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Marine Ecosystems Observation by a cooperative AUV in the PLOME project

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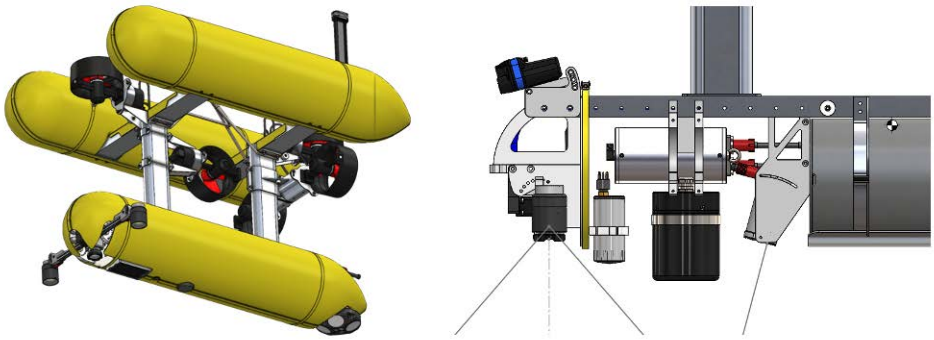

Figure 1. Girona 1000 AUV and its payload for the PLOME project.

I. ABSTRACT

To improve our understanding of how marine ecosystems function, it is crucial to quantify their processes using proper spatio-temporal multiparametric monitoring techniques. Science and innovative technologies must play a central role in developing the Blue Growth in a sustainable manner, where advances in enabling technologies such as remote sensing, modelling, AI and autonomous systems, will enhance our capacity to monitor and predict, assess and manage ecosystems. The PLOME project proposes a spatially adaptive, non-invasive, modular platform of independent and wirelessly connected benthic stations and AUVs to intelligently observe, monitor and map marine ecosystems, during long-lasting periods with real-time supervision. The monitoring solution has a simple deployment and is easy-to-move from an experimental site to another, without any cable installation, for coastal and deep water environments. Stations provide continuous and intensive temporal observation, while AUVs can provide such intensive measurement at spatial level, when they undock for a mission from a station in which they previously recharged batteries and transmitted information.

The PLOME project will demonstrate the proposed concept in two scenarios. The first one, involves testing independent capabilities in a real deep-sea scenario, while the second one entails a one-week demonstration in shallow water, where an AUV will be operated from a docking station. This paper describes the Girona 1000 AUV from the Universitat de Girona that will be used for the deep tests , conducted at depths ranging from 200 to 400 meters. The AUV will be used in cooperation with two fixed stations developed by the Universitat Politècnica de Catalunya. Acoustic communications and ranges between the AUV and the stations will be used to coordinate the AUV's work and to improve its navigation. Optical communications will be used to transmit data to the stations gathered from the AUV observations. The AUV will integrate a multimodal sensor payload, including an optical camera and LED lighting system, a laser for microbathymetry and a forward-looking sonar for acoustic mapping. The AUV will also be able to process some of the data to transmit relevant information to the stations. Deep learning techniques will be used in real-time to detect species on the optical camera

images, 3D point-clouds will be generated to describe the seabed's profile, and onboard acoustic mosaicking will generate an acoustic map of the seabed.

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