

## Ocean Gliders for Maritime Surveillance: the FP7-PERSEUS Project

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**Abstract-** *The work presented in this paper is aimed to explain the key role of unmanned ocean vehicles in marine security applications such as the ones described in the FP7 PERSEUS Project. The PERSEUS project attempts to answer the demand of a European integrated system for border surveillance. Its main goal is to develop and test a European system for maritime monitoring through the integration of the already existent local systems and its update and improvement using technological innovations, setting up the standards and bases for its final development and implementation.*

**Keywords-** *ASV, glider, acoustics, ocean, marine, surveillance, security.*

### 1. INTRODUCTION

Unmanned autonomous marine vehicles presence is becoming nowadays normality across world oceans. Significantly more affordable than other marine observing platforms in terms of operation and maintenance, UAVs, and more specifically underwater (AUVs) and surface (ASVs) gliders, represent one of the best new technological approaches to increase ocean presence in a sustainable and cost-effective way and therefore, improve data quality and derived products in benefit to a wide range of socio-economic sectors [1] [2].

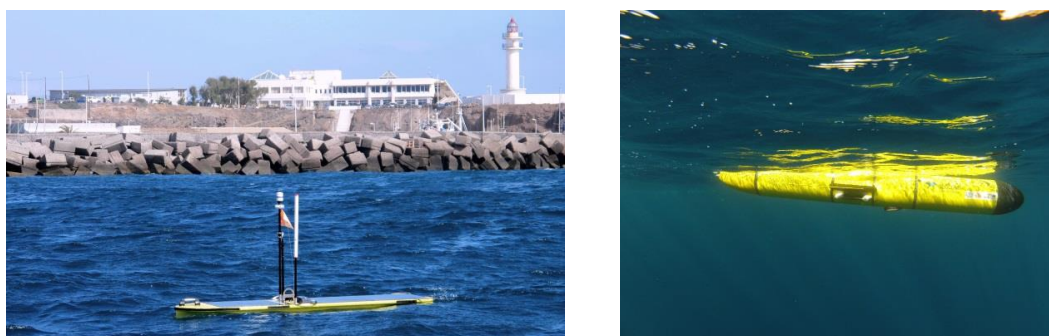


Fig 1. Two ocean glider examples: (left) ASV and (right) AUV.

Despite still futuristic look for many, ocean gliders are consolidated as key ocean observing tool for several reasons. A noteworthy variety of commercial models and prototypes developed on the same physical principle (buoyancy) for those labeled as profilers (AUVs), and the use of renewable energies (wind and waves) for the surface (ASVs) versions, offer all together a broad range of features and capabilities in comparative terms between them and respect other ocean observing platforms, where highlights the “*low and blue-power device*” concept, allowing to monitor under new spatiotemporal scales, mainly due to higher presence and endurance in terms of autonomy.

## 2. THE PERSEUS PROJECT

PERSEUS (Protection of European BoRders and Seas through the IntElligent Use of Surveillance) [3] is an FP7 demonstration project supported by the FP7 Security Research theme under DG-Enterprise. It is a 4 year project with a budget of 43 M€ involving partners from 12 different countries. Its purpose is to build and demonstrate a global EU maritime surveillance system integrating existing national and communitarian installations and enhancing them with innovative technologies. PERSEUS covers the whole chain of the system from the design to the delivery of a validated maritime surveillance architecture.

The PERSEUS scope is three-fold: i) focused research on complex security missions (e.g. illegal migration and drug trafficking), ii) validation and demonstration of new solutions (integration of existing legacy systems within a trans-national network and implementation of innovative surveillance tools ensuring an uniform and high level surveillance and control of EU borders) and, iii) involvement of end users to warrant a realistic step by step approach to reach an efficient operational cooperation among the Member States while preserving the National prerogatives.

## 3. SEA-TRIALS AND EXPECTED RESULTS

In order to test and validate the whole marine surveillance tool-system, the PERSEUS project has scheduled and performed several practical exercises in different stages of the project, including sea-trials. These demonstration exercises have involved different security systems, entities and countries. The main goal of the exercises at sea is to detect motor boats including those having a low radar signature and/or not equipped with an AIS system. To achieve this, the system receives sonic impulses continually through a passive acoustic module -PAM- (hydrophone array) [4] that is attached in the bottom part of an ASV. Gathered data are processed on-board in real-time, and when a target boat is detected the information related to it is sent to the coast station for decision making.

PLOCAN is aimed to coordinate exercises related to sea-trials using an ASV-Wave Glider [5], suited by the PAM system aforementioned. In this sense, several practical exercises will be carried out. The first of them, in direct cooperation with MARUM, has been developed in waters of the Canary Islands in order to test capability basis of the SV3-Wave Glider. The main target of this exercise was to test the Wave Glider AIS satellite communication system offshore (50 nm from coast). The monitoring capabilities of the Wave Glider interface let us see the AIS screenshot continually during the whole exercise. A second exercise will be held in conjunction with CMRE in Italian waters. The main objective of this second exercise is to test PAM detection capabilities in a Wave Glider SV2. The detection functionalities will be tested on several exercises, including calibration and a real case example with a target boat to be detected. Finally one last exercise will be held in waters of Gran Canaria in order to perform a full test of both the communication and detection capabilities of the whole system in a SV3 Wave Glider.

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