



2ND MARINE BOARD FORUM

Towards a European Network of Marine Observatories for Monitoring and Research

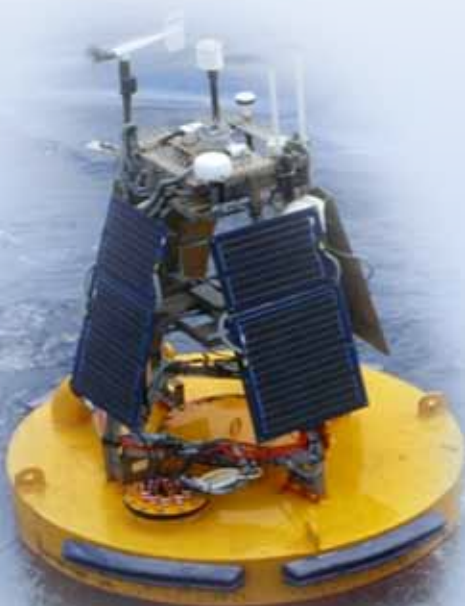
16 September 2010, Brussels, Belgium

PROCEEDINGS

“A Long-term, stable and integrated network of strategic marine observatories... providing consistent in situ data from the seas and oceans... as a driver for smart, sustainable and inclusive growth in Europe...”

Extract from 2nd Marine Board Forum Vision Statement

Driving science and technology frontiers for observing our changing ocean: From discovery and exploration in the 19th Century to new frontiers in ocean observation in the 21st Century



Marine Board profile

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The Marine Board provides a pan-European platform for its member organizations to develop common priorities, to advance marine research and to bridge the gap between science and policy, in order to meet future marine science challenges and opportunities.

The Marine Board develops common positions on research priorities and strategies for European marine science, facilitating enhanced cooperation between stakeholders involved in supporting, delivering and using marine research and technology. Marine Board stakeholders include the Board's members, partner European and international networks, policy makers, strategy developers and programme managers at national and European levels as well as the marine and maritime science community at large. As an independent non-governmental advisory body, the Marine Board provides the essential components for transferring knowledge from the scientific community to decision makers, promoting Europe's leadership in marine research, technology and innovation.

The Marine Board works to bridge the gap between science and policy. Adopting a strategic role, the Marine Board provides a unique forum to develop marine research foresight, initiating state-of-the-art analysis and studies and translating these into clear policy recommendations to national agencies and governments as well as to the European institutions. This work is underpinned by four principle approaches:

Forum – bringing together European marine research stakeholders to share knowledge, identify common priorities, develop common positions and collaborate;

Synergy – fostering European added value to national programmes and infrastructures, and promoting collaboration with international programmes and organizations;

Strategy – identifying scientific challenges and opportunities through analysis and studies, and providing high-level recommendations for European and national research funders and policy makers as well as the scientific community;

Voice – expressing a collective vision of European marine research priorities to meet future science and societal challenges and opportunities.

www.marineboard.eu

2ND MARINE BOARD VISION STATEMENT

Towards a European Network of Marine Observatories

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The Vision

The 2nd Marine Board Forum, held in Brussels on 16 September 2010, culminated in a unanimous call from its participants for the prioritization at national and EU level of actions to deliver:

“A long-term, stable and integrated network of strategic marine observatories, installed and operated through multi-national cooperation and support, providing consistent in situ data from the seas and oceans in support of the EU Integrated Maritime Policy¹ and as a driver for smart, sustainable and inclusive growth in Europe (Europe 2020)²”.

What are marine observatories?

The ocean observing system consists of a combination of remote and *in situ* sensing platforms including satellites, research vessels, ships of opportunity, marine research stations, Argo floats and fixed monitoring buoys. The 2nd Marine Board Forum and this Vision Statement address one critical component of this broad observation infrastructure: strategic *in situ* observing capacities which provide long-term time-series data. These “marine observatories” provide the backbone of the ocean observation system and the EMODNET³.

Why do we need long-term time-series data?

Long-term time-series datasets from the marine environment are of critical importance to facilitate:

- Effective policy making and sustainable management of the seas and oceans;
- Monitoring of the rate and scale of environmental change, including climate change and biodiversity loss;
- Detection of hazards and events;
- Understanding ocean, earth and climate system processes.

The seas and oceans support maritime industries and provide goods and services which are of critical importance for human societies and economies. However, marine ecosystems are under considerable pressure from ocean acidification, global climate change as well as localized impacts from human activities such as fisheries, aquaculture, pollution, transport and marine renewable energy. To sustainably manage our interaction with the sea, and to meet policy and societal needs, requires knowledge of the marine environment and the ability to predict future changes. Long-term and consistent data on key biological, chemical and physical (including geological) parameters from the seas and oceans is, therefore, essential. Such data can only be obtained through a network of marine observatories.

What barriers must be overcome?

In Europe, approximately 90% of the annual investment on ocean observing and monitoring comes from Member States. Although several research infrastructures which could contribute towards a marine observatory network are listed on the ESFRI⁴ Roadmap (2008), only some elements of an observatory network are currently in place. Long-term observations are fragmented, located according to national (rather than pan-European or regional) needs, deliver different measurements in different ways and are largely supported by inadequate funding mechanisms, making their future uncertain. Moreover, observations for research and observations for management purposes are not always well integrated.

To achieve the vision of an inter-operable and stable network of observatories in European regional seas and oceans, which is integrated in the global observing systems, there are many barriers to overcome, including:

- A lack of coordination between EU and national investments in ocean observing infrastructures and activities;
- An over-reliance on short-term funding programmes and research projects to deliver essential operational oceanography data;

- Significant gaps in existing coverage (i.e. areas where there is no data);
- A limited partnership approach between EU Member States, and with third countries;
- Different goals for different observatories, resulting in inconsistent measurements, technologies and data products; and
- No common EU implementation strategy.

What actions are needed to deliver the vision?

To pave the way to achieving the vision, the following preparatory actions are urgently needed:

1. A Europe-wide mapping exercise and gap analysis on long-term marine data provision

Building on existing information gathering initiatives, implement a detailed mapping exercise and gap analysis which will:

- **Identify the Needs:** Assess the policy, economic and scientific requirements at local, regional, pan-European and global scales, which must be met by an integrated observatory network.
- **Examine what is already in place:** Assess what observation activities are already in place in coastal seas and open oceans, focusing, for example, on location, technology, measurements, data management and funding structure. Also, identify synergies and overlaps in effort.
- **Identify the gaps in coverage:** Assess the shortcomings in data coverage. What areas are not well covered? In areas where observations are regularly made, what data is missing and how much of the seafloor, water column, air-sea interface and biota is monitored? Do older datasets exist and can that data be used or rescued?

2. A European strategy on the development of an integrated network of marine observatories

Based on the above mapping exercise, and building on existing national and regional observing systems, develop a comprehensive European strategy for the development of an integrated network of marine observatories which provides a detailed roadmap for the development of a full network of observatories and making recommendations on critical issues including:

- Strategic location of observation activities in regional sea and ocean locations, generated from a full-network perspective, rather than individual observatory perspective;
- Coordination of existing and new observation activities for the network with consistency of operation and measurement;
- Technology needs and uses to ensure consistency of measurements, of operation and interoperability between all parts of the network;
- Research priorities to deliver new sensor and platform solutions;
- Innovative and long-term funding mechanisms combining EU and Member and Associated State funding streams to support development of a full network and its continued operation;
- Use of new or existing legal frameworks for joint funding and management of marine research infrastructures (e.g. ERIC⁵, developed by the European Commission);
- Integration of the enhanced European ocean observing network in the international capacity for Earth observation; and
- Use of advanced e-infrastructure framework to gather and make available consistent and quality-controlled datasets from distributed observing systems.

1 An Integrated Maritime Policy for the European Union (http://ec.europa.eu/maritimeaffairs/policy_documents_en.html)

2 Europe 2020: A Strategy for Smart, Sustainable and Inclusive Growth (http://ec.europa.eu/eu2020/index_en.htm)

3 European Marine Observation and Data Network (http://ec.europa.eu/maritimeaffairs/emodnet_en.html#1)

4 European Strategy Forum on Research Infrastructures (http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri)

5 European Research Infrastructure Consortium (ERIC) (http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=eric)

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Participants at the opening of the 2nd Marine Board Forum (16 September 2010, Brussels)

The Marine Board Forum Series

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The Marine Board Forum brings together European marine research stakeholders, representatives of the marine science community, funding agencies and national and European science institutions, to advance research and to promote marine science in Europe and globally. In line with this objective, the Marine Board Forum provides a platform for Marine Board members, partner organizations, individual scientists and European and national policy makers to interact on a particular topic or theme of strategic importance for European marine science. For each selected topic or theme, the Marine Board Forum aims to:

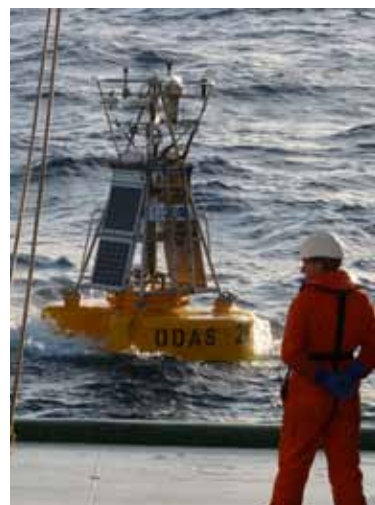
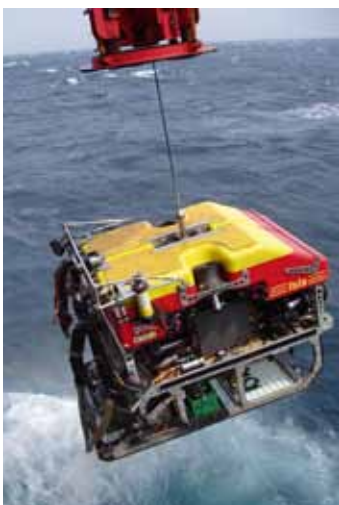
- Provide a focal meeting point for discussion among individual scientists, policy makers and other relevant stakeholders;
- Facilitate the exchange of information and ideas and agree a common position;
- Enhance collaboration and reduce fragmentation and/or duplication in the European research effort.

