EMSO Ocean Observatories Challenges and Progress
Scientific ideas, early results and infrastructure development

Rome
13-15 November 2013
EMSO Ocean Observatories Challenges and Progress
Scientific ideas, early results and infrastructure development

Rome
13-15 November 2013
1. The faunistic, ethological, and ecological cabled observatory video monitoring of marine communities everywhere

2. The next expansion of NEMO-SN1, EMSO node, by video imaging equipment for the monitoring of the local deep-sea communities

3. Particle fluxes along the western Svalbard margin and at sea glacier interface: oneyear mooring deployments

4. Listening to the Deep-Ocean: A global underwater noise monitoring initiative

5. Real-time data from a profiling CTD mounted on a subsurface mooring in the Corsica Channel

6. Research and New Sensor Development at the Koljo Fjord Observatory

7. Harnessing future sub-sea communications cables for ocean observation and disaster warning: potential links with, and opportunities for EMSO

8. Temperature variation records at diffuse and focused outflow in Lucky Strike hydrothermal field (EMSO-Azores): characterization of long-term outflow dynamics

9. A multidisciplinary approach to the study and conservation of cetaceans in the Mediterranean Sea

10. SmartBay – Ireland’s test, demonstration and validation facility

11. The E2M3A Open Ocean Observatory Sea: a tool to monitor the dense water formation process in the Southern Adriatic

12. Preliminary analysis of NEMO-SN1 seafloor magnetic data and first interpretation

13. Western Mediterranean Observatory OBSEA updates. 2nd Junction Box Deployment, Citizen Science Project and others


15. Ligurian Sea: a permanent seismological station

16. First megafaunal diel and seasonal deep-sea monitoring by crawler within methane Barkley canyon (NEPTUNE-Canada)

17. EMSO MARMARA Node: new results from the multi-parametric benthic observatory SN4 in the Gulf of Izmit

18. Distribution of recent sediments through the strait of Istanbul (Turkey)

19. Underwater geophysical monitoring by European Multidisciplinary Seafloor and water column Observatories

20. The Italian contribution to the EMSO Ligurian Sea node

21. MoLab: a multidisciplinary and flexible stand-alone array of benthic lander systems and moorings

22. The LoVe cabled observatory - status and plans

23. Transport estimates by fixed point observations in combination with gliders
| 24. | Global mercury observation system (GMOS) for over water measurements | 37 |
| 25. | FRAM: a multidisciplinary observatory in the North Atlantic-Arctic Ocean transition zone | 38 |
| 26. | MeBo drilling and borehole observatories for multi-disciplinary time series data | 39 |
| 27. | MEUST: Mediterranean Eurocentre for Underwater Sciences and Technologies | 40 |
| 28. | Observations on the deep-sea benthologic fauna using a baited lander in the SantaMaria di Leuca cold-water coral province | 41 |
| 29. | CREEP-2: Ultra-long-term rock deformation experiments at a cabled deep-sea observatory | 42 |
| 30. | A new look at the lithosphere-asthenosphere structure of the SW Iberian Margin from seismic tomography at the EMSO site | 43 |
| 31. | Svalbard Integrated Earth Observing System (SIOS) Status under the preparatory phase and challenges towards implementation | 44 |
| 32. | EMSO and KM3Net Italia infrastructures for marine bioacoustic studies and for the implementation of the EU Marine Strategy | 45 |
| 33. | SUNRISE “Sensing, monitoring and actuating on the UNderwater world through a federated Research InfraStructure Extending the Future Internet.” | 46 |
| 34. | Deep ocean pressure variability from the Antares neutrino telescope | 47 |
| 35. | A multidisciplinary approach in the analysis of the low frequency hydrophone aboard the NEMO-SN1 observatory of EMSO: first results on shipping noise and bioacoustics | 48 |
| 36. | The SMO-KM3Net Italia Acoustic array: technological innovative solutions and first results | 49 |
| 37. | The acoustic detection infrastructure in East Sicily: a joint EMSO-KM3Net open infrastructure | 50 |
| 38. | A new microbial Connected In Situ Instrumented Colonizer System (CISICS) at Lucky Strike Observatory (EMSO Azores) | 51 |
| 39. | MoMAR Long Term Monitoring of the Mid Atlantic Ridge | 52 |
| 40. | High-resolution dynamics of a deep hydrothermal mussel assemblage monitored through the MoMAR observatory | 53 |
| 41. | Observations on the behaviour of deep-sea sharks in the Santa Maria di Leuca cold-water coral province | 54 |
| 42. | JERICO Trans National Access Programme: overview and lesson learnt | 55 |
| 43. | Mobile platform for the investigation of spatial and temporal variability in the deep seafloor | 56 |
| 44. | Towards the development of the integrated PLOCAN observatory | 57 |
| 45. | Sustained Observations off Northern Chile | 58 |
| 46. | Submarine hill, underwater spring and sediment characteristics of the Harmantaji locality, Northern Saros Gulf (Turkey) | 59 |
**WEDNESDAY 13TH NOVEMBER**

