

Interconnected and interoperable

Dick Schaap, technical coordinator of the SeaDataNet marine environment data management project, updates us on recent progress, the remaining challenges and the exciting potential for future expansion



Could you begin by recapping the context from which the SeaDataNet network emerged?

SeaDataNet is the leading network in Europe, actively operating and developing a pan-European infrastructure for managing, indexing and providing access to ocean and marine datasets and data products acquired from research cruises and monitoring activities in European marine waters and global oceans.

The SeaDataNet II project has been underway for almost a year now and was preceded by SeaDataNet (2006-11) and Sea-Search (2002-05). These made great progress in establishing an infrastructure of 68 connected data centres from 29 countries around European seas, giving access to more than 1 million datasets, a range of pan-European metadata services and SeaDataNet standards that have been widely adopted across the EU.

What is the specific goal of the current SeaDataNet II project?

The overall objective is to move towards an operationally robust and state-of-the-art Pan-European infrastructure. This includes: seeking full INSPIRE compliance, expanding the number of connected data centres; achieving an improved capacity for handling marine biological data, establishing machine-

to-machine interfacing in addition to the present client user interface for serving specific user communities, such as the Marine Strategy Framework Directive; and achieving both delayed-mode and real-time data provision capacities for operational oceanography.

Can you highlight the greatest challenge in the effort to achieve standardised data capture?

Common standards and protocols for data management, including quality control, formatting, naming, and giving data access, are key issues for establishing a coherent infrastructure engaging major actors in ocean and marine data acquisition and management. SeaDataNet has focused on establishing common standards and on applying those standards to interconnect a large group of major data centres in Europe with great success. Moreover, by initiating and collaborating with other EU projects, such as Geo-Seas (see p30) for geological and geophysical data, JERICO (see p12) for operational oceanography, and European Marine Observation and Data Network (EMODNet), its standards are adopted and adapted to provide a richer set of standards fit for handling a wider scope of data types.

How important is cooperation between the US, EU and Australia and how are your activities helping to strengthen ties?

Europe, the US, Australia and IOC-IODE are making significant progress in facilitating the discovery and access of marine data through data management infrastructures such as SeaDataNet, Geo-Seas, IOOS, the Australian Ocean Portal and the IODE Ocean Data Portal. All contribute to the implementation of standards for the formats of metadata, data, data products, quality control methods and flags and common vocabularies. They also provide services for data discovery, viewing and downloading, and software tools for editing, conversions, communication, analysis and presentation, all of which are increasingly being adopted and used by national and regional marine communities.

There is also a general trend towards the use of the basic ISO and OGC standards; however, these allow the use of different profiles and vocabularies. As a result there are differences in the standards used in the different regions which hinder their direct exchange and use at an international and global scale, and as a result act as a barrier to the realisation of global portals such as the IODE Ocean Data Portal and GEOSS. It is therefore necessary to develop common standards, where possible, and otherwise establish interoperability solutions between these leading infrastructures for Europe, US, and Australia, and global portals. This will be subject of the new Ocean Data Interoperability Platform (ODIP) project that was recently awarded to an EU partnership, selected from SeaDataNet and Geo-Seas, together with IOC-IODE and key US and Australian partners.

Moving forward, what are your hopes for Horizon2020 in supporting your continued efforts?

SeaDataNet is a major contributor to the development of the overarching European Marine Observation and Data Network (EMODNet) that is initiated in the framework of the MSFD. EMODNet encourages more data providers to come forward for data sharing and participating in the process of making complete overviews and homogeneous data products. This will give wider visibility at the policy and management levels both at EU and Member States that should seek integration of EMODNet output and services in management and policy processes and that will decide upon its future sustained funding.

In parallel, further RTD work, such as that taking place in SeaDataNet II, will and must continue on standards and protocols that can be applied as basis for the expanding EMODNet portals. For this purpose Horizon 2020 will provide a fertile ground for SeaDataNet III and Geo-Seas II projects that will refine and expand the data management standards as well as their services.

Masters of marine data delivery

SeaDataNet II is the next step in the progression of European infrastructure for marine data management. Building on its current success, the team is aiming to expand the scope of the network, setting their sights on global collaboration

BETWEEN 2006 AND 2011, SeaDataNet emerged as an impressive pan-European infrastructure for marine data management, coordinating vast quantities of information from hundreds of disparate sources in 35 different countries. Now, data about the geographical and environmental makeup of the European seas is accessible in a way that was previously impossible. This innovative approach has facilitated work in a variety of fields, from scientific research to European-level political policy. By standardising data formats, quality control procedures, and vocabularies, and creating common protocols of communication, the SeaDataNet group was able to ensure the interoperability of the many data centres involved.