The main messages, discussions and decisions from Marine Board Fora are recorded and published as

proceedings. Presentations and outputs of the 1st and 2nd Marine Board Fora are available on the Marine Board website: www.marineboard.eu/fora

The 1st Marine Board Forum (15 May 2008, Ostend, Belgium) brought a large stakeholder community together to discuss the topic, *Marine Data Challenges: From Observation to Information*. The Forum's discussions contributed to the development of the European Marine Observation and Data Network (EMODNET) initiative launched by the European Commission. Furthermore, the Forum contributed to a joint Marine Board - EuroGOOS publication on EMODNET.

The 2nd Marine Board Forum (16 September 2010, Brussels, Belgium) placed a particular emphasis on the need for long-term time series data which can best be provided by a coherent European network of marine observatories to support monitoring and research. These form a crucial component of the ocean observing system and the end-to-end EMODNET concept, described in the 2008 Marine Board - EuroGOOS vision document.



Left: ISIS Remotely Operated Vehicle (ROV) deployment by NOC.
Centre: Argo float deployment from the Ifremer Pourquoi-Pas ? research vessel.
Right: Surface buoy and full-depth mooring deployment by NOC.

2ND MARINE BOARD FORUM

Programme (16 September 2010, Brussels)

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Session 1 - Marine observatories: the current landscape

Chair: Lars Horn (Marine Board Chair, Research Council of Norway)

Welcome address and introduction of the Vision Statement

Lars Horn (Marine Board Chair, Research Council of Norway)

Peter Haugan (Marine Board Delegate, University of Bergen, Norway)

Opening address - Ocean Observations: the European landscape

Iain Shepherd (EC Directorate-General for Maritime Affairs and Fisheries)

European Open Ocean Observatory Network: FP7 EuroSITES project

Richard Lampitt (National Oceanography Centre, UK)

Ocean Observatories: the US case

Bauke Houtman (National Science Foundation, USA)

From Time-Series to Genomes: Challenges and Opportunities for Marine Research Stations

Michael Thorndyke (Swedish Institute for the Marine Environment / European Network of Marine Stations, MARS)

Observation of Marine Biodiversity: Perspectives and Challenges

Carlo Heip (Royal Netherlands Institute for Sea Research)

Session 2 - Projects and initiatives

Chair: Alan Edwards (EC Directorate-General for Research)

The TENATSO Case: critical results and data applications

Doug Wallace (Leibniz Institute of Marine Sciences, Germany)

The ESONET and EMSO Initiatives: coordinating European Seas Observatories

Roland Person (French Research Institute for Exploration of the Sea)

The Mediterranean Operational Oceanography Network (MOON): ocean observatories in support of science and management

Giovanni Coppini (Istituto Nazionale di Geofisica e Vulcanologia, Italy)

Session 3 - European marine long-term time-series observatories: critical issues

Chair: Edward Hill (Marine Board vice-Chair (National Oceanography Centre, UK))

Towards a network of Marine Observatories in Europe: what elements are missing?

Hans Dahlin (European Global Ocean Observing System, EuroGOOS)

FP7 Euro-Argo Infrastructure Initiative: long-term support for a marine observation infrastructure

Pierre-Yves Le Traon (French Research Institute for Exploration of the Sea)

Interoperability of Marine Observatories in Europe: how to achieve technical and data harmonization?

Kai Soetje (Bundesamt fuer Seeschifffahrt und Hydrographie, Germany)

European Marine Research Infrastructure: EC perspectives

Waddah Saab (EC Directorate-General for Research)

Finalizing the common Statement "Towards a European network of long-term marine Observatories". Presentation and panel discussion

Peter Haugan (University of Bergen, Norway)

Concluding remarks Edward Hill (National Oceanography Centre, UK)

2ND MARINE BOARD FORUM

Introduction

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The 2nd Marine Board Forum, Towards a European Network of Marine Observatories for Monitoring and Research, held in Brussels on 16 September 2010, brought together over 90 scientists and policy makers from 53 organizations to discuss critical gaps and opportunities for the long-term monitoring of Europe's marine environment. The Forum delivered a Vision Statement in support of a sustained and integrated pan-European network of observing systems (see p. 3-4). The key messages from the 2nd Marine Board Forum presentations and discussions are published here as proceedings. All documents and materials from the Forum are available online: www.marineboard.eu/fora/2nd-marine-board-forum

Why are marine observations important?

Understanding and predicting future change in our seas and oceans is fundamental for tackling societal challenges and creating new opportunities and economic growth. There is, therefore, a clear societal need for high resolution environmental datasets from the global ocean and European seas. The marine environment is highly dynamic with processes constantly changing at a variety of temporal and spatial scales. Long-term, high resolution monitoring of environmental variables using multidisciplinary approaches enables ocean processes to be resolved and further understood. In addition, a continuous monitoring system can capture unforeseen 'episodic' ocean events such as storm surges and toxic algal blooms, allowing the impact of these events on ecosystem functioning to be investigated. Ultimately, information on the health of our oceans provides policy makers with the knowledge, evidence and tools to make strategic and longer-term decisions regarding the management and sustainable use of our oceans.

Real-time acquisition of environmental datasets has revolutionized ocean monitoring, offering the possibility for datasets from the coast to the deep ocean to be routinely assimilated into environmental models, increasing the accuracy of model outputs and future predictions. In addition, *in situ* ocean datasets can be

used to validate environmental data from remote platforms such as satellites, leading to enhanced products and services for society and offering a powerful tool for present and future ocean stewardship.

What are marine observatories?

The ocean observing system consists of a variety of complimentary remote and *in situ* sensing platforms including satellites, research vessels, ships of opportunity, marine research stations, mobile platforms such as Argo floats and fixed monitoring buoys. The 2nd Marine Board Forum and the resulting Vision Statement define "marine observatories" as "strategic *in situ* observing capacities which provide long-term time-series data" (see pages 3 and 4). These marine observatories are the backbone of the *in situ* ocean observation system and the environmental data they provide are used to support research, management and the generation of services and products for people and industry. Across Europe, marine observatories contribute to EuroGOOS, the European component of the Global Ocean Observing System, and the resulting environmental datasets contribute to the European Marine Observation and Data Network (EMODNET).



Ocean observing system infrastructure

The need for multidisciplinary, full-depth observations

In Europe, the *in situ* marine observation infrastructure currently consists of a number of fixed (e.g. moorings) and mobile (e.g. ships, floats) platforms. *In situ* marine observatories offer the possibility for simultaneous, near real-time data acquisition at a fixed location on a wide range of variables (from physics to biogeochemistry and from deep-sea biology to geology). It is also widely recognized that *in situ* observatories offer a unique platform to assess deeper ocean layers, resolve fine-scale ocean processes and to validate remote sensing and modeling efforts. Such full-depth, multi-parametric state and rate measurements support research themes including, for example, biogeochemical cycling, ocean-atmosphere interactions, deep water formation, benthic ecology and tsunami warning.

Towards a sustained, integrated European ocean observing system

With a fast evolving European marine policy context, including the Marine Strategy Framework Directive and the European Strategy for Marine and Maritime Research, there is a growing demand for a sustained and integrated European ocean observing system to monitor and sustainably manage European seas and oceans. However, despite this clear rationale, funding for *in situ* ocean observation has been historically fragmented, resulting in a lack of long-term funding commitments for core “up-stream” observatory platforms. Securing sustained funding for such systems is paramount for providing products and services to society, meeting national commitments for ocean governance and driving innovation to increase Europe's global competitiveness.

At the time of the 2nd Marine Board Forum, a number of international initiatives had recognized need for sustained *in situ* marine observations, including for example, the Group on Earth Observation and the OceanObs'09 conference. Across Europe, initiatives such as EMODNET, SeaDataNet and the GMES

Marine Core Service (MCS) project, MyOcean, have been developing portals for societal products, which rely on the sustained supply of marine environmental datasets to underpin the Marine Core Services. Yet there remains no common EU implementation strategy for an integrated Ocean Observing System and a lack of coordination between EU and national investments in ocean observing infrastructures and activities.

