Effortless Integration of Underwater Noise Measurements into EMODnet data portal through Sensor Web Standards

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Underwater noise has been significantly raising in the past decades due to an increment of human-related activities in the oceans such as shipping, industrial activities, seismic explorations, etc. These activities may have adverse effects on fish and mammals, such as communications masking and modifying predator–prey interactions.

In order to assess and limit the impact of these, the European Commission approved the Marine Strategy Framework Directive (MSFD) which aims to achieve a good environmental status in European waters. Within this directive different environmental challenges are addressed, including the long-term monitoring of underwater noise throughout European waters.

In order to monitor underwater noise at a European level, underwater noise data gathered by acoustic stations need to be integrated into a common network. Moreover, as these installations are scarce and expensive to maintain, this network could be complemented with mobile platforms to monitor remote areas (i.e. underwater gliders and profilers). Therefore, data form different platforms (usually managed by different institutions) needs to be merged into a common data infrastructure.

To obtain interoperable underwater noise time series from different sources standardized procedures as well as uniform metadata management techniques are required. To achieve this use of Sensor Web standards is proposed, with special emphasis on the Open Geospatial Consortium's Sensor Web Enablement (SWE) framework.

The standards provided by the SWE framework provide a flexible yet semantically-tied manner of sharing data and metadata between institutions. New nodes could be easily integrated into the network as these standards provide well-defined interfaces for data / metadata archival and access. The EMODnet data injection portal provides SWE-compatible interface, allowing the automated publications of underwater noise data through Sensor Web standards.

However, in order to integrate new hydrophones into an acoustic station an ad-hoc driver is still required. Combining the SWE framework with controlled vocabularies is also possible to enhance interoperability at the instrument level, providing well-defined, standards-based metadata documents (i.e. SensorML). A process capable of accessing and interpreting such metadata could automatically interface a new hydrophone when deployed in an observation platform, providing an end-to-end plug and play framework. The data gathering, processing of the raw acoustical data and the injection of processed underwater noise data into data portals would then be completely automated.