In order to maintain the high quality access to up-to-date data achieved so far a new phase, SeaDataNet II, has been underway since October 2011. Coordinated by Michele Fichaut of Ifremer and technically coordinated by Dick Schaap of MARIS, the second stage of the process aims to build on the achievements of the first. In particular, SeaDataNet II wants to increase the efficiency of the data management infrastructure and its capacity to cope with the huge diversity and volume of data available. This work will provide users from a wide range of backgrounds with access to reliable observations of seas and oceans and facilitate their research into marine environments which may have important social, economic and environmental consequences.

PAN-EUROPEAN COOPERATION

SeaDataNet II will rely on the continued cooperation and support of its various partners.

Without collaboration from research institutes and oceanographic data centres from all over Europe, the project would never see fruition. Among the many members of the SeaDataNet consortium are the IEO Data Centre of Spain, the British Oceanographic Data Centre, SMHI of Sweden, and the Institute of Meteorology and Water Management of Poland, to name but a few.

Maintaining effective communication and good relationships between all of the involved parties is a considerable achievement and fundamental to the success of the SeaDataNet infrastructure. Schaap does not underestimate the value of all contributors and recognises the exciting potential it holds for expansion beyond European borders: "These networks and contacts contribute to the further positioning and development of the SeaDataNet infrastructure at operational and strategic levels. The consortium also includes IOC-IODE, ICES and two World Data Centres, RIHMI-WDC and PANGAEA-MARUM that will contribute to further strengthening the tuning of standards on a global scale".

BIGGER AND BETTER

Despite the enormity of the challenge to standardise cross-disciplinary databases in over 35 different countries, SeaDataNet II has very clear targets for improving the existing infrastructure and aims to become an operationally robust and state-of-the-art Pan-European infrastructure. This includes among others: seeking full INSPIRE compliance; achieving an improved capability for handling also marine biological data; establishing machine-to-machine interfacing in addition to the present client user interface for serving

specific user communities such as MSFD, and achieving both delayed-mode and real-time data provision capacities for operational oceanography.

True to the project's core value of maintaining and facilitating effective communication, SeaDataNet II will see enhancements to its range of software tools and services for data analysis and prepare entries for the infrastructure, making them easier to use and providing improved functions and features. Alongside these developments, the project has introduced science literacy and training courses to share knowledge and give guidance about the SeaDataNet standards, services and various tools and how these can be gainfully adopted and applied. The first of these courses was held in Ostend, Belgium in July 2012 and received very positive feedback from participants who are now better equipped not only to make the most of SeaDataNet's services, but also to communicate that information to their colleagues and contribute their data sets to the overall infrastructure.

Many other activities are in the pipeline, if not already underway, for SeaDataNet II, working in close collaboration with its partners. These activities include; increasing the number of connected data centres and the volume and types of data accessible through SeaDataNet services, the expansion of its role as a key component in European Marine Observations and Data Network (EMODNet), and working with other marine infrastructure projects such as Eurofleets and MyOcean to optimise the flow of data between systems.

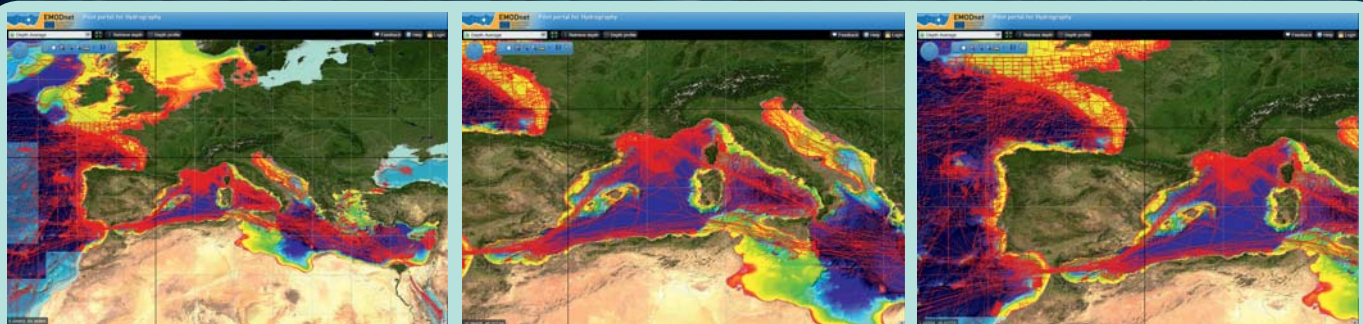


FIGURE 1. Higher resolution Digital Bathymetry for European seas as developed in EMODNet Hydrography with SeaDataNet giving overview and access to the underlying bathymetric survey datasets.

