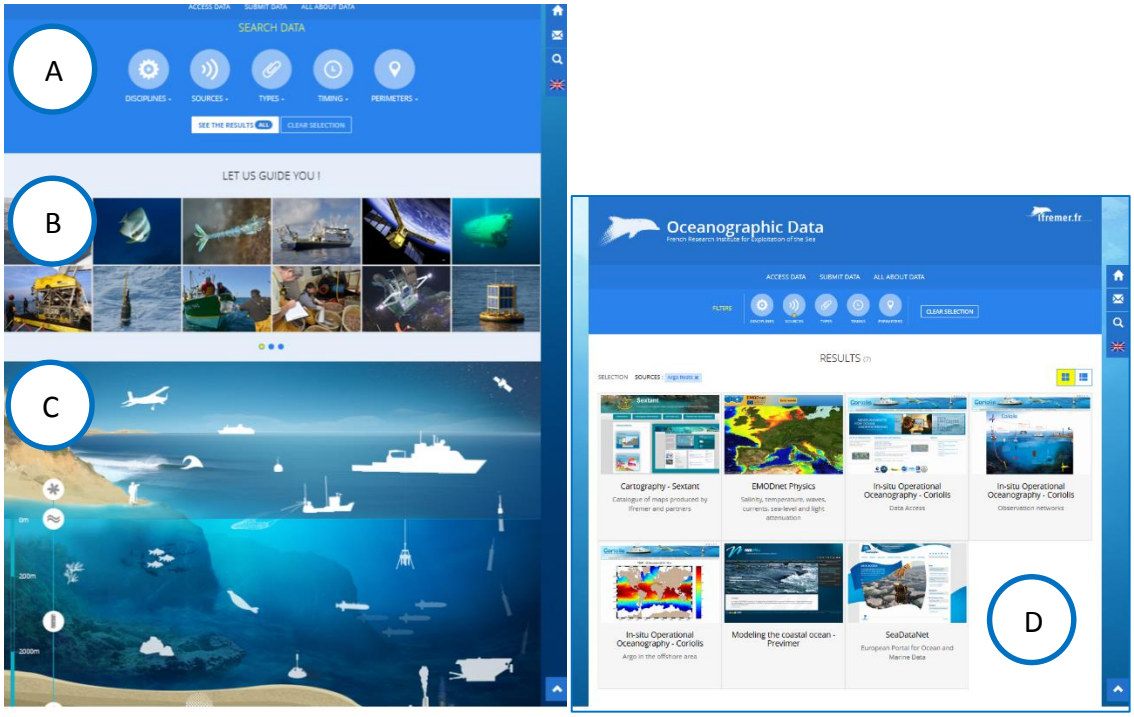
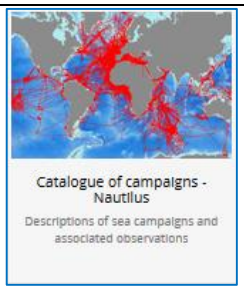
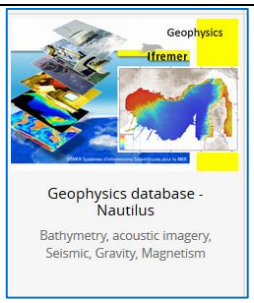
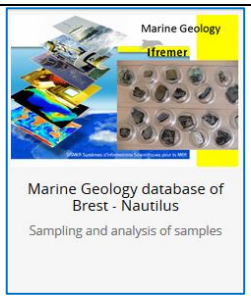
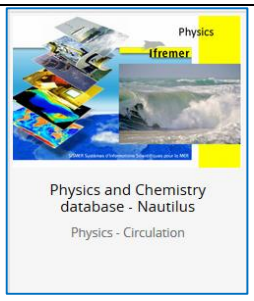
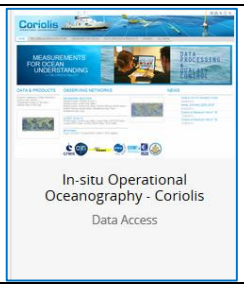



*Figure 7 – 'data.IFREMER.fr page' with A) Search criteria B) and C) Predefined requests D) Results of a Search with a predefined request on ARGO floats: datasets are listed by alphabetic order of their name*

All marine data systems managed by SISMER as described in §1.2.2 of this document are accessible through the IFREMER data portal, as presented in Table 1.