Stakeholder representation at the 2nd Marine Board Forum

Many of the existing European infrastructures and ocean observation initiatives were presented at the 2nd Marine Board Forum, including ESONET, TENATSO, EuroSITES and the ESFRI Projects EMSO and EuroARGO. Wider regional and European operational oceanography and infrastructure networks including the MOON and MARS networks also participated. In addition, the Forum attracted international and European funding agencies, policy makers and marine and maritime communities, including presentations by the US National Science Foundation and the European Commission.

2ND MARINE BOARD FORUM

Opening Statements

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Chair: Lars Horn (Marine Board Chair, Research Council of Norway)

Welcome address and introduction of the Vision Statement



Lars Horn (Marine Board Chair) opened the Forum by welcoming speakers and participants. He thanked the Flemish Government Department of Economy, Science and Innovation for providing the venue for the Forum. He drew attention to the

very high attendance (over 90 participants from 53 organizations) which revealed the crucial timing and high priority given by both the science community and policy makers to investigate new avenues of management and governance for the future operation of marine observatories in Europe. Lars Horn stressed the crucial role of observations, data acquisition and monitoring activities in order to gain a better knowledge of European seas and oceans, which is necessary to preserve and maintain human welfare. To reach this objective, he said, Europe requires a coherent network of marine observatories.

“ Stable, long-term marine observations are essential so that we can interact with our marine environment in a sustainable way. ”

Lars Horn (2nd Marine Board Forum)

Lars Horn also highlighted that, unfortunately, the European effort for ocean observation is fragmented, and that there is a real need for a common European framework to provide further integration. He highlighted that this Forum was designed to provide an impetus for scientists, policy makers and industry rep-

resentatives to work together towards achieving the common goal of a coherent network of marine observatories in Europe. Achieving this goal will require support from European and national programmes and policies in the medium and longer-term.

Peter Haugan (University of Bergen, Norway) presented the draft of the Forum Vision Statement. Prior to the Forum, the Marine Board facilitated the initial draft of this Vision Statement liaising with European experts and stakeholders.



“ Solutions for sustaining marine observatories should be based on societal targets and better rely on innovative outputs. ”

Peter Haugan (2nd Marine Board Forum)

2ND MARINE BOARD FORUM

Session 1 - Marine observations: the current landscape

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This session provided an overview of marine observatories with presentations on:

- The current European policy context;
- Case studies from European and US networks; and
- Biodiversity observation as a grand challenge of the 21st century.

Opening address - Ocean Observations: the European landscape



Data are crucial to shape and develop European policies. **Iain Shepherd (European Commission Directorate-General for Maritime Affairs and Fisheries)** emphasized the very high costs associated with data acquisition: € 1.5 billion per year for collecting both *in situ* and satellite data.

collecting both *in situ* and satellite data.

"Data collected through observations can only generate knowledge and innovation if Europe's engineers and scientists are able to find, access, assemble and apply them efficiently and rapidly. At present, this is often not the case."

Maria Damanaki,
European Commissioner for Maritime Affairs and Fisheries

To overcome these financial constraints and to enable access to observations, the European Commission launched, in 2008, the European Marine Observation and Data Network (EMODNET) initiative. EMODNET focuses, through targeted preparatory actions, on

thematic areas including:

- Hydrography (water depth, coastlines, etc.);
- Physics (temperature, currents, waves, etc.);
- Chemistry (concentrations in water, sediments, sea-life, etc.);
- Biology (distribution, abundance and diversity, etc.);
- Geology (sediments, hazards, erosion, etc.);
- Habitats (common classification for European waters, etc.).

Iain Shepherd then presented the recently adopted communication on "Marine Knowledge 2020" (adopted, September 2010) which sets out guidance towards the integration of the different EU initiatives on data (e.g. Data Collection for Fisheries, EMODNET, GMES, INSPIRE).

The overall objectives are to:

1. Reduce operational costs and delays for those who use marine data which can:
 - increase industry competitiveness
 - improve the quality of public decision-making at all levels;
 - strengthen marine scientific research.
2. Increase innovation.
3. Reduce uncertainty through improved knowledge of the oceans.

From 2011 to 2013, EMODNET thematic groups will be set up to assemble data from European data centres. Three regional sea-basin checkpoints - North Sea, Mediterranean Sea and Baltic Sea - will be created to check data layers and compatibility and to define priorities for further observations. Foreseen applications will help private industry to better inform decision making processes at all levels, and to strengthen marine scientific research. To achieve this overarching goal, the European Commission intends to set up an EMODNET Secretariat and thematic advisory committees.

**European Ocean Observatory Network:
FP7 EuroSITES project**



Richard Lampitt (National Oceanography Centre, United Kingdom) presented the EU FP7 EuroSITES project (2008-2011) which has coordinated a network of open ocean observatories as the European component to a global framework

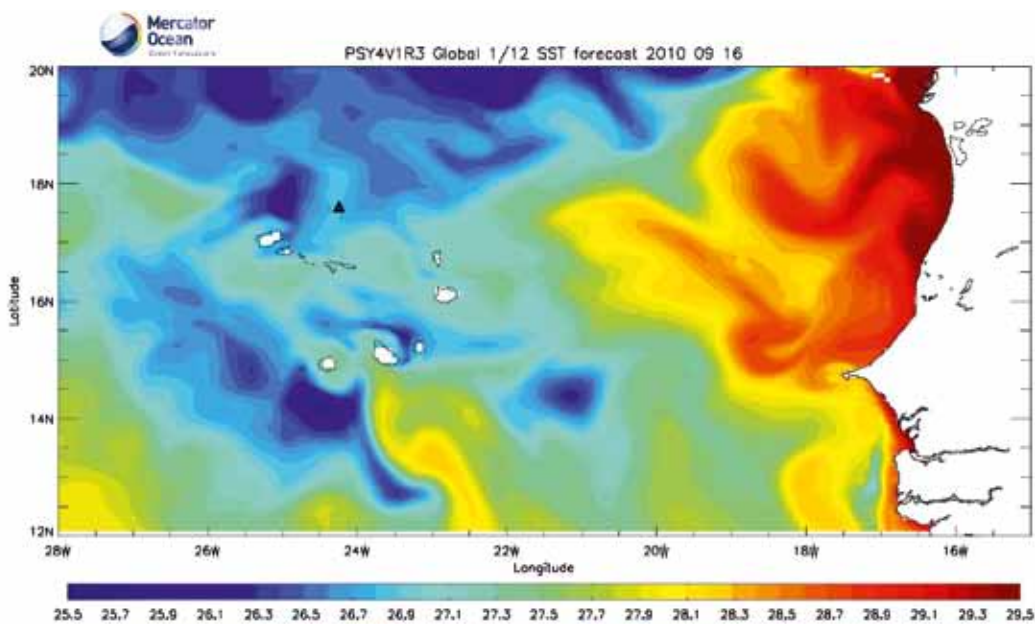
(OceanSITES and GOOS). EuroSITES focuses on the integration and enhancement of Eulerian (fixed-point) observatories in nine open ocean sites located in deep water (>1000 m). EuroSITES has considerably enhanced the European *in situ* ocean observing capacity through research and development activities and the infrastructure has matured towards a pre-operational network. However, funding for such sustained observations is still based on research project time-scales, leaving their future sustainability in question..

“Sustaining continuous multidisciplinary observations at appropriate temporal resolution is of crucial importance for understanding and monitoring the marine system and, as a whole, planet Earth.”

Richard Lampitt (2nd Marine Board Forum)

Networking activities are an important component of EuroSITES as they considerably improve the project's operations and synergies with relevant ocean and meteorology initiatives, specifically with:

- shelf networks (e.g. the UK Met Office ODAS buoy array, Western Shelf Observatory);
- other EU projects (e.g. ESONET, EMSO, CARBOOCEAN);
- international ocean observation initiatives (e.g. OOI, NEPTUNE Canada).



Sea surface temperature in the subtropical North Atlantic for the 16 September 2010 provided by the global 1/12° system operated by Mercator Océan. This system assimilates *in situ* ocean observations such as data from the TENATSO ocean mooring (black triangle) which is part of EuroSITES network.

To avoid duplication and fragmentation of the research effort in Europe in relation to marine data and observation, Richard Lampitt called for a synergistic approach with interested stakeholders in order to create and coordinate a European sustained network from the lower atmosphere to the seafloor (e.g. in coordination with the ESONET/EMSO). In analysing processes, from data collection to information, Richard Lampitt specified that:

- Real-time telemetry is the best means to facilitate the transmission, secure storage and treatment of multidisciplinary data. The information produced (e.g. meteorology, seismic predictions) supports numerous societal services;
- Current data management processes guarantee data availability in international formats;
- Final datasets are used to perform calibration and inter-calibration (e.g. with sensors) and contribute to marine platforms which provide downstream services including ocean circulation (e.g. My-Ocean).

Ocean Observatories: the US case

Bauke Houtman (National Science Foundation, United States of America) presented the US Integrated and Sustained Ocean and Coastal Observing and Prediction System (IOOS) which:



- is a collaborative, regional-based framework operated by a cross-sectoral partnership (private, academic, state);
- is a network of many different land-, water-, air-, and space-based facilities and technologies (platforms, instruments and sensors, telecommunications systems, computer systems);
- contributes to the Global Ocean Observing System (GOOS);
- delivers a new observing capability (multi-platform, multi-use);

- delivers numerous benefits (e.g. protection of coastal communities, safe and efficient navigation, ecological management, public utilities, support to the energy sector etc.).