EVIDENTLY EFFECTIVE

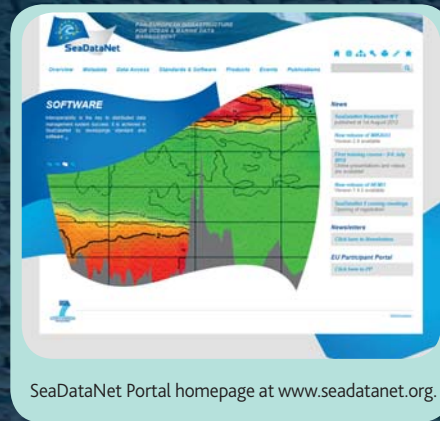
For one specific example of the benefits of the SeaDataNet infrastructure, Schaap directs us towards the case of the EMODNet Physics Portal project. This was initiated early in 2011 as a cooperative effort between SeaDataNet, MyOcean, and EuroGOOS. The goal of the project is to provide a broad and useful dataset of in situ observations, both near real-time and long historical time series, from operational oceanography programmes and monitoring systems to serve a wide variety of user communities. Schaap emphasises the positive effect of this type of project: "The EMODnet Physics portal will also encourage other physical data providers outside the present communities to come forward, contribute and become engaged".

The portal provides users with direct access to comprehensive charts and tables of time series for a sliding window of the last 60 days and facilitates requests for the downloading of historical time series of selected stations and parameters. It is a flexible, user-friendly portal which makes use of the SeaDataNet infrastructure in combination with the EuroGOOS and MyOcean infrastructures, as it was intended, to facilitate scientific research, management and economic user applications, by giving access to data from a wide area and various sources through one portal.

BEYOND EUROPE

Given the success of the pan-European data management infrastructure, including its offspring Geo-Seas for marine geology and geophysics data, the project is also undertaking activities in a new, more global, direction. Currently, efforts to create an Ocean Data Interoperability Platform (ODIP) for Europe, the US and Australia are underway.

ODIP will bring together leading marine data management initiatives from three continents with the goal of exploring common standards and interoperability solutions that will facilitate common access to the wide scope of underlying data centres and their databases. This will also pave the way for contributing to the global Ocean Data Portal of IOC-IODE and GEOSS. Partners involved from the US include parties from research and governmental sectors of oceanography such as Marine Metadata Initiative and Rolling Deck to Repository, as well as the National Oceanic and Atmospheric Organisation (see p6). Participation is also anticipated from various Australian organisations working towards the realisation of an Australian ocean and marine data infrastructure, for example the Australian Ocean Data Network and the Integrated Marine Observing System. The success of collaboration on this global



SeaDataNet Portal homepage at www.seadatanet.org.

scale would provide the first step towards a transformation in the way data is shared across national borders, scientific fields and organisations of all shapes and sizes.

In practice, ODIP will organise international workshops to foster the development of common standards and develop prototypes to evaluate and test selected potential standards and interoperability solutions. Schaap is enthusiastic about what ODIP can achieve thanks to the vast experience afforded by the SeaDataNet and Geo-Seas projects: "The ODIP partnership will provide a forum to harmonise the diverse regional systems, while advancing the European contribution to the global system".

The strong ethos of collaboration – which has driven many aspects of SeaDataNet's work so far – has evidently been central to its success in achieving greater interoperability. Bringing together such an impressive array of organisations from all over Europe to create a data management network which serves the common interests of researchers worldwide has served to demonstrate how much can be achieved from working collaboratively. With a strong track record of success, ever more exciting services and developments are expected from the next phase of the project and its rapidly expanding horizons.

This work will provide users from a wide range of backgrounds with access to reliable observations of seas and oceans and facilitate their research into marine environments

INTELLIGENCE

SeaDataNet II

A PAN-EUROPEAN INFRASTRUCTURE FOR OCEAN AND MARINE DATA MANAGEMENT

OBJECTIVES

To network the existing professional data centres of 35 countries, active in data collection, and provide integrated databases of quality online standards.

PARTNERS

Ifremer, France • MARIS BV, The Netherlands • NERC, UK • BSH, Germany • RIHMI, Russia • ENEA, Italy • INGV, Italy • METU, Turkey • CLS, France • AWI, Germany • Université de Liège, Belgium • IMR, Norway • NERI, Denmark • ICES – CIEM • European Commission • Marine Institute, Ireland • Instituto Hidrográfico de Portugal, Portugal • NODC, The Netherlands • MUMM, Belgium • VLIZ, Belgium • MRI, Iceland • FMI, Finland • Institute of Meteorology and Water Management, Poland • TTU, Estonia • Latvian Institute of Aquatic Ecology, Latvia • EPA, Lithuania • SIO-RAS, Russia • National Academy of Science of Ukraine, Ukraine • IO-BAS, Bulgaria • NIMRD, Romania • Tbilisi State University, Georgia • IOF, Croatia • NIB, Slovenia • University of Malta, Malta • University of Cyprus, Cyprus • IOLR, Israel • CNR, Italy • IBSS, Ukraine • UniHB, Germany • TUBITAK-MAM, Turkey

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MICHÈLE FICHAUT received a PhD in computer engineering in 1986. She was deeply involved in the development of data management tools during the 1st phase of SeaDataNet.

DICK M A SCHAAP received an MSc in coastal engineering in 1980. At present he is Technical Coordinator for the FP7 SeaDataNet II and FP7 Geo-Seas projects and Technical Harmoniser for EMODNet.

