

EGU21-10131

<https://doi.org/10.5194/egusphere-egu21-10131>

EGU General Assembly 2021

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



## Development of innovative monitoring technologies in the framework of InnovaMare Project

**Angelo Odetti**<sup>1</sup>, Federica Braga<sup>2</sup>, Fabio Brunetti<sup>3</sup>, Massimo Caccia<sup>1</sup>, Simone Marini<sup>2</sup>, Fantina Matricardo<sup>2</sup>, Marzia Rovere<sup>2</sup>, and Francesca De Pascàlis<sup>2</sup>

<sup>1</sup>CNR-INstitute of Marine Engineering

<sup>2</sup>CNR-Institute of Marine Sciences

<sup>3</sup>National Institute of Oceanography and Applied Geophysics

The IT-HR InnovaMare project, led by the Croatian Chamber of Economy, puts together policy instruments and key players for development of innovative technologies for the sustainable development of the Adriatic Sea (<https://www.italy-croatia.eu/web/innovamare>). The project aims at enhancing the cross-border cooperation among research, public and private stakeholders through creation of a Digital Innovation Hub (DIH). The goal is to increase effectiveness of innovation in underwater robotics and sensors to achieve and maintain a healthy and productive Adriatic Sea, as one of the crucial and strategic societal challenges existing at the cross-border level. Within InnovaMare, CNR ISMAR and INM institutes and OGS, in cooperation with the University of Zagreb and other project partners, contribute to developing a solution to access and monitor extremely shallow water by means of portable, modular, reconfigurable and highly maneuverable robotic vehicles. The identified vehicle is SWAMP, an innovative highly modular catamaran ASV recently developed by CNR-INM. SWAMP is characterised by small size, low draft, new materials, azimuth propulsion system for shallow waters and modular WiFi-based hardware&software architecture. Two SWAMP vehicles will be enhanced with a series of kits, tools and sensors to perform a series of strategic actions in the environmental monitoring of the Venice Lagoon:

- i) An air-cushion-system-kit will be designed and developed. The vehicle will become a side-wall air-cushion-vehicle with reduction of drag and increase in speed. This will also increase the payload with a reduction of draft.
- ii) An intelligent winch kit with a communication cable for the management of underwater sensors and tools.
- iii) A GPS-RTK kit for highly accurate positioning in the range of centimeters.
- iv) An Autonomous programmable device for image acquisition and processing based on the Guard1 camera. This camera acquires images content and, by means of a supervised machine learning approach, recognises/classifies features such as fish, zooplankton, seabed, infrastructures. The system is conceived for autonomous monitoring activities extended in time in fixed or mobile platforms.
- v) A Multibeam Echo-sounder (MBES) coupled with an IMU (for pitch-roll compensation). MBES data can be used, also coupled with Cameras Imagery, through image-detection techniques for

reconstruction and comprehensive knowledge of underwater environment and infrastructures. Possible analyses in coastal areas are: seabed mapping also for cultural heritage, offshore structures and resources and monitoring of biodiversity, hydrocarbon, marine litter, pollution.

vi) An underwater Radiometer for multiple analysis: temporal dynamics of optical properties of water; temporal dynamics of water turbidity from water reflectance; submerged vegetation and water depth mapping in optically shallow water; produce reference data for validation of satellite data.

vii) Automatic Nutrient Analyzer for real-time nutrient monitoring. This sensor measures nitrate with high accuracy over a wide range of environmental conditions (including extremely turbid and high CDOM conditions), from blue-ocean nitraclines to storm runoff in rivers and streams.

The final result of this pilot action is the creation of an innovative prototype platform for sea environmental monitoring. This will be validated through the analysis of results and draw up of guidelines for the improvement of underwater conditions.