A NEW BUOY FOR MEASUREMENT AND REAL TIME TRANSMISSION OF SURFACE SALINITY

J. Salvador [1], P. Fernández [1], A. Julià [1], J. Font [1]* and J. Pelegrí [1]
[1] Institut de Ciencies del Mar (CSIS),08003 Barcelona, Spain - jfont@icm.csic.es

Abstract

A surface buoy has been designed to measure temperature and salinity with high accuracy and transmit the data by satellite for a long period of time in studies of mesoscale or long scale oceanography. Prototypes have been built and tested in two different versions: to collect data close to the surface or at a depth of 100-150 m depending on the objectives of the experiment. These buoys are mainly used for Lagrangian measurements after being released from a vessel, although long duration tests have also been made with moored units mainly in the NW Mediterranean.

Keywords: Salinity, Temperature, Instruments And Techniques

Measuring oceanographic variables, mainly temperature and salinity, from drifting buoys is an important component in many process studies or long duration ocean circulation observations. Nowadays several kinds of buoys are manufactured to operate as surface drifters or profiling floats. But in both cases no commercial versions exist that provide sufficiently reliable salinity data close to the surface, since the occurrence of biofouling (in surface buoys) or the risk of surface particles being ingested into the measuring circuit (in profiling floats) can easily degrade the accuracy of recorded data.

The Institut de Ciències del Mar (CSIC, Barcelona), as contribution to two different research projects (MIDAS, Microwave measurements and algorithms development for the SMOS mission, and CANOA, Upwelling current in NW Africa), has developed and further tested a platform to record oceanographic parameters and transmit them in real time. The main characteristic of the platform is its modularity and versatility.

The support structure is a 380 mm diameter buoy formed by two semispheres injected in propylene charged with glass fibre. The two halves are fixed through 24 points and an o-ring gasket to ensure water-proof sealing. Two eight-pin communication connectors can be adapted to each semisphere. The overall structure has been tested for pressure and confirmed a good behaviour up to 7000 hectopascals. To adapt the temperature-salinity (T, S) measurements probe an inox structure was added to the buoy with four union points and a support for the instrument (Fig. 1).

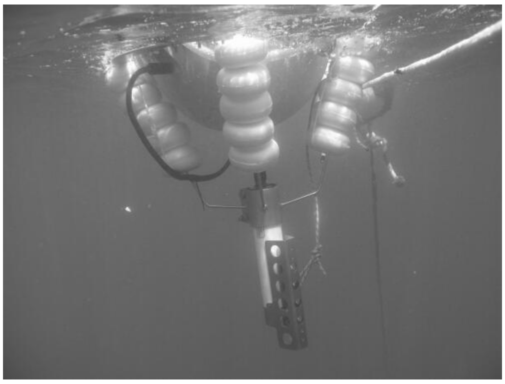

Fig. 1. Moored version of the buoy with the inox structure to attach the SBE37SI probe

This buoy has been used both in Lagrangian studies, transmitting data while drifting, and in Eulerian studies, moored in a fixed point. The Lagrangian version uses the same mechanical configuration than the SVP (Surface Velocity Program) drifter [1] adopted as standard by the World Ocean Circulation Experiment, it was deployed in the second cruise of the CANOA project in November 2008. Several configuratios were tested and one of them succeeded to record a surface (T, S) time series for over a year, this buoy still drifting and transmitting (T, S) data in early 2010. For Eulerian measurements one buoy was moored during 2007 and 2008 in the Medes islands, a small coastal archipelago in the NW Mediterranean, with very good results in terms of batteries duration and sensors stability. At present two units are moored in Las Cruces, Chile (September 2008, LINCG-Global project) and one in Colima, Pacific coast of Mexico (May 2009, EMPAM project).

Fig. 2. Preliminary prototype of the drifting buoy with an additional flotation in the line that connects to the standard cyclindrical drogue

The control electronics is formed by a Microchip 16F876A microcontroller that manages the data acquisition, implements a compression algorithm and sends the information to a SEIMAC X-CAT transmitter. The platform can adapt transmitters for the Orbcomm and GlobalStar systems, plus Argos that is the one now implemented. The system incorporates supercapacitors to use low cost batteries and to avoid sudden power decreases due to high energy consumption in short times (1 A during transmission).

The units built until now use a SeaBird microcat CTD probe, model SBE37SI. This instrument has a temperature drift of 0.0002ºC/month and a conductivity drift of 0.0003 S/m/month. The designed buoy can use any other sensor able to send data through a serial port, and can be also adapted to record analogic information.

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References

1 - Niiler P P., Davis R. and White H., 1987. Water-following characteristics of a mixed-layer drifter. *Deep-Sea Res.*, 34: 1867-1882