| | | | |
|---|---|---|---|
| Cruise catalogue<br>http://campagnes.flotteoceanographique.fr/ |  | Research vessel routine measurements<br>http://www.IFREMER.fr/sismerData/jsp/donneesInSitu.jsp |  |
| Marine geology data<br>http://www.IFREMER.fr/sismerData/jsp/donneesInSitu.jsp |  | Physical and chemical data<br>http://www.IFREMER.fr/sismerData/jsp/donneesInSitu.jsp |  |
| Operational oceanography data<br>http://www.coriolis.eu.org/Data-Products/Data-Delivery |  | Biology and deep environment data<br>http://www.IFREMER.fr/biocean/acces_gb/rapports/Appel_1cruiselistfr.htql |  |

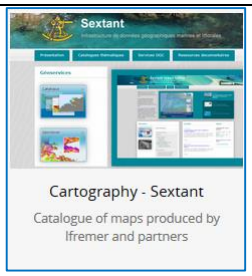
| | | | |
|---|---|---|---|
| Satellite data<br>http://www.catds.fr/Products/Products-access |  | Referenced data and products<br>http://sextant.IFREMER.fr/en/geoportail/sextant#/search |  |
| Fisheries data<br>http://sih.IFREMER.fr/Publications/Syntheses<br><br>http://www.IFREMER.fr/SIH-indices-campagnes/ |  |  | |

*Table 1 - Links to all datasets managed by SISMER*

SISMER is continuously working on the integration of new datasets received either in near real time for operational oceanography and or delayed mode after the end of oceanographic cruises. Available data are thus regularly increasing in all data portals.

Recently, SISMER has developed a marine data ingestion and publisher system called Seanoe (http://www.seanoe.org/html/publish-your-data.htm) which allows scientists to upload original datasets (up to 5 Go) including metadata and other related information and to link them to a DOI.

Data published by Seanoe are freely available. They can be used in accordance with the terms of the Creative Commons license selected by the author of data. Seanoe contributes to Open Access / Open Science movement for a free access for everyone to all scientific data financed by public funds for the benefit of research.

An embargo limited to 2 years on a set of data is possible; for example to restrict access to data of a publication under scientific review. Each data set published by Seanoe has a DOI which enables it to be cited in a publication in a reliable and sustainable way. The long-term preservation of data files in Seanoe is ensured by IFREMER infrastructure.

Datasets uploaded in Seanoe are archived as they are in Seanoe system, but if they are of some interest for SISMER, they can also be duplicated in its own databases and under its own formats.

Users can also search for data in Seanoe using the Search user interface (www.seanoe.org, Figure 8) with search criteria such as author names, title of the dataset, publication year, etc.

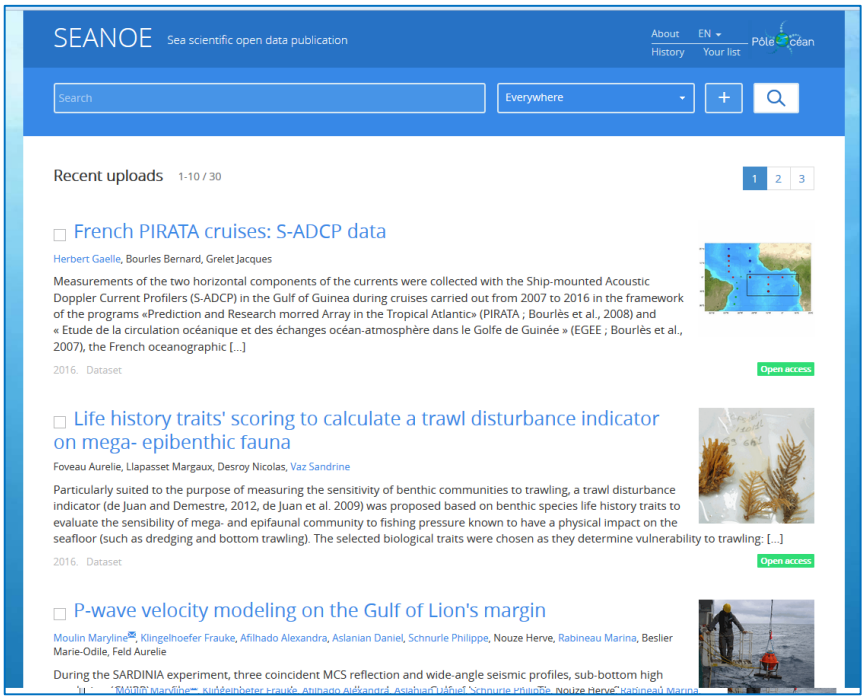



*Figure 8 – Seanoe Search Interface*

### 3.2.2. Data products

In the frame of the Copernicus Marine Service (CMEMS), SISMER operates Coriolis and coordinates the IN SITU TAC (Thematic Assembling Centre) activity at the European level.
SISMER distributes both NRT and delayed mode datasets. All the products and distributed datasets are described on the online catalogue http://marine.copernicus.eu/services-portfolio/access-to-products/ :

- NRT global and regional temperature and salinity aggregated datasets produced on a daily basis for the purpose of ocean modellers,
- CORA (COriolis dataset for Re-Analysis), delayed mode validated global temperature and salinity dataset delivered on a yearly basis.