09:30 Registration

10:30 Welcome & Overview
- Official Opening
- EMSO Short Overview
- Conference Goals Overview
- General Discussion & Questions

12:00 Poster Introductory Session
- Overview
- Participants start to become acquainted with range of activities in EMSO

12:30 **Lunch and Posters**

14:00 **Theme I Geosciences**
Louis Geli IFREMER
- Introduction
- Scientific ideas
- Early results
- Infrastructure development (hardware and data)
- How to be involved
- Discussion
- Summary and conclusions

15:30 **Break (Posters/Demos)**

16:00 **Theme II Physical Oceanography**
Peter Haugan
Geophysical Institute, Univ. of Bergen
- Introduction
- Scientific ideas
- Early results
- Infrastructure development (hardware and data)
- How to be involved
- Discussion
- Summary and conclusions

17:30 **Summary Discussion Day 1**

18:00 Reception & Poster Session

19:00 **Conference Dinner**
THURSDAY 14TH NOVEMBER

08:45 Progress Check-in and Plan for the 2nd Day

09:00 **Theme III** Biogeochemistry  
   - Richard Lampitt National Oceanography Centre  
   - Introduction  
   - Scientific ideas  
   - Early results  
   - Infrastructure development (hardware and data)  
   - How to be involved  
   - Discussion  
   - Summary and conclusions

10:00 *Break (Posters/Demos)*

11:00 Summary & Discussion

11:30 Data and Analysis Tools, Plans and Contributions  
   Christoph Waldmann MARUM

12:30 *Lunch and Posters*

14:00 **Theme IV** Marine Ecology  
   - Henry Ruhl National Oceanography Centre  
   - Introduction  
   - Scientific ideas  
   - Early results  
   - Infrastructure development (hardware and data)  
   - How to be involved  
   - Discussion  
   - Summary and conclusions

15:30 *Break (Posters/Demos)*

16:00 **Theme V** Transformative Ocean and Earth Science  
   - Mairi Best Consultant to EMSO  
   - Introduction  
   - Scientific ideas  
   - Early results  
   - Infrastructure development (hardware and data)  
   - How to be involved  
   - Discussion  
   - Summary and conclusions

17:00 Summary Discussion Day 2

18:00 Reception & Poster Session

FRIDAY 15TH NOVEMBER

09:00 How to be involved: Funding and Access

10:30 *Break (Posters/Demos)*

11:30 EMSO: Conference Statement and Path Forward
The faunistic, ethological, and ecological cabled observatory video monitoring of marine communities everywhere


\(^{(1)}\) Marine Science Institute (ICM-CSIC)

Important constraints in sampling repeatability at statistically relevant frequencies are still limiting the progress of marine ecology. Within the framework of novel cabled observatory science, it is now possible to study and monitor the fauna of geologically different ecosystems at any depth of the continental margin, including the abyssal plains, at sampling frequencies and over temporal durations never attained before (i.e. from seconds to decades). New multiparametric platforms endowed with video cameras that are being progressively installed in different oceans, can be used not only for a broad faunal characterization, but also to quantify the massive three-dimensional displacements of marine populations in response to cyclic oceanographic, chemical, and geologic fluctuations (also measured in a multiparametric fashion). Here, we will review how time-lapse image/footage acquisition and automated video-imaging protocols for animal classification and counting could be implemented to transform video-cameras into one of the first intelligent marine sensors for the remote, autonomous and continuous monitoring of communities in relation to their diel (i.e. inertial, internal-tidal or day-night), seasonal, and inter-annual cycles of functioning. We will also discuss the possibility to study the responses of benthic species to other and more stochastic habitat changes (e.g. those linked to the meteorology), through the measurement of modifications in water column properties by observatory vertical expansions. Studies of this kind may allow an efficient modelling of marine community modifications in spite of global change scenarios, based on alterations of the benthopelagic coupling equilibrium.

