M3 NEAR SURFACE OCEANOGRAPHIC MEASUREMENTS USING THE SAILBUOY

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Abstract- Test Deployment off Gran Canaria.

Keywords- Unmanned ocean vessel.

INTRODUCTION

In this document, the preliminary data are reported from a deployment of SailBuoy conducted in winter 2012, off Grand Canaria. The SailBuoy was equipped with conductivity-temperature sensors and an oxygen optode. The SailBuoy, developed by Christian Michelsen Research (CMR) Instrumentation, is an unmanned ocean vessel capable of travelling the oceans for extended periods of time (see <http://www.sailbuoy.no>). It navigates autonomously, controlled by 2-way communication through the Iridium satellite system, transmitting data in real time underway. The SailBuoy can be fitted with various sensors to be used for a wide variety of ocean applications. A detailed report on the navigation performance and characteristics of the SailBuoy can be found in Fer & Peddie [1].

Figure 1. CT sensor mounted on the SailBuoy.

In this document, the data are presented from a deployment of SailBuoy SB02 off Grand Canaria (Canary Islands, Spain) (Figure 1). The deployment has been conducted in collaboration with the Oceanic Platform of the Canary Islands (PLOCAN). For this deployment, SB02 was equipped with Neil Brown conductivity-temperature sensors and an Aanderaa Instruments oxygen optode. The deployment is summarized in Section 2 together with the sensors used. The SailBuoy utilized in this trial is SB02. SB02 was equipped with a conductivity-temperature sensor (Section 2.1) and an oxygen optode (Section 2.2) which are described below. The main goal of the mission was to sail to the European Station for Time-series in the Ocean (ESTOC) site, and demonstrate its navigation and near-surface oceanographic sampling capabilities. ESTOC is an internationally recognized ocean site, and has recently improved its sampling program with unmanned, autonomous underwater and surface vehicles technology. The deployment was made from a light boat on 13 November 2012, 12:00 UTC, and the mission started at 15:00. During the mission, data are relayed at 30 minute intervals, whereas in recovery mode prior to and after the mission, the position is sent at 10 minute intervals. The recovery mode ensures frequent update on GPS fixes of the SailBuoy. The mission was completed on 5 December 07:30

Figure 2. Trajectory of the SailBuoy.

and the SailBuoy recovered on 11:20 from a small boat. The deployment and recovery was conducted in collaboration with PLOCAN in Grand Canaria.

SUMMARY

SailBuoy SB02, fitted with a Neil Brown conductivity-temperature sensor and an Aanderaa Instruments oxygen optode, was deployed off Grand Canaria, Spain, in 13 November 2012. The mission duration was 22 days and the extent of the track coverage was approximately 140 km zonally and 220 km meridionally. During the mission, several episodes of calm weather occurred which reduced the navigation performance of the vessel. With the onset of wind, however, SB02 sailed satisfactorily with an average ($\pm$ one standard deviation) speed of 70 ($\pm$ 27) cm s⁻¹.

Two weeks into the deployment, the measurements indicate a significant drift in temperature and conductivity induced by substantial bio-fouling. This pilot study was conducted without anti-fouling material on the sensors, and the performance of the sensors is expected to improve if anti-fouling paint is applied. During the 14 days period with high quality near surface measurements, the temperature and salinity were 22.81 ($\pm$ 0.37) °C and 36.8 ($\pm$ 0.1), respectively. Temperature fronts, with order 0.4 °C anomaly, compensated in density with salinity anomalies, were observed. The time-series of oxygen concentration showed a pronounced diurnal cycle of about 0.1-0.2 mg l⁻¹ peak-to-peak amplitude overlain on a weak increasing trend, presumably due to a drift in the sensor. After two weeks, similar to the onset of bio-fouling inferred for the conductivity-temperature sensors, the amplitude of the oscillations is suppressed suggesting a reduction in the optode's sensitivity and hence bio-fouling.