SISMER was in charge of the North Atlantic area for the production of T&S dataset and corresponding climatology in the frame of the European project SeaDataNet II and of Nutrients, Oxygen and Chlorophyll climatologies in the frame of the European project EMODnet chemistry 2 using the DIVA analysis tool developed by the Liège University (Belgium). These products are available from the project web sites http://www.seadatanet.org/Products/Climatologies and http://www.emodnet-chemistry.eu/data_products.html.

### 3.2.3. Linkage with other organisations that use the data for generation of products

SISMER is actively working with other institutions, especially in the frame of European projects that aim to generate products.

In the framework of SeaDataNet, SISMER is the regional leader for the preparation of the regional products of temperature and salinity in the North Atlantic Ocean. These products are aggregated in collections of temperature and salinity measurements extracted from the SeaDataNet infrastructure, as well as climatologies calculated using these aggregated data sets.

In the framework of EMODNET, several pan-European products are also generated such as the Digital Terrain Model at the resolution of approx. 200 m which is now the European component of GEBCO. SISMER has been deeply involved in the processing of several regional Models: Black Sea and West Mediterranean models, Bay of Biscay …

Within several international ocean observation programmes which are placed in the umbrella of IOC such as ARGO, GOSUD, GTSPP… SISMER acts as one of the global data centres which assembles global databases and processes global analyses that are made available for a wide community: operational oceanography, weather (Meteorological Agencies) and climate studies and models, intercalibration with remote sensing data (Spatial Agencies)…

### 3.2.4. Current projects aiming to increase and promote data use

There is currently a new development taking place in SISMER concerning the management of geological and biological samples in order to improve archiving and maintenance of marine samples collected and to make visible and accessible the available information (samples and associated analysis) to the whole scientific community through a dedicated web site.

SISMER is involved in training students at the local university (Université de Bretagne Occidentale, UBO) since several years and nowadays a conference on SeaDataNet infrastructure is given each year since 2012 to MASTER students in computing sciences applied to marine domain.

SISMER actively participates in the organisation of the International conferences on Marine Data and Information Systems (IMDIS). This cycle of conferences started more than 10 years ago (2005 in Brest, France) and, since then, are scheduled every 2 or 3 years. The last event of these conferences was held in Gdansk (Poland) in October 2016 where serveral oral presentations and posters were prepared by SISMER showing its involvement in the data management of various data types and in the European projects such as Copernicus, SeadataCloud…

Every year, four French research institutes (IFREMER, IRD, CNRS and SHOM) involved in marine technologies organise one week summer schools.
During the three last editions, SISMER has been invited to give presentations and courses providing informations on how the data, after collection, are format checked, quality controlled, distributed and archived. The objective is to make the marine technologists directly involved in the quality of the final dataset delivery.

### 3.2.5. Statistics/metrics indicating data usage

Reports on data downloading are provided annually (or more often) by all marine data systems managed by SISMER (described in §1.3), it includes also the requests made through data portal such as SeaDataNet. Increase of the volume of data in the different data system is also monitored.
The openSource AWStats is used to monitor the IFREMER web site and most of the pages related to the data sets described in §1.3 are monitored. Monthly, days of Month, days of week statistics of access are available as well as statistics of access per country, visitors… These statistics are used for the preparation of annual reports, project reports, etc.

## 3.3. Published Data Policy and adherence to the IOC Oceanographic Data Exchange Policy

| | |
|---|---|
| 3.3 Published Data Policy and adherence to the | The NODC should have a policy on data access. In general the NODC should aim to make data and metadata freely available, although it is |

| | |
|---|---|
| IOC Oceanographic Data Exchange Policy | recognised there may be restrictions on access to data for a number of reasons including national security, commercial confidentiality, and for scientific research to allow the principle investigators to exploit the data.<br>The data access policy should include the following:<br>• Details of what data are accessible<br>• Licensing arrangements<br>• The format(s) that data can be provided in<br>• The media used for providing data (if data are not on-line)<br>• Any costs associated with data provision – including cost of media as well as staff time<br>Adherence to the IOC Oceanographic Data Exchange Policy is mandatory for accreditation. |

SISMER applies the IOC-XXII-6 resolution entitled “IOC Oceanographic Data Exchange Policy”.

The data policy of SISMER is mostly an open data policy, relying on the SeaDataNet policy (http://www.seadatanet.org/Data-Access/Data-policy). This open policy is reinforced by the French and European regulations, such as:

- The Water Framework Directive which imposes that grants to all citizens open and free access to fresh and coastal monitoring data,
- The Inspire Directive which imposes the creation of metadata (data description and discovery) and grants access to environmental data,
- The Marine Framework Strategy Directive which imposes access to marine environment monitoring data.

