AUV Underwater Robotics Experiment in The Mar Menor Coastal Lagoon and beyond. The Submarine Vehicles Lab - UPCT.

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***Abstract*—During November 2011 a multivehicle collaborative underwater robotics experiment was carried out in order to determine the saline plume of water going out and coming in to the Mar Menor Coastal lagoon from the Mediterranean Sea. This experiment provide with extensive expertise to perform this kind of experiments. Since then the Underwater Vehicles Lab of the Universidad Politécnica de Cartagena (UPCT) has enlarged the vehicles fleet with three vehicles: 1) the AEGIR is a high payload vehicle with AUV and ROV capabilities designed for large missions; 2) one EcoMapper AUV for rapid deployment and inspection and water quality measurements; and 3) a ROV Seabotix vLBV950. Here we show some of the data obtained in the first missions carried out with these vehicles and a summary of possible applications and future developments of the LVS-UPCT.**

***Index Terms*—AUV, AUV, ROV, EcoMapper, Mar Menor, LVS-UPCT.**

I. Introduction

The AUV Underwater Robotics Experiment in the Mar Menor Coastal Lagoon

Introduction. A fleet of five AUV met for a collaborative experiment in the Mar Menor coastal lagoon in November 2011: AEGIR (Technical University of Cartagena), Sparus (University of Girona), Guanay II (SARTI-Technical University of Catalonia) and 2 SeaCon (University of Porto) [1]. The Mar Menor is a hypersaline coastal lagoon located on the southeastern coast of Spain separated from the Mediterranean Sea by a sand bar called La Manga. The communication with Mediterranean Sea is by 3 narrow channels. The Mar Menor has a high ecological value for touristic and fishery activities. The lagoon water going out to the Mediterranean Sea is, by itself, an important vector of exportation of selected species to the Mediterranean Sea. The Mar Menor coastal lagoon could be seen as a natural laboratory to better understand future changes in larger water masses. The outline of the experiments was presented in Martech 2011 [2] while some results were presented at IFAC-NGCUV workshop held in Porto 2012 [3]. Figure 1 shows the location of the surveyed area and Fig. 2 shows the vehicles participating all of them equipped with a conductivity probe to measure salinity.

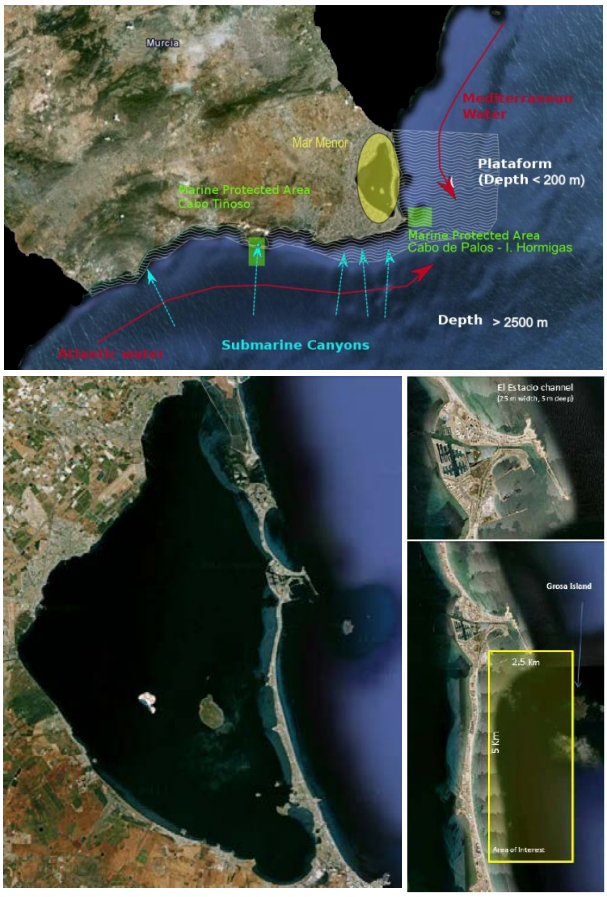

Figure 1. Location area.

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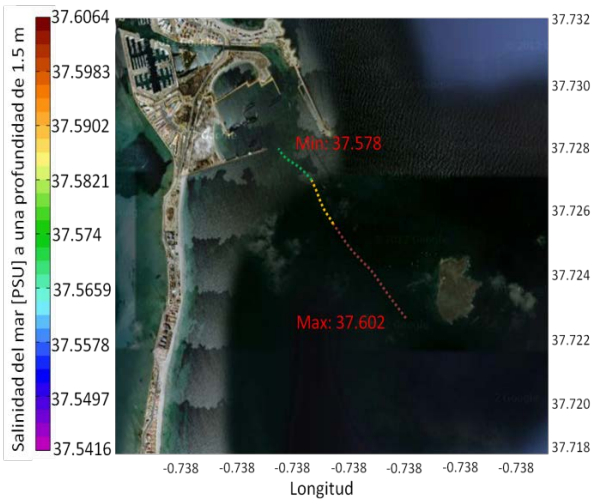
Figure 2. Participating vehicles.

