Vol. 54 – SUPPLEMENT

Bollettino di Geofisica
teorica ed applicata

An International Journal of Earth Sciences

IMDIS 2013
International Conference on Marine Data and Information Systems

23-25 September, 2013 - Lucca (Italy)

Organised by
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ISSN 0006-6729

New EU efforts to assess the state of the marine environment: the EMODnet Chemistry pilot project

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The EU Green Paper for Marine Knowledge 2020 highlighted that Seas and Oceans that surround Europe provide an essential part of our wealth and well-being but they are also under huge pressure from human activities and climate change, they offer opportunities that we have to develop in a sustainable way. Central to this strategy is the concept to develop a European Marine Observation and Data Network (EMODnet), a network of marine organizations that would provide a single entry point for accessing and retrieving marine data derived from observations, surveys or samples from the hundreds of databases maintained on behalf of agencies, public authorities, research institutions and universities throughout Europe. EMODnet started as a pilot project with four thematic service contracts for a final operational European Marine Observation and Data Network, launched by the Directorate-General for Maritime Affairs and Fisheries (DG MARE).

EMODnet Chemistry pilot project aims to assemble fragmented and inaccessible marine data into interoperable, continuous and publicly available data streams for complete maritime basins, focusing on the marine data groups of chemicals required for the monitoring of the Marine Strategy Directive: pesticides, antifoulants, pharmaceuticals, heavy metals, radionuclides, fertilizers, organic matter, hydrocarbons including oil pollution.

It concerns the following geographical regions:

- North Sea;
- Black Sea;
- 5 spots of the Mediterranenan Sea.

EMODnet Chemistry is focused on multidisciplinary interoperability by adopting and adapting existing and well established data sharing initiatives and being at the same time compliant with the EU INSPIRE directive. Great attention was devoted to the definition of data and product viewing and downloading services to fit the purpose of the Marine Strategy Framework Directive. The Chemistry Lot was developed according to the principle of adopting and adapting the SeaDataNet V1 infrastructure. This because SeaDataNet is a “de facto” European open infrastructure that can give access to a continuously increasing number of data centres across sectors and countries, increasingly meeting the standards needed for INSPIRE compliance. It is an efficient distributed Marine Data Management Infrastructure conceived for the management of large and diverse sets

of Physical Oceanography data deriving from in situ and remote observation of the seas and oceans which is developing its standards and tools and now adopted by a growing number of other communities.

As an European platform building upon SeaDataNet, the European Marine Observation Data Network - EMODnet could provide a solid framework for the structured development of a network of distributed data centres using a common lexicon and ensuring broad accessibility for diverse users, from scientists to policy makers, as well as provide user-friendly assembling tools.

The Chemistry Lot adopted SDN Standards for metadata , data and products as:

- metadata CDI (xml ISO 19115);
- Standard Vocabularies (P021, P011, P061...) for common terms;
- ODV data format for background data exchange.

One of the main challenges of the activities of the three year Chemical lot Pilot Project was represented by the Data complexity and heterogeneity management. The Lot had to manage data coming from 8 groups of compounds measured in three matrices (sediment, water column and biota). Seventeen parameters were selected for the data-products generation. The data collected presented a high heterogeneity in all the 3 matrices considered, in relationship with the sampling methods, the data distribution (coastal time series stations vs homogenous sampling at basins level), the analytical methods (instrument, method, target species, target basis, grain sizes). The heterogeneity was also depending on the geographical distribution of the target species considered in the data collection. This is the case of the Mytilus sp that in the Mediterranean Sea was mainly represented by Mytilus galloprovincialis, while in the North Sea area was represented by Mytilus edulis.

The complexity on the management of this information was approached by adapting:

- the Metadata and data description:

the SeaDataNet infrastructure, that was created to handle mainly physical oceanographic data, was adapted to fit it to the management of chemical data which need a more detailed metadata description. In fact, in order to be able to store and handle chemical data also after several years from their measurement and to have the necessary information to be able to compare data from different areas, more details on analytical methods, target species, target basis are required.

- Products generation and handling:

suitable products were defined to represent the different features of the datasets collected and to satisfy the needs of a standard for reporting environmental data.

Data with a homogeneous distribution in time and space, collected at basin level were used to generate seasonal and annual interpolated maps for nutrients, metals and radionuclides in the North Sea, in the Black Sea and in selected areas of the Mediterranean Sea. Data collected at coastal stations repeated in time, were used to generate time series plots for hydrocarbons, pesticides, metals, fertilizers over more than 160 stations.

Through the EMODnet portal it is possible to visualize the maps of selected parameters, the pre-computed time series plots and the original data. The objective of the obtained results and of future efforts is the development of an efficient infrastructure for the data collection, management and analysis and then for the integrated assessment of the marine environment.