THE MESURHO MULTI-PARAMETER MOORED OBSERVATORY FOR MONITORING OF RIVER INPUTS AND EXTREME EVENTS AT THE RHONE RIVER MOUTH

I. Pairaud [1]*, M. Répécaud [2], J. Lachaise [1], C. Ravel [1], M. Arnaud [3], C. Rabouille [4], F. Toussaint [4], F. Garcia [5], P. Raimbault [5], R. Verney [2], S. Meulé [6], P. Gaufrès [7] and J. F. Cadiou [2]
[1] IFREMER, LER PAC, France - ivane.pairaud@ifremer.fr
[2] IFREMER REM/RDT, Brest, France
[3] IRSN, La Seyne sur Mer, France
[4] LSCE, Gif sur Yvette, France
[5] MIO, Marseille, France
[6] CEREGE, Aix-en-Provence, France
[7] CETMEF, France

Abstract
The Rhone River is the largest source of fresh water discharge to the Mediterranean Sea. As it is also an important source of particles, it constitutes a key forcing for the ecosystems of the Gulf of Lions in the northern part of the western basin. In order to assess the input and fate of suspended material at the Rhone River mouth and the influence of extreme events, a multidisciplinary oceanographic moored observatory has been installed in 2009 for high frequency measurements. Data are collected and sent in near real time to an onshore data centre. Data are available for the scientific community and addition of new sensors is still ongoing in the framework of the MOOSE, MERMEX, AMORAD and PERSEUS programs.

Keywords: Rhone Delta, Instruments and techniques, River input, Gulf of Lyon, Monitoring

The Rhone River accounts for one third of the average total freshwater input to the Mediterranean Sea. Draining an industrialized catchment, it is an important source of nutrients, suspended particle matter (SPM), carbon and other chemicals including contaminants [1]. These inputs strongly influence the ecosystems of the gulf of Lions [2]. A good knowledge of i) the quantity of water, suspended particulate matter, nutrients and contaminants brought from the Rhone River to the sea and ii) the resuspension by extreme meteorological events is thus needed to understand and model physical and biogeochemical processes in this area.

In addition to the SORA station located in Arles 50 km upstream from the sea, the MesuRho instrumented platform was installed at the Rhone River mouth (East Roustan buoy : 43°19.2N, 4°52E, 20 meters of water depth) in order to provide data at sea in the fresh/saline water transition zone. Since June 2009, the MesuRho station (fig.1) provides near real time high frequency measurements.
The system was initially equipped with two multi-parameter probes (one below the subsurface and one close to the sea bottom), a meteorological station, a photosynthetic active radiation sensor (PAR), an Acoustic Doppler Current Profiler (ADCP). Sampling and transmission interval has been set to 0.5 hour for all sensors. In 2012, a nitrates sensor and a fixed benthic station with oxygen micro-electrodes for sediment mineralization studies were added. The 3 year experience of operating the system in various weather conditions has demonstrated the interest of the use of an immersed flotation buoy as a plateform for installing sensors. In the near future, a subsurface and an atmospheric sensors will be added for radioactivity monitoring.

Complementary data acquired during surveys from 2010 to 2013 were used to qualify and when possible to correct the temperature, salinity, fluorescence and turbidity time series. As the plume salinity strongly varies away from the coast, specific surveys were conducted very close to the buoy. Data from the subsurface and bottom multi-parameter probes are compared to data profiles from a CTD sensor including a turbidity sensor and a fluorometer. Water samples also allow for SPM and Chlorophyll-a quantification.

This observation system is part of the coastal operational oceanography in situ network of the North Western Mediterranean Sea. Data are transmitted six times per day (each four hours) to the Coriolis *in situ* data centre (www.coriolis.eu.org), which provides an interface for data visualization and download. This interface can be used to check the instrument fair working.
Temperature and salinity data were made available for the MyOcean community and served for operational model validation purpose [3].

The long time series recorded at the MesuRho buoy show the impact of extreme events. Strong floods caused a salinity decrease down to the subsurface sensor associated with a possible increase of turbidity. At the bottom, turbidity increase were recorded under south-east swells associated with sediment resuspension events [4]. An example is shown for spring 2012 (fig.1). First results from the benthic station dedicated to the study of the fate of particulate organic matter delivered during floods showed that during the turbidity events of spring 2012, oxygen demand rises by a factor of 3-4.

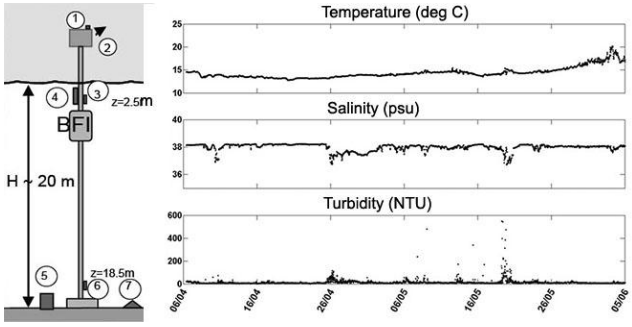

Fig. 1. (left) MesuRho observatory instrumentation : meteorological station + PAR (1), ABIN control and transmission (2), multi-parameter probes (temperature, pressure, conductivity, turbidity, fluorescence, dissolved oxygen) (3, 6), ISUS nitrate sensor (4), benthic station(5)
(right) Time series measured by the bottom multi-parameter probe in april-may 2012 : temperature (top), salinity (middle) and turbidity (bottom). The high turbidity event of 20 May occured under south-east winds.

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