European Initiatives: Coastal and Open Sea Infrastructures

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Monitoring the marine environment not only constitutes a challenge for the scientific community, but is also recognized as a priority for policies aimed at managing the environment.
Eutrophication

The process by which a body of water acquires a high concentration of nutrients, especially phosphates and nitrates

Effects
Eutrophication can have serious, long-term effects. The most noticeable effect of eutrophication is algal blooms. When a bloom occurs, the stream, river, lake, or ocean becomes covered with algae, which is usually bright green.

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Coastal erosion is the wearing away of land and the removal of beach or dune sediments by wave action, tidal currents, wave currents, drainage or high winds (see also beach evolution).

On non-rocky coasts, coastal erosion results in dramatic (or non-dramatic) rock formations. In areas where the coastline contains rock layers or fracture zones with varying resistance to erosion.

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• 89,000 km of coast along two oceans and four seas: the Atlantic and Artic Ocean, the Baltic, the North Sea, the Mediterranean and the Black Sea

• Sustained observation of the seas and oceans is currently a high priority for European marine and maritime activities
Towards a long-term and sustained European Network of observatories

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Episodic events profoundly affect ecosystem function and probably have long term consequences. Their significance is impossible to assess without sustained observations.

Continuous monitoring is required for a variety of key properties.
Watch

Deep ocean observatories are fixed at one point in the ocean, far away from coastal influence. They continuously measure properties of the seawater such as temperature, salinity and carbon dioxide, but also biological activity such as algal growth.

Record

Without the help of man, data are recorded and captured continuously every few hours for weeks, months and even years at a time. The data are then transmitted by satellite to the research centres around the world or stored inside the sensors until they are picked up by scientists venturing out to sea.

Understand

This continuous flow of data enables scientists to understand natural patterns and fluctuations such as seasonal cycles. It also allows them to follow everyday variation, to detect episodic events (such as algal blooms) and long-term changes (such as increasing seawater temperatures).

Predict

These important amounts of data collected over long periods of time are also used to produce more accurate computer models to predict future changes.

Technology

Observatories are typically made of a single column of strong wire stretching from the sea surface to the sea floor. Several scientific instruments and sensors are attached in clusters like mini constellations all the way down. Some equipment including landers can also be positioned on the seafloor.
The W1-M3A surface buoy acts as a Fish Aggregating Device (F.A.D.), attracting several species of fishes and marine mammals.

- **Dissolved oxygen**: quite stable dynamics in winter period and high variability during late spring-summer season.
- **Fluorescence**: low values in winter, and bloom in spring or summer.

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Salinity variability (E2M3A) in the Southern Adriatic

- Detection of dense water cascading
- Increase of bottom salinity

High frequency sampling is essential

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Coastal and Open Ocean
Multidisciplinary
Existing at fixed locations
Build on former programs and networks
Data Sharing:
  - Freely available to all immediately after collection and Quality Control (QC)
  - Using internationally Associated metadata
  - agreed protocols and format

Criteria for Fixed Observatories

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Two projects funded by the 7th Framework Program for Research and Technological Development within the Integrated Infrastructures Initiative:

- JERICO (Joint European Research Infrastructure network for Coastal Observatories)
- FixO³ (Fixed point Open Ocean Observatories Network)
Structure of Fixed Point Programs

COORDINATION ACTIVITIES:
Networking activity

- aim to foster the culture of cooperation between the partners
- target at spreading good practice, promoting common protocols and interoperability

SUPPORT ACTIONS:
Service Activity and Transnational Access

- offer international access to observatory infrastructures and the data services and products obtained from them

RTD: Joint Research activities

- Innovate and enhance the current capability for multidisciplinary in situ ocean observation from the sea floor to the air-sea interface

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Main Objective:

Prepare for the future European Network of operational coastal observatories (OCO)

3 observation systems:
- Glider
- Ferryboxes
- fixed coastal platforms
Jerico Partners

The JERICO consortium is composed of 27 partners representing 17 European countries.

