

# OCEANOGRAPHIC BUOY EXPANDS OBSEA CAPABILITIES

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*Abstract – On this paper, the electronic system and oceanographic instruments of a moored buoy are presented. The system has been designed by the SARTI research team to meet a very specific objective, which is to expand the capabilities of the underwater observatory OBSEA as a research and test platform, providing an infrastructure for testing instruments either at the seafloor or at the surface. The system currently has a meteorological station, a video camera and a 3G modem for telemetry, in addition to a connection to OBSEA and expansion ports for connecting other systems for tests.*

*Keywords – Oceanographic Buoy, Ocean Test bench, Telemetry, OBSEA*

## I. INTRODUCTION

Moored buoys are important oceanographic observing platforms for monitoring different variables of the water column and the seafloor [1]. For this reason, the SARTI research group (UPC) [2] has designed an oceanographic buoy for expanding the capabilities of the observatory OBSEA [3]. OBSEA ([www.obsea.es](http://www.obsea.es)) is an underwater cabled observatory located at a depth of 20 m, 4km offshore of Vilanova i la Geltrú (Barcelona), and it started its operation in May 2009 as a test bench infrastructure for research on marine sensors and instruments, and to provide a wide variety of oceanographic real-time data to scientist, academics and general public.

The SARTI moored oceanographic buoy was deployed in May 2011 and currently it serves as a platform for testing instruments and making oceanographic observations at the surface level or below water near the surface. Its cabled connection with OBSEA provides a flexible infrastructure for marine observation, and it takes the advantage of the OBSEA data management and network control.

## II. SYSTEM DESCRIPTION

The SARTI oceanographic buoy has offered an opportunity to extend the research infrastructure capabilities of the OBSEA observatory. The requirements to meet were to provide a system that can work either autonomously or connected to the OBSEA main power energy system, to provide telemetry of onboard sensors, and to afford a large payload for future experiments where weight may be an issue.

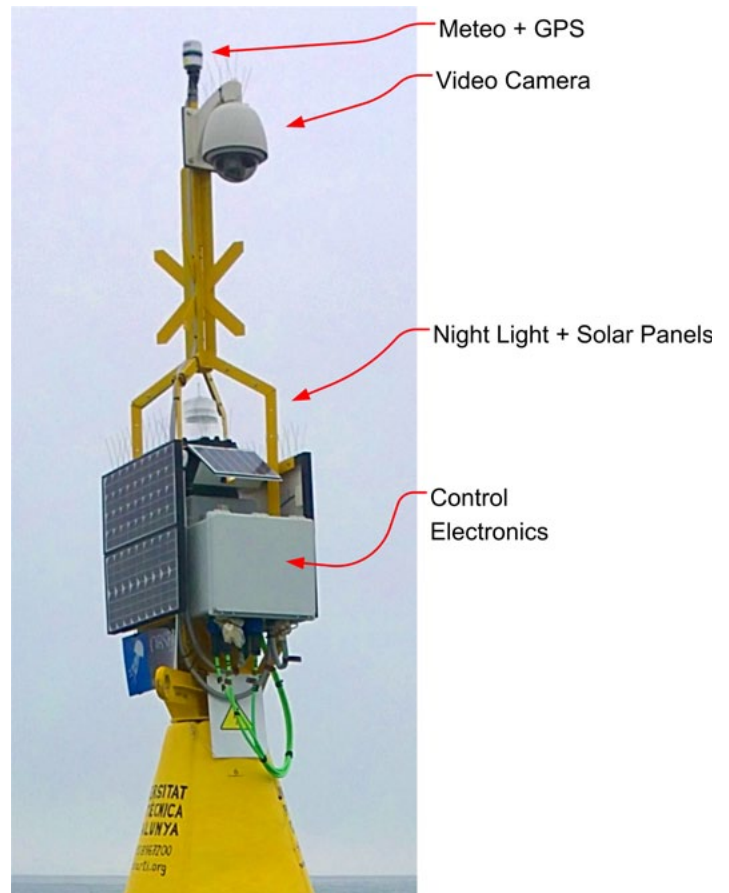
The buoy has the shape of a long tube 1 m in diameter and 6 m long. On the top it has a passive and active signalling in accordance with current regulation: a Saint Andrew's cross, a night light flash, a radar reflector, and it has been painted in yellow with property marks.

### A) Instruments and Telemetry

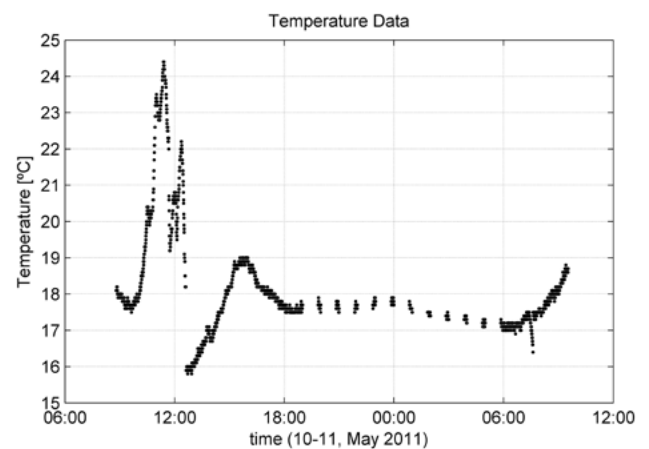
The electronic system has been divided in two main parts. One consists on a night signalling light based on LEDs, with two dedicated solar panels and one battery power supply, being independent from the rest of the system and packed on its own water tight box. This system has been located on the upper part of the buoy to improve its visibility, as shown in Fig. 1.

