

Investigation of Benthic Boundary Layer processes through seafloor observatories

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ABSTRACT

The investigation of the Benthic Boundary Layer (BBL) involves the study of a wide spectrum of different, but linked, processes. In order to study the evolution of physical, geochemical, geological and biological phenomena, and to comprehend their possible relationships, a long-term monitoring using seafloor observatories support is necessary.

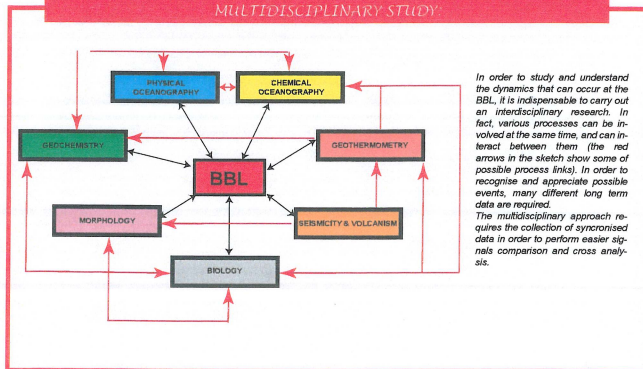
Unlike mooring approach, the sea bottom observatories represent a platform where a wider variety of instrument can be mounted, giving several advantages: on power autonomy and higher sampling rate. In addition, the shortest distance to the bottom of observatory instruments, permits to appreciate even phenomena that can happen close to the sea bottom.

The stable localisation of all the instruments at the same bottom depth and their accurate unique time reference allow a easier and efficient comparison of different kind of signals recorded in situ, offering a new and interesting possibility to better understand and describe benthic processes.

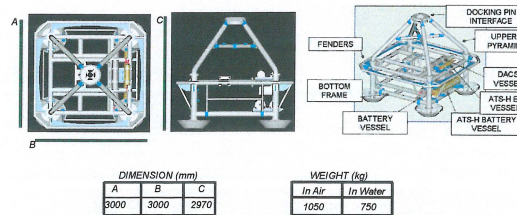
Although to collect long-time series often can give some instrumental drifting problems (especially for the electrode sensors or, in shallow environment, due to bigger defouling activity), an efficient instrumental pre- and post-calibration, as well as the possibility to collect water samples during the long period of measurements, guarantee to restore the signals recorded during the data processing phases.

The versatility of these observatories then offers a good opportunity to investigate, in the same time, different natural fields and with different instrumental approaches. In addition, they permit to discover that the BBL is not a stable environment at all but, as all the interface layers, it is dominated by strong dynamics processes.

MULTIDISCIPLINARY STUDY



OBSERVATORIES STRATEGY



The observatory frame has been designed to assure a stable position of the instruments configuration on the bottom. It has been planned to lodge batteries and DACS (Data Acquisition and Control System) vessels to guarantee durable power supply and large data storage capability. The opened frame and the unique power and storage system, make it an accessible and expandable platform, without causing any interference problem.



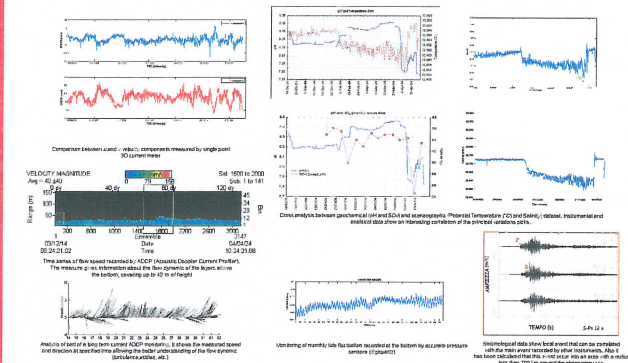
The observatory design has to take into account:

- Different specific requirements for each scientific packages (MULTIDISCIPLINARY)
- High precision clock to provide a single time reference
- Automatic levelling system for tilt-sensitive sensors
- Real time data communication in geohazard monitoring

All the stations are managed by the submarine vehicle MODUS (Mobile Docker for Underwater Science) that allows the control of the status and functionality of each part of the observatory during the operations. Also it permits to accomplish precise deployment / recovery in spite of the observatory weight.



STUDYING THE BBL THROUGH A MULTIDISCIPLINARY DATASET



CONCLUSIONS

The seafloor observatories represent versatile platforms able to host several types of instruments recording many parameters related to different environmental fields.

Unlike other approaches the seafloor observatories permit to apply a multidisciplinary research to detect possible natural events at the Benthic Boundary Layer. In fact the comparison of the synchronized signals in situ recorded, allows to better understand the complex bottom behaviours.

Besides, problems concerning instrumental calibration and drifting can be solved with appropriate and accurate pre- and post-calibration in order to minimize the effect due to the defouling, etc.

The data collected by benthic observatories studying the BBL, prove also that they are not so stable, in spite of the usual thought.



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