MESURHO : a high frequency oceanographic buoy at the Rhone River mouth

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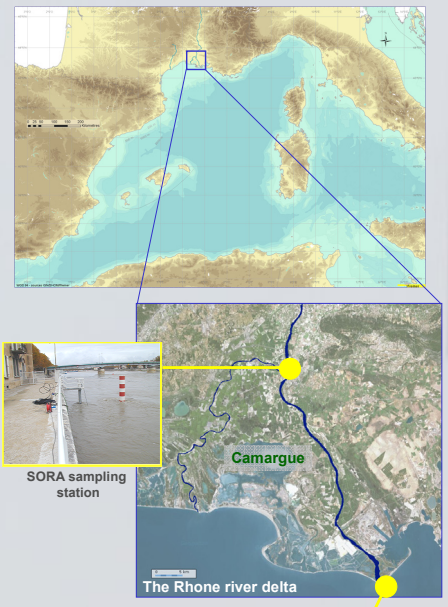
Abstract

As the current main source of continental fresh water discharge in the Mediterranean Sea, the Rhone River inputs are a key forcing for ecosystems of the Gulf of Lions in the western basin. In order to better characterize the exchanges at this key interface, an oceanographic buoy has been installed at the Rhone River mouth in June 2009 for high frequency multi-parameter measurements with bottom, water column and air sensors. Data are sent in near real time towards an onshore data center.



The Rhone River and the Gulf of Lions

With an average flow of 1700 m3.s-1, the Rhone river is the main source of fresh continental water inputs in the Mediterranean Sea. Draining an industrialized catchment, the Rhone river is therefore a major forcing for the ecosystems of the western Mediterranean Sea and the Gulf of Lions. Its contribution to riverine inputs in the Gulf of Lions is estimated to be more than 85% for water and 80% for suspended particulate matter (SPM). Understanding and modeling the functioning of the coastal system in this area requires then a good knowledge of the quantity of water, SPM, nutrients and pollutants brought to the sea by the Rhone river.

In order to complete the multi-parameter measurements acquired at the SORA[1] monitoring station located in Arles 50 km upstream from the sea, a new instrumented platform was installed at the Rhone river mouth. It will help studying the complex processes occurring in the fresh/saline water transition zone. In the Mediterranean area and especially in the Gulf of Lions, extreme events such as floods and storms are known to play a key role in the ecosystem dynamic. To observe these events, a high frequency observation system has been designed. Coupling high frequency measurement with near real time data transmission will allow detecting an event and triggering additional sampling.

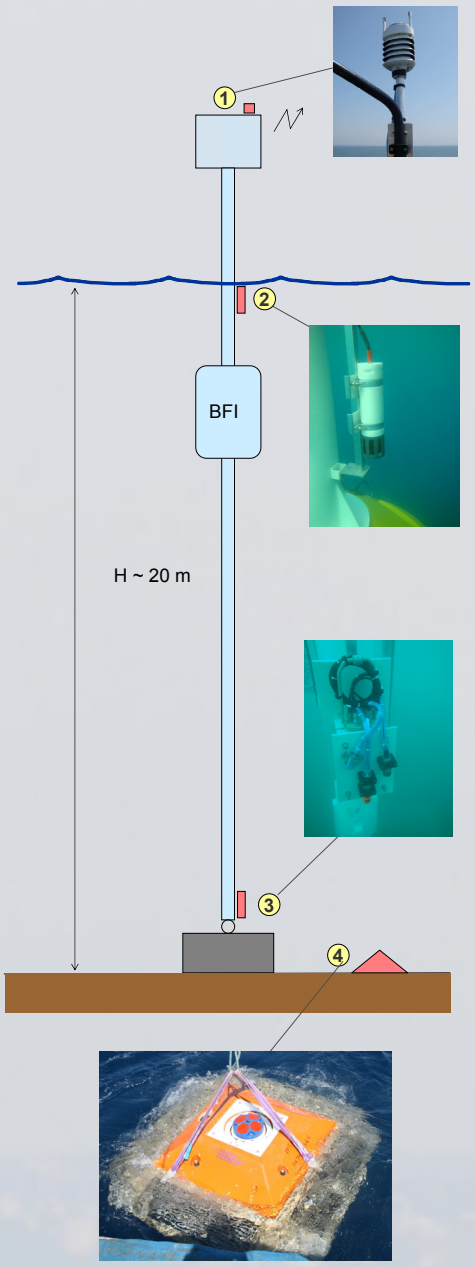
[1] SORA : Station d'Observation du Rhône à Arles