Its is also noticeable that European regulations are evolving towards open and free access to all research data (“Open Research Data”) which will probably enter in force in the coming months.

However, in some cases, the data managed by IFREMER may be covered by a restricted access for a limited period. The objective of these restrictions are:

- To give time to the scientists for publishing before any wider distribution of the data.
- To protect the environment of sensitive areas or of sensitive species,
- To restrict access to individual or professional data (e.g. some fishery or aquaculture monitoring data),
- To protect data which have been collectied in the EEZ of foreign countries, according to the United Nations Convention on the Law of the Sea (Montego Bay), if no other international convention applies to these data.
- To protect data which may be related to French strategic interests (Navy…).

Most of the time, prior any data delivery, it is asked to the data users to register themselves in order to:

- Subscribe a user license agreement (e.g. the “SeaDataNet licence”),
- Be identified to evaluate the utilisation rates of the proposed services.

From a general point of view, data access is linked to the data type (referenced in §1.2.2):

| Data type | Fully open | Controlled access | Restricted |
|---|---|---|---|
| French oceanographic database (Physical and chemical oceanography) | X | | |
| Coriolis (Operational Oceanograph) | X | | |
| Biocean (deep sea biology) | X | | |
| Quadrige (coastal monitoring) | X | | |
| Harmonie (Fisheries) | | | X |
| Geoscience data | X (MGD) | X | |
| Satellite | X | | |
| Sextant (GIS data) | X | | |

Linked documentation

- The IOC-XXII-6 resolution entitled "IOC Oceanographic Data Exchange Policy"
- United Nations Convention on the Law of the Sea
- Aarhus Convention (directive 2003/4/CE )
- Inspire European Directive (2007/2/CE)
- Marine Framework Strategy Directive (2008/56/CE)
- Water Framework Directive (2000/60/CE)
- Public Sector Information Directive (2013/37/UE)
- Article 7 de la Charte de l'environnement de 2004 (loi constitutionnelle n°2005-205 du 1er mars 2005)

# 4. Technical infrastructure

## 4.1. Description of hardware and software systems used to manage and archive data

| | |
|---|---|
| *4.1 Description of hardware and software systems used to manage and archive data* | *The NODC shall provide documentation on the data centre's operating environment (hardware, software). This should be appropriate to the services provided to its customers.* |

The technical infrastructure is described in the IFREMER internal document "Schéma Directeur des Systèmes d'Information et de Télécommunication 2016-2020" and the annexed documentation provided by the IT support unit.

### 4.1.1. Technical infrastructure for data archiving and long term preservation

All data are stored, for long term preservation, on magnetic cartridges (presently LTO 6 technology) with robotic access (presently Overland Neo 8000 tape libraries and autoloaders). All magnetic cartridges are duplicated in two libraries located in two separated locations (two building of IFREMER campus in Brest, with a distance of approx. 0.5 km). Information on magnetic tapes is periodically controlled (CRC codes) and replaced when their MTBF (mean-time-between-failure) is reached. Technical transitions (new generation of hardware e.g. change from LTO 5 to LTO 6) are periodically (approx. every 5 years) conducted and all tapes are copied and replaced.

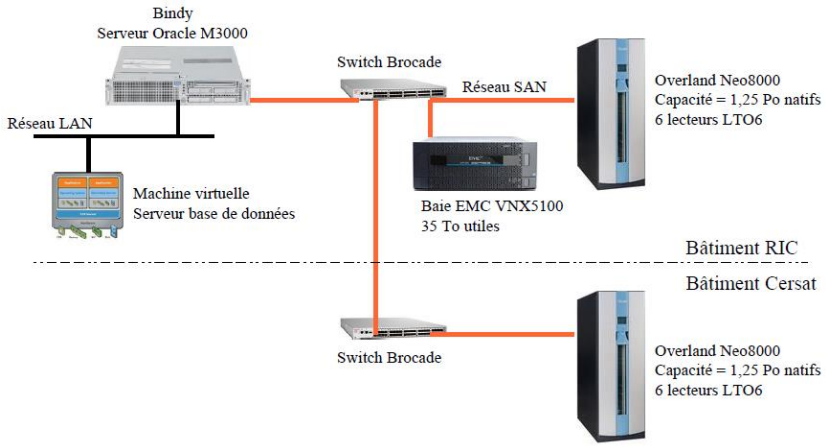



*Figure 9 - Long term data preservation infrastructure, including redundancy in two separated buildings*

Most data (except data with extremely large size such as raw underwater optical and acoustic imagery, and remote sensing data) are also recorded on disks in order to allow quality control and processing and to provide online access and visualisation. Disks are located in network-attached storage libraries (NAS) (NetApps libraries or similar, up to 1.5 petaBytes at the end of 2016), with data storage virtualisation technology (RAID 5 or similar) to provide protection against failure of physical drives (hot replacement and rebuilt).