"We need to be proactive rather than reactive in designing and implementing a network of observatories. Securing long-term funding commitments is the key to success."

Bauke Houtman (2nd Marine Board Forum)

IOOS's future plans are to improve technically the network of observatories, to strengthen the partnership and to develop new tools for informing decision-making processes at the coastal level.

Bauke Houtman then presented the Ocean Observatories Initiative (OOI), which is both a distributed (i.e. with different single site observatories) and virtual (i.e. system of systems via supporting e-infrastructure) observing system. OOI will monitor air-sea, water column and seafloor processes at different depths and at key locations across the global ocean. Its operational design and configuration have been shaped by specific scientific requirements and have necessitated a long negotiation process for targeting site locations (global-regional-coastal, each with different mobile assets and specialized sensors) and securing long-term funding commitments. The construction phase will be complete by 2015. The final e-infrastructure will constitute an interactive ocean laboratory, integrated by leading-edge and multi-scalar software tools. As an example of a key single-site observatory, Bauke Houtman presented the Monterey Accelerated Research System (MARS), which is a single "science node" in California with eight ports, each equipped with an underwater connector to a specific observatory (e.g. CO₂ experiments, seismic).

From Time Series to Genomes: Challenges and Opportunities for Marine Research Stations



Michael Thorndyke
(Swedish Institute
for the Marine Envi-
ronment / European
Network of Marine
Research Institutes
and Stations, MARS)

presented the case for
marine research stations
as an essential component

of the observing system, in particular for biological observations. Often defined as the “original multidisciplinary laboratories and science parks”, marine research stations are unique and essential infrastructures (in partnership with vessels, satellites and remote systems) to carry out marine research from molecular to ecosystem levels.

Mike Thorndyke outlined the strong added value of marine stations in providing access to:

- Marine ecosystems including valuable (and often historical) time-series data;
- Marine models for biomedicine, eco-toxicology, biodiversity, gene discovery; and
- Logistics for *ex-situ* experiments, e.g. modern equipment for marine biology research.

Marine Research Stations also act as nodes for interdisciplinary research and integrating activities between social and natural science research and education.

“ Marine research stations are ... at the core of many environmental studies, crucial to address the Grand Challenges of the 21st Century. ”

Mike Thorndyke (2nd Marine Board Forum)

Mike Thorndyke then described the European Network of Marine Research Institutes and Stations, MARS, which includes the BIOMARE sites (which will provide

the marine information to the LIFEWATCH ESFRI project) and the MARS sites. On a global scale, the World Association of Marine Stations (WAMS) is being consolidated. WAMS will promote the development of joint research activities, the organization of training and education schemes and the harmonization of techniques and methods.

Observation of Marine Biodiversity: Perspectives and Challenges

Carlo Heip (Royal
Netherlands Institute
for Sea Research,
Netherlands)

began by defining biodiversity as the term given to the variety of life on Earth and the natural patterns it forms. The multi-disciplinary research which underpins the conservation

and protection of marine biodiversity is, therefore, of critical importance to safeguard the services and benefits provided by marine ecosystems to human societies. Carlo Heip explained that marine biodiversity is an essential descriptor and an indicator of change in the state of marine ecosystems, and he noted that over 31,000 species are included on the European register of marine species. However, he stated that changes in biodiversity and ecosystem state are mostly unpredictable. Appropriate detection, monitoring and management therefore requires surveillance at the right spatial and temporal scales.

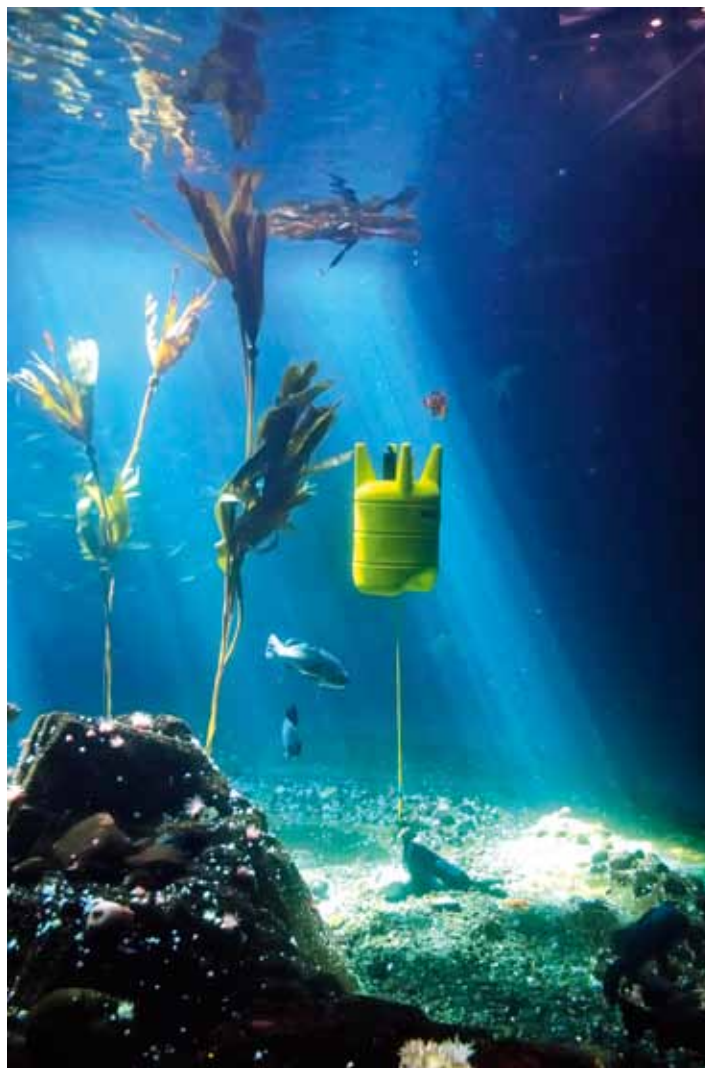
“ Marine Biodiversity research is multidisciplinary in essence: we should ease the cross-fertilization of disciplines and combine research efforts to deliver real-time and integrated biological information for the protection of biodiversity and the sustainable management of marine ecosystems. ”

Carlo Heip (2nd Marine Board Forum)



Carlo Heip described important goals for marine biodiversity research in the future:

- Identify and develop adequate descriptors and indicators of marine biodiversity change;
- Investigate microbial and genetic diversity through new techniques and based on results from previous initiatives (e.g. CoML);
- Monitor changes in biodiversity with adequate technologies (CPR, ferrybox systems, stock assessments, animal tagging, telemetry etc.) in space (e.g. ecosystem, basin, and Large Marine Ecosystem level) and time (decadal);
- Base surveys on international standards and quality-assurance methods and protocols (e.g. habitat mapping);
- Provide free and easy access to data and e-infrastructures;
- Create an adequate legal framework to promote and profile marine biodiversity in strategic research agendas.



Ocean observation by the Pacific Ocean Shelf Tracking Programme

2ND MARINE BOARD FORUM

Session 2 – Projects and initiatives

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Chair: Alan Edwards (European Commission Directorate-General for Research)

This session included presentations on key European ocean observation projects and initiatives, producing time-series of global scientific importance. These included localized projects that form part of a wider European effort (e.g. TENATSO as part of EuroSITES), regional networks (e.g. MOON) and topic-focused European Framework projects (e.g. Fixed-point ocean observatory infrastructure initiatives, ESONET and EMSO).



Alan Edwards (European Commission, Directorate-General for Research) introduced this session by reminding the audience that despite the significant contribution of EU projects towards improving observational capacities, the lack of long-term

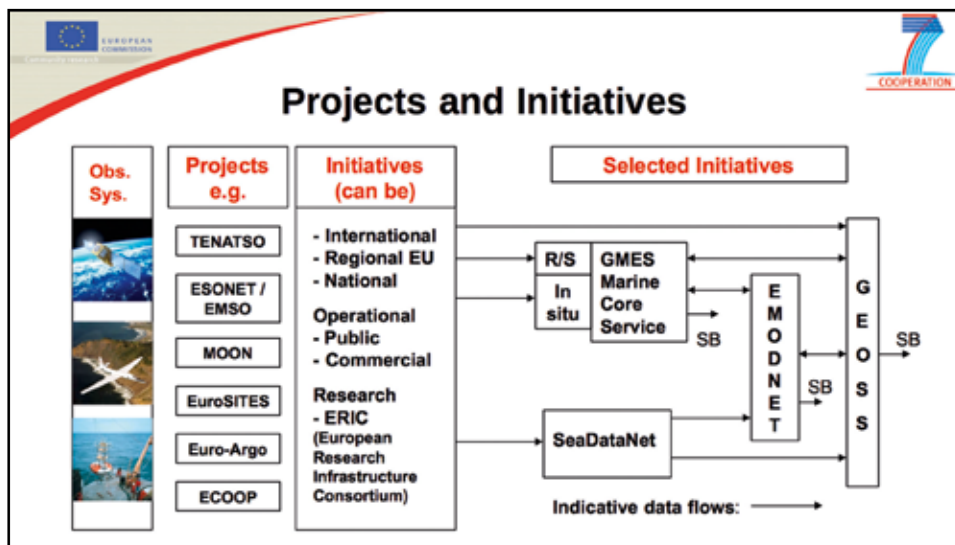
financial commitments would continue to impede the strategic planning of a sustainable global observing system. Such a global observing system should:

- Support societal benefits such as job creation, innovation and economic growth; and
- Improve environmental knowledge.