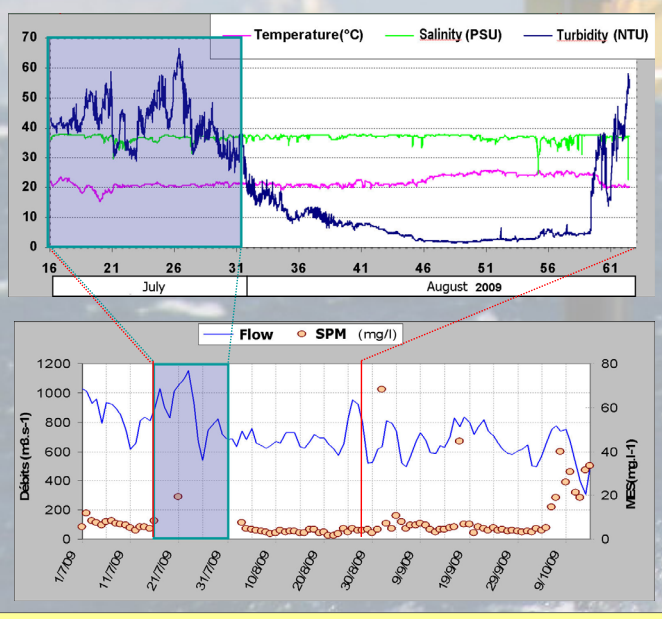
The buoy and its instrumentation

In June 2009, the East Roustan buoy (43° 19.2 N, 4° 52 E, 20 meters water depth), which is one of the two marker buoys of the river prodelta, has been replaced by a new platform equipped with oceanographic instrumentation. This new system consists of a buoyancy beacon which is suitable for small range tide environment. Compared to a chain mooring buoy, this beacon allows simple cable connections between the surface platform and the sea bottom instruments. Bottom sensors get energy from a solar panel unit and are connected to an electronic management and communication device installed in the top part of the buoy.

Initially, the buoy was equipped with two multi-parameter sensors : one below the subsurface (2) and the other close to the sea bottom (3); a weather station (1); a photosynthetic active radiation sensor (PAR) and a 600 kHz Acoustic Doppler Current Profiler (4) from RDI with a wave unit. It will help studying the complex processes occurring in the fresh/saline water transition zone.

Sensor data are acquired with a time step of 30 minutes. This period can be configured and a real time request can also be send from the shore control station. The buoy data are automatically transmitted to the Coriolis in situ data center (www.coriolis.eu.org) via the GSM network. An interface for online consultation of the information is available. This new observation system, is a part of the coastal operational oceanography in situ network to be developed in the north western Mediterranean. The collected data will be used among others by the Previmer forecasting and analysis system (www.previmer.org).





First results

The whole instrumentation is not yet fully operational, mainly due to communication problems between the electronic unit and bottom sensors. That means that the ADCP which has its own recording unit have to be recovered for current data downloading. Meanwhile, the system has been functioning nearly continuously for 10 months sending near real time data to the onshore data center.

On the left side, the top picture shows a time series (salinity, temperature and tubidity) from the multiparameter sensor (NKE Smatch equipped with a anti biofouling device) located at 2.5 meters below the surface acquired in summer 2009. These data are compared to the information collected at the Arles SORA station (bottom picture). A good correlation is observed for turbidity which shows a rise during the two episodes of increased flow.

Future work: in a second phase, further instruments will be added, including a nutrient sensor, a high resolution altimeter and a benthic station equipped with oxygen microelectrodes for sediment remineralization studies.

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