IMEKO TC-19 INTERNATIONAL WORKSHOP ON

Metrology for the Sea

MetroSea2019

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IMEKO

UNIVERSITÀ DEGLI STUDI DI GENOVA

CALL FOR PAPERS

For the Special Session on:

HIGH-TECH FLEXIBLE NETWORKS OF AUGMENTED OBSERVATORIES FOR THE MONITORING OF MARINE ECOSYSTEMS

ABSTRACT

Increasing interest in the acquisition of marine biotic and abiotic resources (e.g. fisheries, oil-gas extraction, and mining) urgently imposes the development of novel monitoring technologies, beyond the traditional vessel-assisted, time-consuming, high-cost sampling surveys. The implementation of fixed augmented observatories (cabled or stand-alone), possibly equipped with docked mobile platforms, for the seabed and water-column investigation and monitoring are presently enforced, to cooperatively measure biological features and environmental (physical-chemical) parameters. Video and acoustic imaging are becoming central approaches for studying nektobenthic and epibenthic megafauna (e.g. quantifying species presence, behaviour, and trophic interactions) in a remote, continuous, and prolonged fashion. Imaging is also being complemented by in situ environmental-DNA sequencing technologies, allowing the traceability of a wide range of organisms (including prokaryotes) beyond the reach of opto-acoustic tools. The upgraded version of the Environmental Sample Processor (3G-ESP) performs molecular analytical functions including digital quantitative polymerase chain reactions (qPCR). The fitting of the 3G-ESP onboard of a long-range autonomous underwater vehicle makes this unit of flexible use cabled and mobile observatories. A promising step forward includes sampling at deeper water and full sequencing facilities onboard. In situ observations can be implemented by laboratory analyses pertaining to -omics technologies carried out on ad hoc samples of DNA/RNA derived from natural communities. These observations can augment the resolution of studies oriented towards describing the relation between biodiversity and ecosystem functioning. Such augmented observatories equipped with heterogeneous sensors, implemented by deeper laboratory observations, managed by Internet of Things (IoT) services and data science approaches, shed new light in the marine science panorama and produce new knowledge for improving ecosystem services.

TOPICS

- Novel and interconnected technologies for improved monitoring of a wide range of environmental impacts.
- High-tech networks of interactive fixed (cabled or stand-alone) observatories and docked mobile platforms to enhance environmental monitoring capacity at appropriate spatial and temporal scales.
- Automation in video and acoustic image processing to monitor organisms within a wide range of ecological sizes, ecosystem functioning, services, and health.
- Genetic and -omics automated approaches to biodiversity and ecosystem functioning analyses to be also implemented in situ for species traceability and biodiversity assessments.
- Data science and IoT approaches to optimize acquisition, processing and interpretation of physic, biological and ecological data.

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