Metadata, data that are collected from automated observatories and transmitted from sea to shore in chunks that must be assembled, and complex data (e.g. biology, chemistry contaminants) that include many links to reference tables (such as taxonomy, parameter, unit, method, …) are managed in relational databases systems (Oracle 11). The Oracle databases run on 2 HP servers (dual cores, Linux Redhat) in cluster for redundancy, failure tolerance and load balancing. In addition, a validation server, located in a separated building, is permanently maintained up-to-date (DataGuard mechanism) and can be used as a recovery mode in case of major disaster. Safeguarding of the Oracle database is done by Oracle Resource Manager associated to Time Navigator (ASG Software Solutions). Archive Log mechanism is set up in order to allow recovery for the last committed transactions (no typing loss). This system is appropriated for recording around 200 million of rows (100 million at present).

### 4.1.2. Technical infrastructure for data access

Most of data are now accessible on line, mainly in open access, but eventually under moratorium with user's authentication and authorisation.

Internet connection is provided, under service level agreement, by the French Research Network (Renater) which links all major research institutes and universities in France. Renater is the French component of the European Research Network (Geant) and linked to global networks.

The portals to access data run on virtual machines (VMWare, RedHat Operating System) which rely on libraries of Dell physical servers. These portals make use of a collection of Apache web servers and Tomcat application servers. In order to be able to absorb load peaks, the web servers are organized in two layers: front-end servers that receive all http requests, filter them and redirect them towards appropriate back-end servers that are in charge of processing them.

Dell libraries of physical servers are redundant for failure tolerance and load balancing. In addition, Veeam backup suite is used for backup and recovery of virtual machines (one day loss maximum, 2 months of retention period).

All servers, disk and cartridge libraries and network components are covered by a maintenance contract (intervention within 24h, delay compatible with redundancy of the equipements).

Linked documentation

- Schéma Directeur des Systèmes d'Information et de Télécommunication 2016-2020 (intranet only)
- Guide utilisateur de l'outil d'archivage « Object Archive » (intranet only)

## 4.2. Security Policy outlining the infrastructure for protection of the facility and its data, products and services

| | |
|---|---|
| *4.2 Security Policy outlining the infrastructure for protection of the facility and its data, products and services* | *The NODC should have a security policy describing how the data holdings are protected from both malicious and accidental loss. A policy should include the following:*<br>• *How the holdings are physically protected (e.g. how access to the building is controlled, how secure the building is, who has access)*<br>• *Access to the network – what is the access policy, how is user access limited and by who, whether there is an internet link and details of how the firewall is configured and altered, how machines are patched, which users can log on to particular machines, policy on passwords*<br>• *Policy when staff leave organisation*<br>• *Description of the data archival system including backup and off-site storage procedures.*<br>*Note that the security policy should exist but should not be made public as it potentially exposes vulnerabilities.* |

### 4.2.1. Physical protection of data holdings

As described above, data holdings are stored in two separated buildings (200 metres from each others) located on the IFREMER campus in Brest-Plouzané. Access to the IFREMER campus is controlled by personal electronic cards and, in addition, by gate keepers for visitors and third parties staffs (6:00 – 22:00).

The two data holdings are secured areas. These areas are equipped with detection system which automatically issues early warnings and alerts when critical parameters are about to be exceeded (electrical power, temperature, hygrometry, smoke…). These alerts are received by dedicated third party staff who are present 7/7, 24h/24. One of the data holding is equipped with a fire extinguishing system; the second one will be equipped before the end of 2016.

Physical access to data hodlings and related servers is only granted to people in charge of the IT infrastructure (IT staff). Entry in the computer rooms is checked by personal electronic cards. Access of people who do not work for the IT staff (including IFREMER/Sismer data managers and third party maintenance people) is only permitted under physical supervision of one of the IT staff.

### 4.2.2. Access to the network

Access to IFREMER internal network (intranet) is only granted to people having a personal IFREMER account (PID, login, password…). Accounts are delivered under the supervision of the IFREMER Human Resources Department. A password policy has been established and low strength passwords are periodically detected and users warn to change them. When one staff leaves the organisation, its account is frozen, the related content (home directories…)

transferred to his/her team leader except his/her personal information (/perso) which deleted according to French regulation principles.