“National governments and the marine research community should work in close cooperation in order to design new models of governance and funding opportunities for the sustainable management and operation of marine observatories in Europe.”

Alan Edwards (2nd Marine Board Forum)

Alan Edwards noted that the current economic situation has negatively impacted on major investments in the long-term management of marine observatories, with the limited duration of EU initiatives being compounded by a decrease in national contributions. He



European ocean observation projects and initiatives presented by the A. Edwards (EC DG RTD) at the 2nd Marine Board Forum

stressed the urgent need for stakeholders to find alternative funding solutions to sustain the European observational capacity. Another major impediment is the timing mismatch in the programming of complementary initiatives which hampers the development of synergies between them.

The Tropical Eastern North Atlantic Time-Series Observatory (TENATSO) Case: critical results and data applications



Doug Wallace (Leibniz Institute of Marine Sciences, IFM-GEOMAR, Germany) presented TENATSO, a multidisciplinary observatory based off the Cape Verde islands, embedded within European (EuroSITES) and international (OceanSITES)

programmes and GEOSS. TENATSO is composed of an atmospheric and an ocean observatory, both of which are regular stations for international research campaigns and surveys. The goals of the TENATSO are to:

- support long-term observations of atmospheric and oceanic conditions relevant to global change in the tropical Eastern North Atlantic region;
- promote access to scientific resources (data / logistics / campaign support) at the international level;
- act as an integrated observatory from the water column to the lower atmosphere.

“The unique TENATSO location and the multidisciplinary observational capacities it provides are of key importance for the consolidation of European scientific knowledge and the implementation of regional management policies.”

Doug Wallace (2nd Marine Board Forum)

The main functions of TENATSO are to:

- deliver long-term time-series data on key parameters;
- provide facilities for unique experiments (e.g. glider fleet test case, Aeolian particle flux and dissolution).

Doug Wallace highlighted the crucial role of the EU in raising the strategic positioning of TENATSO within the EU research framework. He emphasized that the test site provides the opportunity to assess several scientific parameters and trends (e.g. storms, dust, and dissolved oxygen) of critical importance to inform European forecasts and regional management policies. TENATSO's added value is to combine different operations which allow event-based experimentation in the context of time-series studies (e.g. effects of dust input on ocean biogeochemistry). It seems, therefore, of paramount importance to maintain long-term scientific interests in this strategic area and to improve capacity building (infrastructure, training, etc.) in this region.

The ESONET and EMSO Initiatives: coordinating European Seas Observatories

Roland Person (French Research Institute for Exploration of the Sea, Ifremer, France) started

by highlighting that marine observatories are of the utmost importance as they contribute to unravelling the complexity of planet Earth, and to assessing and monitoring interactions between atmosphere, ocean and earth processes.



“ There is a real need to better exploit the results, to consolidate a truly integrated knowledge on deep-sea environments and to foster synergies between similar regional initiatives. ”

Roland Person (2nd Marine Board Forum)

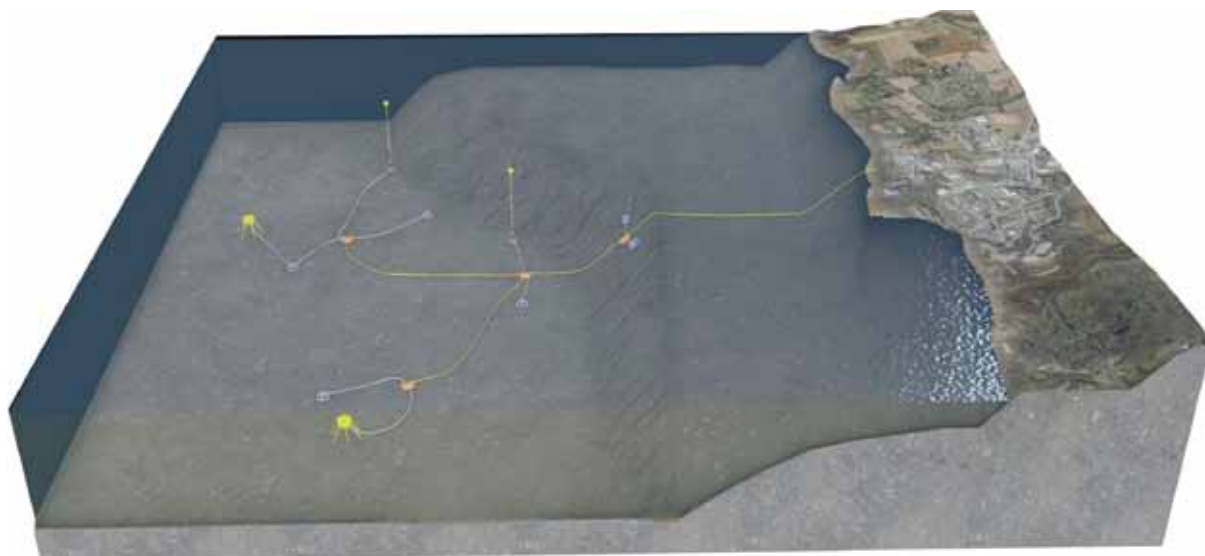
Roland Person presented EMSO, an EU FP7 Capacities project in support of the EMSO ESFRI Research Infrastructure roadmap. EMSO has been built on the progress of the EU FP6 ESONET coordination action and network of excellence project on deep-sea observatories. He described EMSO as a European-scale network of seafloor observatories, constituting a widely distributed infrastructure for long-term monitoring of environmental processes related to ecosystem structure and function, global changes and geo-hazards. The EMSO Preparatory Phase aims to design and create the entities in charge of managing the infrastructure with respect to:

- governance and legal issues (ERIC framework);
- synergies and integration at different levels (e.g. ESONET results into GEOSS).

Roland Person summarized the key objectives and findings of ESONET which have generated important steps towards achieving:

- regional integration;
- technological developments (sensors);
- revision of scientific objectives;
- standardization (ESONET label for data quality control, access etc.) and interoperability;
- novel governance and implementation strategies.

The ESONET Deep-Sea observatories (combined moorings with satellite communications and *in situ* moored and cabled observatories) are currently operating in ten critical European areas (e.g. for seismic activity) and demonstration missions have been conducted to advance cutting edge ocean science and technology. Roland Person concluded that ESONET and EMSO are contributing to the goal of sustaining observations on the seabed at a sufficiently high frequency to explore the changing properties of the oceanic environment.



Schematic of cabled observatory infrastructures

The Mediterranean Operational Oceanography Network (MOON): ocean observatories in support of science and management



Giovanni Coppini (Istituto Nazionale di Geofisica e Vulcanologia, Italy) summarized

operational oceanography activities in the Mediterranean Sea which started in 1995. Such activities form the basis for the current initiatives which contribute

to the Mediterranean Operational Oceanography Network (MOON), the coordinating body of the EuroGOOS Mediterranean Task Team. MOON acts as a real-time observing and modeling system and produces specific end-user applications, particularly regional downstream services for the MyOcean project. Data acquisition and collection operations are taking place across the Mediterranean Sea and MOON is focusing on specific geographical areas where gaps still exist.

“Operational tools as observing networks provide great opportunities for developing technical synergies and fostering regional integration, such as in the Mediterranean Sea.”

Giovanni Coppini (2nd Marine Board Forum)

Giovanni Coppini outlined the concept of “cyber-infrastructure” (or e-infrastructure) which is currently being developed by MOON. This virtual platform aims to act as a catalyst for the development of operational oceanography in providing more information, applications and targeted services in response to increased end-user needs (e.g. monitoring and forecasting the ocean from different components and for different perspectives). MOON also aims to promote and support the transfer of operational oceanography expertise to North African countries through the provision of training and education.



Participants at the 2nd Marine Board Forum, 16 September 2010, Brussels.

Session 3 – European Marine Long-term Time-series Observatories: critical issues

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Chair: Edward Hill (National Oceanography Centre, United Kingdom)

Session 3 focused on issues of critical importance for the future design, management and implementation of marine observatories in Europe; and more specifically on:

- a global assessment of the current European observing capacity;
- options for the sustainability and necessary growth of the system, both in terms of management and governance;
- Interoperability challenges and steps towards data harmonization; and
- New programmatic avenues for the creation and development of marine research infrastructures in an EU policy context.

Towards a network of Marine Observatories in Europe: what elements are missing?



Hans Dahlin (European Global Ocean Observing System, EuroGOOS) started with a historical perspective. Founded in 1994, EuroGOOS has strived to maintain momentum in building up the different operational steps and tools (e.g. Regional Operational

Oceanographic Systems) to sustain a European observing system. Indeed, the regional "ROOSes" which make up EuroGOOS coordinate, optimize and facilitate exchange of data to service marine and maritime users, from ecosystem assessment to flood protection and shipping.