Placed on panel No. 1
The next expansion of NEMO-SN1, EMSO node, by video imaging equipment for the monitoring of the local deep-sea communities


(1) Instituto de Ciencias del Mar (ICM-CSIC)
(2) Rock & Ice Physics Laboratory, Department of Earth Sciences, University College London
(3) AgritechLab-Agricultural Engineering Research Unit of the Agriculture Research Council (CRA-ING)
(4) Istituto Nazionale di Fisica Nucleare
(5) Istituto Nazionale di Geofisica e Vulcanologia
(6) EMSO Interim office

NEMO-SN1 is the cabled node in the Western Ionian Sea of EMSO Research Infrastructure (European Multidisciplinary Seafloor and water-column Observatory; www.emso-eu.org). EMSO is aimed at establishing, implementing and operating ocean observatories from the Arctic, the Atlantic Ocean and to the Mediterranean, for long-term observations and studies of geo-hazards, climate change and marine ecosystems. In this scenario, we describe the next implementation of the NEMO-SN1 node within the framework of the CREEP-2 project, led by the Rock & Ice Physics Laboratory at University College London) and funded by NERC. A video-camera system will be deployed at 2100 m depth, with the major objective of monitoring the local benthic community and its temporal changes at high frequency over a very large period of time. Briefly, the camera system (Luxus Colour Zoom) will be installed onto the frame of a multi-sample rock deformation apparatus, assembled for geophysical experiments devoted to the monitoring of ultra-long-term brittle creep in crustal rocks (including acoustic emission output as a proxy for crustal seismicity). Here, we will describe the system architecture in terms of hardware equipment and software requirements, considering the needs of time-lapse video image acquisition for the high frequency monitoring of the community. The use of that video-imaging will be discussed in relation to potential ecological research scenarios related to the behaviourally sustained benthopelagic coupling, the study of which is of relevance to understand the dynamism of deep-sea communities.

Placed on panel No. 2
Particle fluxes along the western Svalbard margin and at sea glacier interface: one-year mooring deployments.

Aliani S.(1), Conese I., Giglio F., Miserocchi S., Langone L.

(1) CNR ISMAR, La Spezia, Italy

Preliminary results of two experiments carried out between 2010 and 2011 in different parts of the western Svalbard margin were shown. The Storfjorden is a sill-fjord that produces significant volumes of dense, brine-enriched shelf water through ice formation. The dense water produced in the fjord overflows the sill and can reach deep into the Fram Strait. Four instrumented moorings were deployed for one year along the pathway of the cascading dense waters. Mass fluxes peaked from Jan-May 2011 (up to 11 g m-2 d-1) increasing at the near bottom. Particles were mainly lithogenic. All findings converge to highlight that the mechanism of particle delivery was by laterally advection of resuspended material from the seabed. When mass fluxes peaked, water masses were warmer and more saline. Currents were maxima (up to 40 cm/s), directed toward NW. Because the cold plume of cascading dense waters entrains and mixes with the relatively warm intermediate Atlantic Water, it appears as a heat source for the bottom ambient Norwegian Sea Deep Water, where is mainly driven by its salinity excess.