Because most of the data are made accessible online to general or specific publics, access to the Internet network is necessary. The security policy will not be described in this document as it potentially exposes vulnerabilities. The main principles of the security policy are:

- Several network areas are identified, related to the categories of public the data services are provided to (from general public to IFREMER sub-staffs),
- Exchanges between these areas are controlled by firewalls, and some protocols (e.g. http) are prohibited.

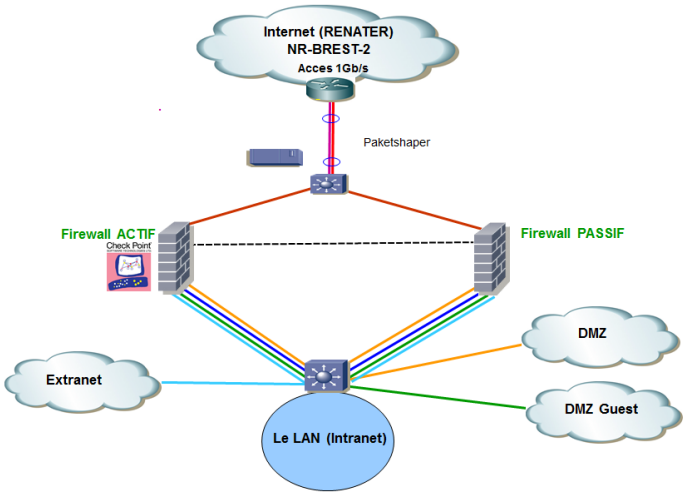



*Figure 10 - IFREMER network areas*

- Even the area dedicated to interact with general public (DMZ – De-Militarized Zone) is, at least, protected by two types of firewalls: physical firewall which parses and filters IP frames, application firewall which parses and filters content.
- Suspicious requests are black listed.
- All network, firewall and server log files are monitored and archived.
- Versions of software, servers are upgraded when security failures are reported by editors.
- Personal computers, emails, ... which are connected to the IFREMER intranet are protected by appropriate software (anti-virus, anti-spams, …)

All IFREMER staff, when recruited, must agree on an "information technology charter" that lays out IFREMER staff's rights and obligations, in order to preserve the security of the IT infrastructure and the information systems.

Connection to servers that manage data holdings is restricted to personal in charge of.

Security procedures are recorded in an "Information System Security Plan" in accordance with the recommendations of the French Agency for the Security of Information Systems (ANSSI). The ANSSI sends us, in real time, security alerts and information notices whit the appropriate measures to be applied to discard vulnerabilities (e.g. upgrade of firewalls, of servers, of software). Interruption of the internet services may be decided in case of urgent and severe threat.

A security officer and a deputy security officer have been nominated. Security audits are periodically conducted and related recommendations taken in account by appropriate measures.

Documentation of the configuration of the various components for SISMER activities is available on demand only. For the purpose of the accreditation process and audits of SISMER, these demands need to be emailed to the Head of SISMER (gilbert.maudire@ifremer.fr) who will make the necessary internal arrangements.

### 4.2.3. Security of personal computers

Personal computers which are connected to the IFREMER internal network must be registered in the IFREMER network « Yellow pages ». Otherwise, connection is refused.

Personal computers are protected by anti-virus software (Kaspersky) which is automatically updated. Operating systems are also automatically upgraded to prevent potential vulnerabilities.

Access to “System login” is restricted to authorized staff.

Linked documentation

- Charte informatique (IFREMER "information technology charter") (intranet only)
- Politique de Sécurité des Systèmes d’Information de l’Etat (PSSIE) portée par la circulaire du Premier ministre n° 5725/SG du 17 juillet 2014 (Governmental recommendations, French version only)
- 40 essential measures for a healthy network (ANSSI)
- Recommandations du CERT et des réseaux RSSI des établissements publics nationaux sous dépendance MNESR (Governmental recommendations, French version only)
- Guide pour le changement des mots de passe (comptes informatiques) (intranet only)
- Formulaire d'Autorisation d’accès à des zones contrôlées (Imprimé n°10) (intranet only)
- Note intérieure n°205 - Accès sur le Centre IFREMER de Bretagne.pdf (intranet only)
- Revue de la sécurité de l'infrastructure de l'IFREMER (on demand)
- Audit de maturité SSI ISO 27002 réalisé en décembre 2015 par SOGETI ESEC (on demand)

# 5. **Annex 1 : ISO9001 IFREMER Certificate**

afaq
AFNOR CERTIFICATION

Certificat
Certificate

N° 2009/33967.2

AFNOR Certification certifie que le système de management mis en place par :
*AFNOR Certification certifies that the management system implemented by:*