Objective of the Experiment. Two main objectives were established for this experiment: 1) the scientific goal was to measure the saline plume of water going out to the lagoon to the Mediterranean Sea as reveled by the 3D hydrodynamic model; 2) the logistic goal was to measure our ability to operate with a fleet of different vehicles in a cooperative way.

Trajectories. As each vehicle was conceived and designed for different purposes and were in different development stages, complementary capabilities were evidenced. Aegir was sampling in a subsurface line from the Estacio channel to Isla Grosa. As Guanay II was only able to navigate in surface but that time it covered a line in the Mar Menor area from the west to the mouth of the Estacio channel. The Sparus vehicle covered a transversal line perpendicular to the mouth of the Estacio channel in the Mediterranean area, whereas the Seacon vehicles surveyed three areas along the outer side of La Manga in the Mediterranean Sea. Figure 3 shows trajectories for the vehicles.



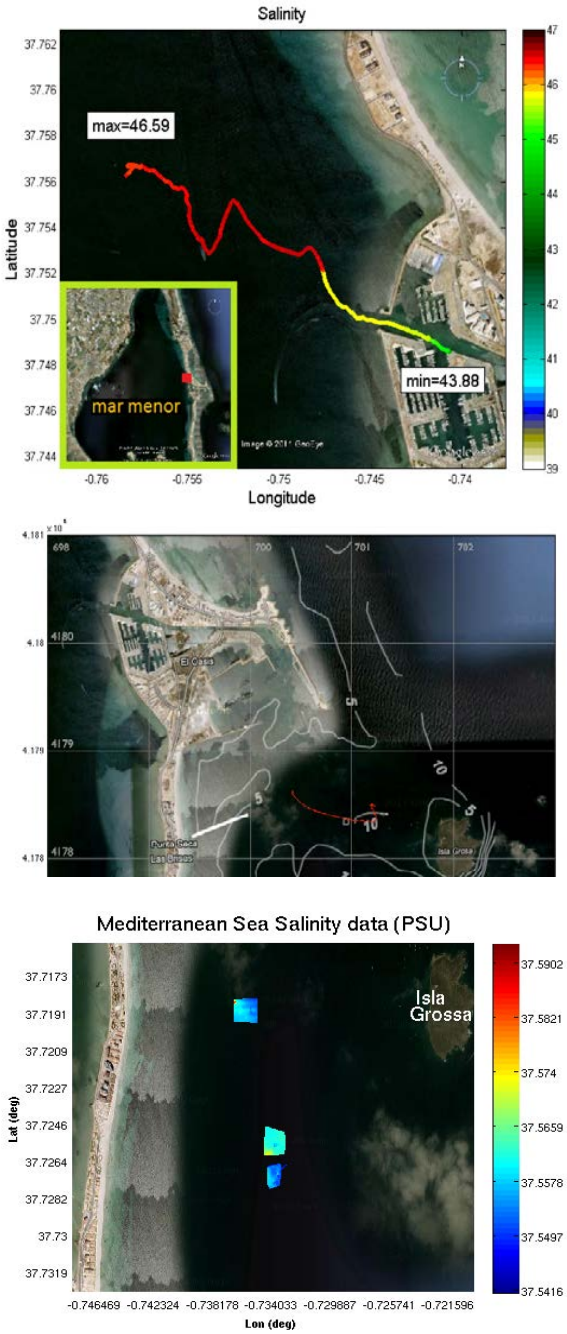


Figure 3. Trajectories of the vehicles and salinity values.

An example of data acquired by the Sparus vehicle with ability to hoover is shown in figure 4 where the most saline water is located at the bottom of the water column.

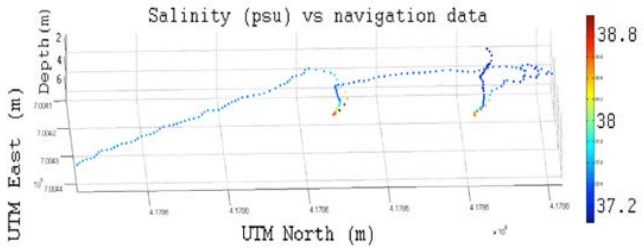


Figure 4. Salinity data recorded by the Sparus

Obtained data and vehicles tracking was centralized in the ODSS (MBARI) data base in order to check and validate this approach.

THE SUBMARINE VEHICLES LABORATORY (LVS) AT THE UNIVERSIDAD POLITÉCNICA DE CARTAGENA.

In December 2012 the LVS acquired an EcoMapper AUV equipped with DVL and a multiparametric sonde with probes for temperature, salinity, pH, turbidity, dissolved oxygen and chlorophyll (Figure 5). Also in June 2013 the LVS has acquired a Seabotics ROV equipped with video camera and a 5 degrees of freedom arm. With these three vehicles the lab is now fully operative to cover a wide range of inspection and intervention missions.

Figure 5. EcoMapper AUV and Seabotics ROV at the LVS-UPCT.

One of the main objectives of the LVS-UPCT is to conduct oceanographic research at a multi-scale level in collaboration with many other vehicles from different institutions in order to establish a trained fleet of vehicles able to quickly operate in any place in Europe under different scenarios and problems.

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