"To improve Europe's observational capacity, we should use and coordinate the existing expertise more effectively through the consolidation of networks of marine research infrastructures such as ocean observatories."

Hans Dahlin (2nd Marine Board Forum)

In this global context, Hans Dahlin noted that the European observational capacity is rapidly evolving with the coordinated use of different tools from Argo-floats in the high seas to ferrybox systems in regional seas. Operational oceanography supports societal needs through the production and delivery of referenced data (space, time and variable criteria) for direct use. While there is a huge demand for data and information, such requirements are costly and imply effective and timely data acquisition processes, but are justified given the societal benefits which accrue.

FP7 Euro-Argo Infrastructure Initiative: long-term support for a marine observation infrastructure

Pierre-Yves Le Traon (French Research Institute for Exploration of the Sea, Ifremer, France) introduced Argo



as the first global real time *in-situ* ocean observing system (3000 floats measuring temperature and salinity to a depth of 2000m around the world) resulting from a truly international effort by 30 countries. In providing the European contribution to the global ocean observing system, the Euro-Argo infrastructure:

- requires strong and dynamic international and European cooperation;
- covers 25% of the global array with specific regional enhancements;
- provides 15% of the global Argo funding.

According to Pierre-Yves Le Traon, the main challenge for Euro-Argo over the coming decades is to maintain the size of the array, essential for performing ocean and climate research (e.g. monitoring heat and salt transport and storage) and operational oceanography (e.g. GMES Marine Core Service). In addition, new research avenues are being profiled (e.g. in biogeochemistry) by making full use of emerging technologies adapted to Argo.

“Europe should play a leading role in sustaining a global ocean observing system. Member States and EC initiatives should be better organized and coordinated in order to improve efficiency in all implementation aspects of the system.”

Pierre-Yves Le Traon (2nd Marine Board Forum)

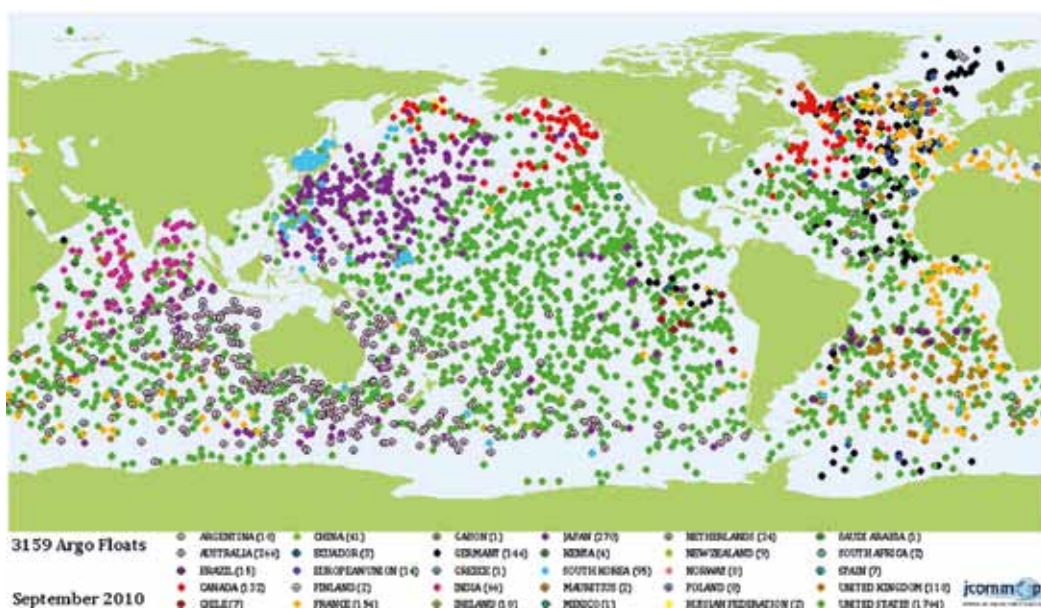
The EU FP7 Euro-Argo Integrated Infrastructure Initiative started in 2008. 15 partners from 12 countries were involved in the preparation phase aiming at positioning the marine infrastructure in the ESFRI Road-map. Major steps are to:

- Design a work plan to deploy, maintain and operate a European array of 800 floats (250 floats deployed per annum worldwide);

- Provide a world-class service to the research (climate) and operational oceanography (GMES Marine Core Service) communities.
- Set the foundations for the future development of a permanent organization (governance and legal structure) and describe the work needed to ensure Europe’s technological leadership and long-term commitment (e.g. consolidation of partnerships with GMES, EC, EEA etc.) in this global initiative.

The Euro-Argo Research Infrastructure (RI) will comprise:

- A central facility (C-RI) which will act as a European legal entity (Euro-Argo ERIC, to be implemented in 2011).
- Distributed national facilities (as of today but with coordination via the C-RI); and,
- Floats to be procured through the C-RI and through national facilities.



The global coverage of Argo Floats in September 2010

Interoperability of Marine Observatories in Europe: how to achieve technical and data harmonization?



Kai Soetje (Bundesamt für Seeschifffahrt und Hydrographie, BSH, Germany) highlighted the lack of standardization and common approaches between research and data management processes which may impede the support of

end-user needs. The international and European data management landscape is highly complex. Efforts are still required to improve the harmonization of programmes, the standardization of project outputs, and the clarification of the positioning and responsibilities of the different data providers and organizations. The INSPIRE Directive is designed to address these issues. The optimum approach would be to link all data centres in one overarching European marine data centre using common data management standards and methodologies. In the interim, the research community and data managers should make the best use of the existing initiatives (EMODNET, MyOcean, SeaDataNet, ROOSes, INSPIRE, etc.) to consolidate the operational network.

“Real centralization and concentration of multidisciplinary research efforts for data harmonization and standardization is still a dream. It is crucial that the different research communities work together towards that goal by consolidating the existing networks already in place.”

Kai Soetje (2nd Marine Board Forum)

European Marine Research Infrastructure: EC perspectives

Waddah Saab (European Commission Directorate-General for Research) provided an EC perspective on marine research infrastructures. The European marine policy context is very diverse (e.g. The Marine Strategy Framework Directive and the European Strategy for Marine and Maritime Research), fast evolving, and influences the design and the management of marine Research infrastructures at the pan-European (ESFRI roadmap, GMES) and global (GEOSS, GOOS) levels. Marine research infrastructures represent a crucial component in structuring and shaping the European Research Area (ERA) and in supporting the European Integrated Maritime Policy objectives. Drivers such as climate change underline the urgent necessity to build up and/or to renew marine research infrastructures for both conducting research and supporting policy needs.



“New marine research infrastructures are needed to observe and understand the impact of human activities and climate change on the marine environment: the JPI Oceans provides the right opportunity to develop synergies at the regional scale and to develop an adaptive framework to sustain and coordinate a European Ocean Observing System.”

Waddah Saab (2nd Marine Board Forum)

Waddah Saab explained that there is an absolute requirement to develop marine research in order to improve our capacity to better observe and assess the pace of marine environmental change. EMODNET is, therefore, of crucial importance in facilitating the exchange of multidisciplinary data and in generating an integrated knowledge necessary to inform cross-cutting policy needs and to respond to societal challenges. Building a new marine infrastructure is generally very expensive and new management systems and governance mechanisms must, therefore, be developed to optimise the design, operation and maintenance of future marine research infrastructures. From Waddah Saab's point of view, an overarching

pan-European initiative such as the JPI Oceans may be best placed to develop long-term strategies and innovative mechanisms (e.g. maximise impacts of investments in marine research infrastructures between the Member States and the European Commission).

He finished by highlighting the following needs:

- Shift from project-based to long-term and sustained observations;
- Better coordinate projects and initiatives to ensure that they converge towards policy and societal needs;
- Optimise the EU contribution to global initiatives.

Discussion and Recommendations

Finalizing the common Vision Statement: Presentation and panel discussion



Peter Haugan (University of Bergen, UiB, Norway) concluded that the presentations delivered during the Forum provided a broad overview of the existing management and policy challenges and opportunities linked to the current status of marine observatories in Europe. Subsequent discussions allowed the draft of the proposed Vision Statement to be improved (see p. 3-4).

Peter Haugan thanked the participants for their fruitful contributions. The Vision Statement would be used to voice a strong and urgent message from the scientific community to a broad range of marine and maritime stakeholders, including national and European programme managers and policy makers.

Major stakeholders at the 2nd Marine Board Forum called for:

“ a long-term, stable and integrated network of strategic marine observatories ... providing consistent in situ data from the seas and oceans ... as a driver for smart, sustainable and inclusive growth in Europe ”

Extract from 2nd Marine Board Forum Vision Statement



2nd Marine Board Forum panel discussion: Finalizing the common Statement "Towards a European Network of Long-term Marine Observatories". From right to left: Peter Haugan (presenter; University of Bergen, Norway), Niall McDonough (Marine Board Executive Secretary), Alan Edwards (EC DG Research), Lars Horn (Marine Board Chair, Research Council of Norway) and Edward Hill (National Oceanography Centre, United Kingdom).



Participants during the open-floor discussion at the 2nd Marine Board Forum

Adoption of the Forum Vision statement and concluding remarks

As a conclusion to the 2nd Marine Board Forum, the participants approved and adopted the proposed Marine Board Vision Statement (see p. 3-4).