**IFREMER**

pour les activités suivantes :
*for the following activities:*

PILOTAGE DE L'IFREMER. STRATEGIE, PROGRAMMATION, SUIVI, EVALUATION, VALORISATION DE L'ACTIVITE DE L'IFREMER. COORDINATION ET CONDUITE DES PROJETS DE RECHERCHE DE L'IFREMER. DEVELOPPEMENT DES MOYENS NAVALS ET PROGRAMMATION DES CAMPAGNES A LA MER. EXPERTISE ET AVIS. RECUEIL ET MISE A DISPOSITION DES DONNEES SUR LE MILIEU MARIN. EXPLOITATION, MAINTIEN ET DEVELOPPEMENT DES MOYENS EXPERIMENTAUX. SURVEILLANCE DU LITTORAL ET DES RESSOURCES BIOLOGIQUES. PROMOTION ET VALORISATION ECONOMIQUE DE L'OFFRE IFREMER.

*MANAGEMENT OF THE IFREMER (FRENCH RESEARCH INSTITUTE FOR EXPLOITATION OF THE SEA). STRATEGY, PLANNING, MONITORING, EVALUATION AND VALORIZATION OF THE IFREMER ACTIVITIES. COORDINATION AND PILOTING OF THE IFREMER RESEARCH PROGRAMS. DEVELOPMENT OF NAVAL RESOURCES AND PLANNING OF SEA MISSIONS. EXPERTISE AND CONSULTING SERVICES. COLLECTION AND COMMUNICATION OF MARINE ENVIRONMENTAL DATA. OPERATION, MAINTENANCE AND DEVELOPMENT OF EXPERIMENTAL TOOLS. SUPERVISION OF THE LITTORAL AND BIOLOGICAL RESSOURCES. PROMOTION AND ECONOMICAL VALUATION OF THE IFREMER SERVICES.*

a été évalué et jugé conforme aux exigences requises par :
*has been assessed and found to meet the requirements of:*

**ISO 9001 : 2008**

et est déployé sur les sites suivants :
*and is developed on the following locations:*

155, rue Jean Jacques Rousseau FR-92138 ISSY-LES-MOULINEAUX CEDEX
(Liste des sites certifiés en annexe n° 1) *(List of certified locations on appendix n° 1)*

Ce certificat est valable à compter du (jj/mm/aaaa) *This certificate is valid from (dd/mm/yyyy)* 2015-11-25 Jusqu'au *until* 2018-09-14

Directeur Général d'AFNOR Certification
*Managing Director of AFNOR Certification*

F. LEBEUGLE

# 6. **Annex 2: List of acronyms**

| | |
|---|---|
| **ADCP** | Acoustic Doppler Current Profiler |
| **AFAQ** | Association Française pour l'Assurance de la Qualité (French main quality certification office) |
| **AFNOR** | Association Française de Normalisation (French National Standardisation Agency) |
| **ANSSI** | Agence Nationale de la Sécurité des Systèmes d'Information (French National Security Agency for Information Systems) |
| **ARGO** | Array for Real-time Geostrophic Oceanography |
| **ASG** | Allen Systems Group |
| **BGMB** | Banque de Géologie Marine de Brest (Marine Geological Database) |
| **BNDO** | Central Authentication System |
| **CARAIBES** | Seafloor mapping software developped by IFREMER |
| **CATDS** | Centre Aval de Traitement des Données SMOS (ground segment for the SMOS Level 3 and 4 data) |
| **CDI** | Common data Index (SeaDataNet catalogue) |
| **CERT** | Computer Emergency Response Team |
| **CESBIO** | Centre d'Etudes Spatiales de la BIOsphère |
| **CINES** | Centre Informatique National de l'Enseignement Supérieur |
| **CMEMS** | Copernicus Marine Environment Monitoring Service |
| **CNES** | Centre National d'Etudes Spatiales |
| **CNEXO** | Centre National pour l'EXploitation des Océans |
| **CNRS** | Centre National de la Recherche Scientifique |
| **CORA** | COriolis dataset for Re-Analysis |
| **CPDC** | Centre de production du CATDS |
| **CTD** | Conductivity Temperature Depth sensor |
| **DIG** | Data and Information Group (ICES) |
| **DIVA** | Data-Interpolating Variational Analysis |
| **DMZ** | De-Militarized Zone |
| **DOI** | Digital Object Identifier |
| **EDIOS** | European Directory of Initial Ocean observing Systems (SeaDataNet catalogue) |
| **EDMED** | European Directory of Marine Environmental Data sets (SeaDataNet catalogue) |
| **EDMERP** | European Directory of Marine Environmental Research Projects (SeaDataNet catalogue) |
| **EDMO** | European Directory of Marine Organisations (SeaDataNet catalogue) |
| **EEZ** | Exclusive Economic Zone |
| **EGO** | Everyone's Gliding Observatories |
| **EMODNET** | European Marine Observation and Data Network |
| **ESA** | European Space Agency |
| **ESEC** | ESEC is the consulting agency in charge of security for Sogeti |
| **GEBCO** | General Bathymetric Chart of the Oceans |
| **GESCOL** | Logiciel de GEStion des COLlections faunistiques (Software for the management of fauna collections) |
| **GLOBE** | software for Global Oceanography and Bathymetry Explorer |
| **GMES** | Global Monitoring for Environment and Security |
| **GOSUD** | Global Ocean Surface Underway Data |
| **GTS** | Global Telecommunication System |
| **GTSPP** | Global Temperature and Salinity Profile Programme |
| **ICD** | ESA interface control Document |
| **ICES** | International Council for the Exploration of the Sea |
| **IDM** | IFREMER unit : Informatique et Données Marines |
| **IFREMER** | Institut Français de Recherche pour l'Exploitation de la Mer |