The second part contains the power supply, the oceanographic instruments, and the communications and control system. The energy stage consists on four 25 watts solar panels, which are used to charge a 12V battery with 60Ah capacity, which in turn powers the entire system. Currently, the onboard oceanographic instruments are a meteorological station, a GPS, and a video camera. Figure 2 and Fig. 3 show graphics with temperature and wind speed. Nevertheless, the system has the capacity to be connected to more instruments through an extension port. Currently, in this port an AWAC (integrated Acoustic Waves And Currents sensor) located on the seafloor has been connected to the buoy for telemetry. Figure 4 shows the AWAC ready to be installed.

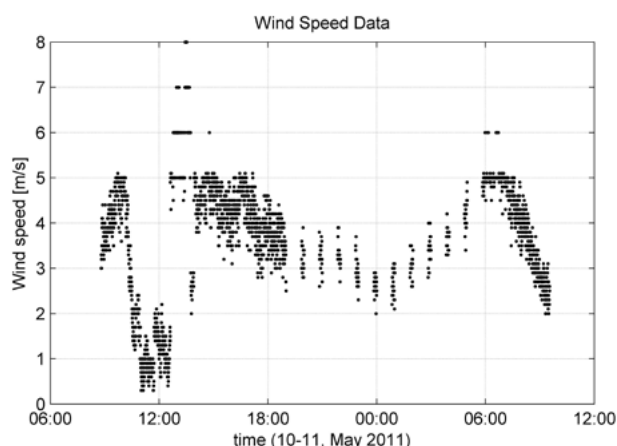
The rest of the electronics are a 3G modem that provides real-time telemetry and a microcontroller for system control and monitoring. All these elements have been packed into two water tight boxes, one for the battery and the charger,



**Fig. 1. Buoy and instruments**



**Fig. 2. Temperature**



**Fig. 3. Wind speed**

and the second one for the 3G modem and the control unit. The video camera has its own enclosure with a transparent screen, located on the top.

### III. MOORING SYSTEM

The SARTI buoy has been located next to OBSEA, and its mooring system consists on three anchors of 1200 kg connected to with chains to the buoy. The localization and distances between them, and chains behaviour was studied and simulated as a preliminary work [4], where marine conditions of the area located in the Vilanova i la Geltrú coast were taken into account.

Figure 5 shows the simulation of the system using OrcaFlex 9.4, where is possible to observe a "star" configuration, which provides position stability and prevents rotations, which is interesting for some experiments and measurements, as the onboard video camera.

### IV. CONCLUSIONS

The characteristic of an oceanographic buoy has been presented, providing details of the onboard electronic systems. The buoy has different sensors, a video camera, and a redundant telemetry: via a 3G modem or through OBSEA network. As an additional feature, its solar panels also allow electrical power autonomy for standalone operation, in case it is disconnected from OBSEA.



**Fig. 4. AWAC ready to be installed**

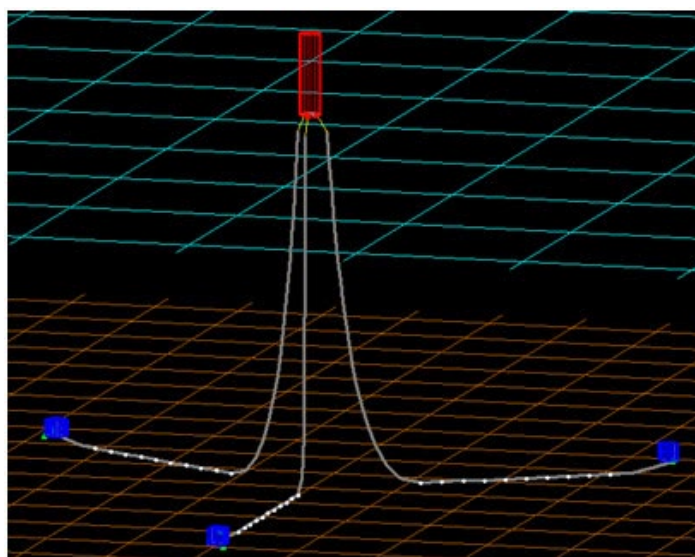
The buoy is an extension of the OBSEA underwater laboratory, providing a surface platform for oceanographic measurements and also as a test bench for testing marine sensors and instruments, taking the advantages of OBSEA infrastructure and connectivity. Its design has considered also the mooring system, which has been analyzed using simulation software before the buoy deployment.

### V. ACKNOWLEDGEMENTS

We want to acknowledge the financial support of the Ministerio de Ciencia y Educación of Spain, through the project "Sistemas Inalámbricos para la Extensión de Observatorios Submarinos" CTM2010-15459 (subprograma MAR).

### VI. REFERENCES

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**Fig. 5. Simulation of the Mooring system using three anchors.**