Edward Hill (National Oceanography Centre, United Kingdom)

highlighted the pivotal importance of the Forum and Vision Statement message in shaping and designing national and European Strategic Research Agendas, in

support of scientific and societal needs.

“Despite the current economic context, it is now time for the marine research community and associated stakeholders to build up the future of European marine observatories, to better focus on what is really important, to do more and better for less money and in a shorter period of time.”

Edward Hill (2nd Marine Board Forum)

- From an operational perspective: foster research efforts in terms of interoperability, technological performance, innovation and access, and act towards an improved integration of the different systems, networks and observatories at the regional and local levels;
- From a policy and societal perspective: be aligned with specific requirements and demands and provide *à la carte* and timely marine information and specialized data.

The 3rd Marine Board Forum Vision Statement was subsequently presented at the high-level EurOCEAN 2010 conference organized as a Belgian EU Presidency event on 12-13 October 2010, Ostend.

The high number of participants and a large stakeholder representation at the Forum testified to the urgent need to collectively develop the practical and innovative solutions necessary for sustaining and developing marine observatories throughout Europe.

The Forum pinpointed critical elements which need to be brought forward by the marine and maritime research communities to advance the creation of a European integrated Ocean Observing System.

ANNEXES

26

Annex I: 2nd Marine Board Forum Organization

Forum Programme Committee

Marine Board Executive Committee 2010:

Lars Horn (Chair)
Antoine Dosdat (vice-Chair)
Edward Hill (vice-Chair)
Jan Mees (vice-Chair)
Beatriz Morales-Nin (vice-Chair)
Geoffrey O'Sullivan (vice-Chair)
Çolpan Polat-Beken (vice-Chair)
Niall McDonough (Executive Scientific Secretary)

Forum Organization

Marine Board Secretariat 2010:
Aurélien Carbonnière (Science Officer)
Dina Eparkhina (Administration & Coordination Officer)
Jan-Bart Calewaert (Science Officer)
Maud Evrard (Science Officer)
Niall McDonough (Executive Scientific Secretary)

The Marine Board gratefully acknowledges the support of the Flemish Government in providing the Auditorium Maria Baers, Martellarspein 7, Brussels, as a venue for the 2nd Marine Board Forum.

Forum material and presentations

Available at:
www.marineboard.eu/fora/2nd-marine-board-forum

Expert contributions to the draft Statement:

Peter Haugan, University of Bergen, Norway
Kostas Nittis, Hellenic Centre for Marine Research, Greece

Proceedings prepared and edited by the Marine Board Secretariat:

Kate Larkin (Science Officer)
Aurélien Carbonnière (Science Officer)
Dina Eparkhina (Administration & Coordination Officer)
Jan-Bart Calewaert (Science Officer)
Maud Evrard (Science Officer)
Niall McDonough (Executive Scientific Secretary)

Image credits

Cover page (Top right to bottom right):
1. H.M.S. Challenger (online open source). 2. Autosub Autonomous Underwater Vehicle (NOC) 3. Sub-surface mooring schematic (Pacific Ocean Shelf Tracking Program/Vancouver Aquarium, 2009)
Cover page (bottom left): Surface buoy (EuroSITES - ULPGC/ICCM)
p. 6. NOC (left); Ifremer - 2009, Mamaca/Dugorny (centre); EuroSITES/NOC (right)
p. 8. OceanSITES
p. 12. Mercator-Océan / EuroSITES
p. 15. Pacific Ocean Shelf Tracking Program/Vancouver Aquarium, 2009
p. 16. A. Edwards, European Commission, DG Research and Innovation, Directorate I - Environment (DG Research at the time of the 2nd Marine Board Forum)
p. 18. Ifremer / Chloe Production company
p. 21. JCOMM / ARGO
All other photos: Marine Board



Marine Board Delegates and Secretariat at the Autumn 2010 Marine Board Plenary meeting (14 October 2010)

Annex II: Glossary of acronyms

BIOMARE

Implementation and networking of large-scale, long-term MARine BIOdiversity research in Europe

www.biomareweb.org

CFP

Common Fisheries Policy

http://ec.europa.eu/fisheries/cfp/index_en.htm

CoML

Census of Marine Life

International initiative to assess and explain the diversity, distribution, and abundance of life in the oceans; 2000-2010.

www.coml.org/

CP

Collaborative Project

CSA

Coordination and Support Action

FP funding schemes.

http://cordis.europa.eu/home_en.html

DCF

Data Collection Framework

The DCF is a European Community framework for data collection, management and use in the fisheries sector and support for scientific advice regarding the Common Fisheries Policy (CFP). Under this framework, the European Commission requires Member States to collect data on biological and economic aspects of many European fisheries and fisheries-related sectors.

<https://datacollection.jrc.ec.europa.eu/home>

DG ENTR

Directorate General for Enterprise and Industry

EC Directorate hosting the **GMES** Bureau (among other responsibilities.)

<http://ec.europa.eu/enterprise>

DG ENV

Directorate General for Environment

EC Directorate responsible for **MSFD** (among other responsibilities.)

<http://ec.europa.eu/dgs/environment>

DG MARE

Directorate General for Maritime Affairs and Fisheries (EU)

EC Directorate leading the **EMODNET** initiative (among other responsibilities.)

<http://ec.europa.eu/dgs/maritimeaffairs>

DG RTD

Directorate General for Research

European Commission Directorate responsible for managing the implementation of the EU Framework Programme for research and technology development. This includes responsibility for strategy and support for marine research infrastructures.

<http://ec.europa.eu/research>

EC

European Commission

http://ec.europa.eu/index_en.htm

EBONE

European Biodiversity Observation Network

FP7 CP; 2008-2012. EBONE is a European (FP7) contribution on terrestrial monitoring to GEO BON, the Group on Earth Observations Biodiversity Observation Network.

www.ebone.wur.nl/UK/

EDIOS**European Directory of the Ocean-observing System**

www.edios.org/

E-Infrastructure

E-infrastructures are **ICT**-based infrastructures and services across a broad range of user disciplines, providing an easy and controlled online access to facilities, resources and collaboration tools, bringing to them the power of ICT for computing, connectivity, storage and instrumentation. This allows for instant access to data and remote instruments, “*in silico*” experimentation, as well as the setup of virtual research communities (i.e. research collaborations formed across geographical, disciplinary and organizational boundaries). E-Infrastructures foster the emergence of e-Science, enabling the circulation of knowledge in Europe online and therefore constitute an essential building block for the European Research Area (ERA). http://europa.eu/legislation_summaries/information_society/si0006_en.htm

EMBRC**European Marine Biological Research Centre**

ESFRI Preparatory Phase project; 2011-2014.
www.embrc.eu/

EMECO**European Marine Ecosystem Observatory**

EMECO is a consortium of European Marine Institutes that aim to integrate marine environmental monitoring, ecosystem modeling and coastal and ocean research. www.emecogroup.org/

EMMRS**European Marine and Maritime Research Strategy**

http://europa.eu/legislation_summaries/research_innovation/research_in_support_of_other_policies/ri0008_en.htm

EMODNET**European Marine Observation and Data Network**

The primary objective of the European Commission EMODNET initiative is to improve availability of high quality data through the development of standards across and within scientific disciplines and the creation of thematic portals for data and product discovery. The EMODNET prototype is being tested through preparatory actions. Thematic groups are assembling existing data from different sources, making these data available in thematic portals (e.g. hydrography, geology, biology, chemistry, physics). DG MARE lead an EMODNET expert group **MODEG** (Marine Observation and Data Expert Group). http://ec.europa.eu/maritimeaffairs/emodnet_en.html#1
<https://webgate.ec.europa.eu/maritimeforum/node/1451>

EMSO**European Multidisciplinary Seafloor Observation**

SFRI Preparatory Phase project; 2008-2012.
www.emso-eu.org

ERIC**European Research Infrastructure Consortium**

ERIC is a Community legal framework for creating coordinated research infrastructures between EU countries. This recently developed legal instrument is designed to facilitate the joint establishment and operation of research facilities of European interest. http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=eric

ERA**European Research Area**

http://ec.europa.eu/research/era/index_en.htm

ESFRI**European Strategy Forum on Research Infrastructures**

EC strategic instrument.

http://ec.europa.eu/research/infrastructures/index_en.cfm?pg=esfri

ESONET**European Seas Observatory Network**

FP6 NoE 2007-2011. Also see **EMSO**.

www.esonet-noe.org/

EU**European Union****Euro-Argo****Global Ocean Observing Infrastructure**

FP7 2008-2011. The Euro-Argo array is the European component of a world-wide *Argo in situ* global ocean observing system, based on autonomous profiling floats.

www.euro-argo.eu/

EuroGOOS**European Global Ocean Observing System**

EuroGOOS is an association of national governmental agencies and research organizations, founded in 1994, committed to European-scale operational oceanography within the context of the intergovernmental Global Ocean Observing System (GOOS).

www.eurogoos.org/

EuroOcean**Marine information webportal**

www.euroocean.org/

EuroOCEAN**High-level Marine Science Policy conference series**

EuroOCEAN conferences provide a forum for policy makers and strategic planners, both at European and Member State level, to interact and exchange with the marine research community and marine and maritime stakeholders.