| | |
|---|---|
| **IMDIS** | International Conference on Marine Data and Information Systems |
| **IMN** | Ifremer department (Infrastructures Marines et Numériques) |
| **INSPIRE** | Infrastructure for Spatial Information in Europe |
| **IOC** | Intergovernmental Oceanographic Commission |
| **IODE** | International Oceanographic Data and Information Exchange |
| **IPEV** | Institut Paul Emile Victor |
| **IRD** | Institut de Recherche pour le développement |
| **ISD** | Information Systems Division |
| **ISI** | Ingénérie des Systèmes d'Information (Data management software development) |
| **ISO** | International Standards Organisation |
| **ISTPM** | Institut Scientifique et Technique des Pêches Maritimes |
| **ITIL** | Information Technology Infrastructure Library |
| **JCOMMOPS** | Joint Commission for Oceanography and Marine Meteorology in-situ Observing Programmes Support centre |
| **JERICO** | Joint European research infrastructure network for coastal observatories. |
| **LTO** | Linear Tape-Open |
| **Data MEQ** | Data Management, Exchange and Quality (EuroGOOS working group) |
| **MGD** | Magnetism, Gravimetry, Depth |
| **MNESR** | Ministry of National Education and Scientific Research |
| **MOCCA** | Mobile Context-aware Cross-cultural Applications (H2020 EU project) |
| **MTBF** | Mean Time Between Failure |
| **NAS** | Network Attached Storage |
| **NIVMER** | NIVeau de la MER (Sea Level) |
| **NODC** | National Oceanographic Data Centre |
| **NRT** | Near Real Time |
| **OBIS** | Ocean Biogeographic Information System |
| **ODIP** | Ocean Data Interoperability Platform |
| **ODP** | Ocean Data Portal |
| **OGC** | Open Geospatial Consortium |
| **OSPAR** | The Convention for the Protection of the Marine Environment of the North-East Atlantic (Oslo-PARis) |
| **PID** | Personal IDentifier |
| **PSSIE** | Politique de Sécurité des Systèmes d'Information de l'Etat |
| **QMF** | Quality Management Framework |
| **QMS** | Quality Management System |
| **RAID** | Redundant Array of Independent Disks |
| **REBENT** | REseau BENThique (Monitoring of Benthic Habitats) |
| **REVEX** | Revue d'Exploitation (Operation Review) |
| **RIC** | Ressources Informatiques et Communications (IT infrastructure) |
| **RSSI** | Responsable de la Sécurité du Système d'Information (Chief information security officer) |
| **SACAPT** | SAisie des CAPTures (Fishermen' logbooks and declaration of catches) |
| **SCOOP** | Système de Contrôle Orienté Océanographie Physique |
| **SEANOE** | SEA scieNtific Open data Edition |
| **SHOM** | Service Hydrographique et Océanographique de la Marine |
| **SIH** | Système d'Informations Halieutiques (Fisheries information system) |
| **SIPA** | Système d'Information de la Pêche et de l'Aquaculture (French National Fishery Monitoring System) |
| **SISMER** | Systèmes d'Informations Scientifiques pour la MER |
| **SMOS** | Soil Moisture and Ocean Salinity |
| **SQL** | Query Language for relational databases |
| **TAC** | Thematic Assembling Centre (INSTAC = In-Situ TAC) |
| **UBO** | Université de Bretagne Occidentale (University of Brest) |

| | |
|---|---|
| **UNESCO** | United Nations Educational, Scientific and Cultural Organisation |
| **WCS** | Web Coverage Serbvice |
| **WFS** | Web Feature Service |
| **WIS** | WMO Information System |
| **WMO** | World Meteorological Organisation |
| **WMS** | Web Map Service |
| **WOCE** | World Ocean Circulation Experiment |
| **XML** | eXtended Markup Language |