- 7 millions euro
- Start on 2011
- 4 years project
- International Steering Committee

Coordination: IFREMER
DR. P. Farcy

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Jerico Results

* Increased harmonisation of existing infrastructures
* Exchange of know-how and definition of Best Practices
* Promote coastal oceanography through TNA
* Agreed on deployment needs and gaps
* Promote innovation in technology (FCT and WP10)
* Propose a future strategy for coastal oceanography

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• Best practices and the available technologies for protection against fouling
• Best practices in calibration of oceanographic sensors.
• End-to-End Quality Assurance (Best Practices on Sensors, Housings, Pre & Post deployment procedures, Data processing) for Fixed Platforms
FixO$^3$ Network

It covers all part of the oceans: in the Atlantic from the Artic to the Antarctic throughout the Mediterranean.
• 29 European Partners
• 22 Open Ocean Observatories (7 in the Med Sea)
• 1 test site
• 7 millions euro
• 4 years project

International advisory board & Steering Committee

Coordinated: NOC, UK
Started: 1st September 2013

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• Different type of observatories
Single mooring
E1-M3A, Cretan Sea

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Two mooring system: E2-M3A, Southern Adriatic Sea
Antares - Cable observatory

North Western Mediterranean Sea

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Different type of observatories

- Wide range of disciplines: biology, biogeochemistry, chemistry, physics, geology

- Surface to seafloor / air-sea interaction

- Build on former projects and networks:
  - EuroSITES
  - CarboOCEAN
  - ESONET

- “glue” with ESFRI programs:
  - EMSO (European Multidisciplinary Seafloor & Water column Observatory)
  - ICOS (Integrated Carbon Observing System)

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EuroSITES Network

9 existing deep ocean (> 1000m) observatories
2 existing networks
3 associated sites – 2 cable sites

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Networking activities

- Technological and procedural harmonization
- Data management and harmonization
- Innovation through industry
- Interface with policy and intergovernmental bodies
- Outreach and training
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Networking activities:

Workshop on Best Practices

Developing Technology Clusters within Industry Partners

Task 8.5 Organisation of training for less experienced users of hardware OGS (Lead)

A three-day training course will be organised for existing and novel instruments mainly focusing on biochemical measurements on carbonate species, sensors for ocean acidification, fluorometers, and automatic nitrate measurements. The course will accommodate 15 delegates and serve to promote and disseminate the FixO3 label to a wider group of responsible engaged in meteo-marine observation.

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• Free of charge access to research teams to 16 infrastructures operated by 14 European institutions
  (first call June 2014 – Second call May 2015)
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Transnational Access
FREE access to open ocean infrastructures
14 open ocean observatories and 1 shallow water test site of the FixO3 fixed point ocean observatory network are open to projects from industry and science

E2M3A
Eastern Mediterranean Multidisciplinary Moored Array

The E2-M3A observatory is located in the center of the Southern Adriatic, where deep convection and cascading of dense water take place, involving both the atmosphere and the ocean dynamics, and triggering the solubility and the biological pumps. The E2-M3A observatory is particularly devoted towards studies that characterize the long term changes of Adriatic Sea in response to local climatic forcing.

2015

Sub-surface mooring

- Horizontal, with 2 anchors and 2 wires, each 300m long, providing a strong and stable platform to host instruments.
- An additional, chain-like mooring system with 6 anchors, each 300m long, for mooring an array of instruments at different depths.

Surface buoy

- Provides a stable platform to host instruments.
- Monitors temperature, salinity, conductivity, dissolved oxygen, currents, turbidity.

TNA Information

Are you a European marine enterprise or research organisation interested in open ocean facilities, e.g., for instrument tests or research projects, but are short of budget?

TNA Support offered

- Site visits
- Data delivery (near-real-time, delayed-mode)
- Training and capacity building
- Access to industry services

Further information is available at:
http://www.fixo3.eu/observatory/e2-m3a
Joint Research Activities

- Free of charge access to research teams to 16 infrastructures operated by 14 European institutions
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- Enhancement of CO2 and pH measurements
- Enhancement of marine sound
- Development of non cabled platform for high data volume sensors

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1. EuroGOOS (European Global Ocean Observation System)
2. OceanSITES
3. Copernicus and EEA (European Environmental Agency)
4. EuroArgo and EuroFleets
5. ICOS (Integrated Carbon Observing System)
6. EMSO (European Multidisciplinary Seafloor and water column observatory)
7. EMODNET (European Marine Observation and Data Network) & SeaDataNet
8. Industry

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