www.eurooceanconferences.eu/

EuroSITES**European Open Ocean Observatory Network**

FP7 CP 2008-2011

www.eurosites.info

FP**EU Research Framework Programme**

<http://cordis.europa.eu/research/fp7/>

GEO**Group on Earth Observation**

GEO is a voluntary partnership of governments and international organizations providing a framework within which these partners can develop new projects and coordinate their strategies and investments for earth observation. GEO is coordinating efforts to build a Global Earth Observation System of Systems, or **GEOSS**. The GEO Work Plan 2009-2011 has a cross-cutting task 'Advocating for Sustained Observing Systems'.

www.earthobservations.org/index.shtml

GEOSS**Global Earth Observation System of Systems**

This emerging public infrastructure is interconnecting a diverse and growing array of instruments and systems for monitoring and forecasting changes in the global environment. This "system of systems" supports policy makers, resource managers, science researchers and many other experts and decision-makers. GEOSS aims to:

- Acquire observational data from many different Earth observation platforms, promoting interoperability and harmonization of different systems (e.g. Europe's Global Monitoring for Environment and Security (GMES) initiative), aiming to process data into useful environmental information products for the benefit of societies;
- Address exchange, dissemination and archiving of shared data, metadata and products;
- Strengthen ongoing Earth Observation research, capacity building and outreach;
- Establish and maintain certain sites for global *in situ* and remote-sensing networks that cannot always be justified on national grounds alone, in cooperation with relevant global research programmes and activities.

www.earthobservations.org/geoss.shtml

European Contributions to GEOSS:

The goals of the GEO initiative are highly relevant to EU policies in the areas of environment, sustainable development, research and external relations, which call for a strong European knowledge-based economy. Europe supports this initiative and the implementation of GEOSS, through targeted research activities (e.g. FP7 EuroGEOSS and EBONE projects), EU major programmes (e.g. GMES) and policies (e.g. EU INSPIRE Directive).

www.eurogeoss.eu/

GES

Good Environmental Status

Core objective of the EU Marine Strategy Framework Directive which aims to achieve good environmental status in all EU marine waters by 2020. See **MSFD**.

GMES

Global Monitoring for Environment and Security

GMES is a European Programme for the establishment of a European capacity for Earth Observation. GMES provides the environmental

information necessary to monitor global change, the role played by human activities and how such changes will influence our daily lives. Policy makers and public authorities, the major users of GMES, will use the information to inform the development of environmental legislation and policies with a particular focus on climate change, and to monitor their implementation and assess their effects. GMES services also address emergency response (e.g. in case of natural disaster, technological accidents or humanitarian crises) and security-related issues (e.g. maritime surveillance, border control). Users will be provided with information through services dedicated to a systematic monitoring and forecasting of the state of the Earth's subsystems.

Today, GMES services consist of five main services, of which the GMES Marine Core Service is currently provided by the FP7 EU-funded project **MyOcean**.

www.gmes.info/

GISC

GMES *in situ* coordination

P7 2010-2012. Coordinated by the European Environment Agency. The project involves an assessment of existing capability for *in situ* ocean observing platforms to develop recommendations for future GMES *in-situ* management.

<http://gisc.ew.eea.europa.eu/>

GOOS

Global Ocean Observing System

www.ioc-goos.org

I3

Integrated Infrastructure Initiative

EC Funding scheme within the CAPACITIES sub-programme of FP7.

<http://cordis.europa.eu/infrastructures/i3.htm>

ICT

Information and Communication technologies

<http://cordis.europa.eu/fp7/ict/>

IMO**International Maritime Organization**www.imo.org**INSPIRE****Infrastructure for Spatial Information in Europe (INSPIRE Directive)**

The INSPIRE directive came into force on 15 May 2007. It will be implemented in various stages, with full implementation required by 2019. The Directive will enable the sharing of environmental spatial information among public sector organizations to better facilitate public access to spatial information across Europe. A European spatial data Infrastructure will assist in policy making across national boundaries and across a broad range of topical and technical themes. INSPIRE thus forms part of the European contribution to the GEOSS. <http://inspire.jrc.ec.europa.eu/index.cfm>

IOC**Intergovernmental Oceanographic Commission**<http://ioc-unesco.org/>**IOOS****Integrated Ocean Observing System**<http://ioos.gov/>**JPI Oceans****Joint Programming Initiative on *Healthy and Productive Seas and Oceans***

JPI Oceans is being developed as a coordinating and integrating long-term platform open to all EU Member States and Associated Countries who invest in marine and maritime research. In bringing together the interested Member States and Associated Countries, the JPI Oceans aims to add value by:

- avoiding fragmentation and unnecessary duplication;
- planning common and flexible initiatives;
- facilitating cooperation and foresighting;
- establishing efficient mechanisms for interaction and knowledge transfer between the scientific community, industry and services, as well as policy makers at high level to more effectively solve the grand challenges.

In its role as a coordination platform, JPI Oceans will focus on making better and more efficient use of national research budgets, which represent 85% of the marine-maritime funding within Europe. One of the JPI's goals is to develop joint research programmes in which countries can be involved on a voluntarily basis (variable geometry).

www.jpi-oceans.eu**LIFEWATCH****e-science and technology infrastructure for biodiversity data and observatories**

ESFRI Preparatory Phase project 2008-2011.

LIFEWATCH will:

- Build a coherent EU infrastructure based on facilities, hardware, software and governance structures for all aspects of biodiversity research;
- Provide access to a wide range of biodiversity datasets, modeling and analysis tools;
- Support the creation of a network of users, enabling them to share resources and collaborate on projects.

The infrastructure, is supported by all major European biodiversity research networks.

www.lifewatch.eu/**MARS****European Marine Research Stations Network**www.marsnetwork.org**MARS****Monterey Accelerated Research System**www.mbari.org

MCS

Marine Core Service

Marine Component of **GMES**.

<http://www.gmes.info/pages-principales/library/implementation-groups/marine-core-service-mcs/>

Marine Knowledge 2020

Marine data and observation for smart and sustainable growth

Marine data and observation for smart and sustainable growth. Communication from the Commission to the European Parliament and the Council, COM (2010)461.

http://ec.europa.eu/maritimeaffairs/pdf/mediterranean/241110_marine_knowledge_en.pdf

MOON

Mediterranean Operational Oceanography Network

www.moon-oceanforecasting.eu/

MOOSE

Mediterranean Ocean Observing System on Environment

www.oao.obs-vlfr.fr/projectssm/other-ongoing-projectssm/95-moose?lang=

MRI

Marine Research Infrastructures

MSFD

Marine Strategy Framework Directive

Environmental pillar of the EU Integrated Maritime Policy.

http://ec.europa.eu/environment/water/marine/directive_en.htm

MyOcean

GMES Marine Core Service

FP7 2009-2012. MyOcean aims to design and develop a pre-operational validation of upgraded GMES marine core services and capabilities towards a concerted and integrated pan-European capacity for ocean monitoring and forecasting, validated and commissioned by users. The MyOcean services are dependent on remote and *in situ* observations and present analysis, reanalysis and forecast products describing the physical state of the ocean and its primary biogeochemical parameters.

www.myocean.eu/

NEPTUNE Canada

NEPTUNE Canada is a regional cabled ocean network, located in the Northeast Pacific and part of the Ocean Networks Canada (ONC) Observatory.

www.neptunecanada.ca/

NoE

Network of Excellence

FP funding instrument.

http://cordis.europa.eu/fp6/instr_noe.htm

NSF

National Science Foundation (USA)

www.nsf.gov/

OceanObs

International conference series on Ocean Observation

www.oceanobs09.net

OceanSITES

Global Network of deep water reference stations

www.oceansites.org

OOI

Ocean Observatories Initiative

Funded by the National Science Foundation, OOI will build a networked infrastructure of science-driven multidisciplinary sensor systems to measure the ocean and seafloor.

www.oceanobservatories.org/

SeaDataNet

Pan-European Infrastructure for Ocean and Marine Data Management

FP6 and FP7 **I3**.

www.seadatanet.org/

SEIS

Shared Environmental information System

The Shared Environmental Information System (SEIS) is a collaborative initiative of the European Commission and the European Environment Agency (EEA) to establish together with the Member States an integrated and shared EU-wide environmental information system. The system, based on technologies such as the internet and satellites, aims to make environmental information available and understandable for policy makers and the public.

http://ec.europa.eu/environment/water/marine/index_en.htm

SEPRISE

European real-time data service

www.seprise.eu/

SSA

Specific Support Action

FP funding scheme.

http://cordis.europa.eu/home_en.html

TENATSO

Tropical Eastern North Atlantic (Cape Verde)

Time-Series Observatory

FP6 **SSA**. TENATSO-Ocean is part of the **EuroSITES** network.

http://tenatso.ifm-geomar.de/?Ocean_Site

WAMS

World Association of Marine Stations

www.marsnetwork.org/wams.php

WISE

Water Information System in Europe

WISE-Marine is the marine environmental component of SEIS and will be a comprehensive and shared European data and information management system for the marine environment which supports implementation of the Marine Strategy Framework Directive.

www.water.europa.eu

Annex III: List of participants

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