In the inner part of the Kongsfjorden, a mooring (MDI, Mooring Dirigibile Italia) was deployed starting from Sept. 2010 to monitor variations of thermohaline characteristics and the temporal variability of particle fluxes and compositions. Particle fluxes were low through the first 10 months, while in July and August increased up to 72 g m-2 d-1. Due to the low organic content and the less negative values of δ13C, the origin of these flux peaks is likely related to the increased runoff during the summer season. On the other hand, during May and June, both OC content and stable isotopes suggest a vertical rain of particles by biological production.
The growing scientific and societal concern about the effects of underwater sound on marine ecosystems has been recently recognized through the introduction of several international initiatives aiming at measuring the environmental impact of ocean noise on large spatial and temporal scales. From a regulatory perspective, the European Marine Strategy Framework Directive includes noise as one of eleven descriptors to determine Good Environmental Status of the oceans. The Directive specifically requires Member States to provide a measure of annually averaged noise. LIDO (Listening to the Deep-Ocean Environment) has developed a software package that measures sound levels and monitors acoustic sources in real-time; this software is now operating to provide industry with an environmentally responsible approach. The system is currently operating worldwide from several wired and radio-linked underwater observatories. Recently, through a zero-cost contract with the CTBTO (Preparatory Commission for the Comprehensive nuclear-Test Ban Treaty Organization), years of data from hydroacoustic stations were analysed to look for background noise trends and to detect cetacean presence. Here, we present the analysis of four CTBTO platforms, each covering 42 months of data, focussing especially on the estimation of background noise levels and the measurement of noise contributions from anthropogenic sources. Continuous monitoring of background noise will indeed help to understand whether long-term exposures to noise, in areas with intense shipping or seismic campaigns, for instance, might alter animal natural behaviour and may be used in the future to assess the effects of ocean noise on marine life.
A Profiling Buoy System for real time data transmission, manufactured by NGiK Ocean, has been mounted on a subsurface mooring in the Corsica Channel. It is composed of two units: (i) a profiling buoy, carrying a CTD sensor (with oxygen, fluorescence, turbidity sensors), Iridium antenna, and (ii) an underwater winch. Both units are provided with acoustic remote transceivers to communicate with each other, and with a deck unit.

The mooring is anchored at 450 m depth, in the channel connecting the Tyrrhenian with the Ligurian Sea. Being an area with heavy maritime traffic, the need of transmitting data in real time could not be solved by any device floating at surface. This is the reason for the choice of a subsurface buoy, surfacing only for a limited time, enough to transmit the data to shore.

The profiling system is moored at 190 m depth on the line, and it has been programmed to perform a CTD profile every day at a fixed daytime. The buoy wakes up and sends an acoustic command to the winch, which starts unrolling the rope. The CTD performs an upcast profile from 190 m to surface. Once the antennas are out of water, the profile is sent by the built-in iridium transceiver via SBD (short burst data) by email, and the corresponding graphs are updated on the CNR-ISMAR webpage. In order to minimize the surfacing time, a subset of acquired data (one data every 10 s., i.e. every 3.5 m.) is sent to shore. After transmission, or after a time out interval of 10 minutes, the buoy sends an acoustic command to the winch, which starts to wind the rope up.

The real time data transmission is essential for rapid response to specific events, fast delivery to end-users, inclusion in data-assimilative ocean forecasting systems.
Research and New Sensor Development at the Koljo Fjord Observatory

Atamanchuk D.(1), Kononets M.(1), Hall P.(1), Tengberg A.(2), Waldmann C.(3)

(1) University of Gothenburg, Sweden
(2) Aanderaa, Norway and University of Gothenburg, Sweden
(3) Marum, Bremen, Germany

In the Koljoefjord on the Swedish west coast an on-line observatory was installed in April 2011. There were two main goals with this installation:

1. Improve existing models of a system of fjords within the frames of the EU projects HYPOX, ESONET-NoE and EMSO.
2. Easy access to an advanced on-line sensors/instrument test facility with highly variable environmental condition.

The observatory consists of a main hub, which is cable connected to communication and power system on land. The node is prepared to host four experimental modules communicating either with Ethernet or serial protocol. When installed in April 2011 one monitoring module with approximately 30 sensors was connected. Later approximately another 20 sensors have been added in different steps. Several of these are newly developed where the Koljoefjord Observatory serve as an important test facility. Meteorological data is assimilated from a nearby weather station (at the Sven Loven Center for Marine Sciences run by University of Gothenburg).

Data are stored internally in the instruments and at the main hub, and are also retrieved in real-time to the PANGEA database (http://www.pangaea.de/). Remote control over the main hub is implemented and has been used for adjusting measurement system parameters over the Internet. An open access web display is developed for checking, plotting and quality control of the data coming in: http://mkononets.dyndns-home.com:8080/

For quality control of many of the parameters measured the observatory is deployed close to a sampling site of a monthly open access survey program run by SMHI (Swedish Meteorological and Hydrological Institute).

The environment is dynamic and because of this excellent for sensor test purposes. Tidal oscillations result in strong variations in the intermediate layer. Within a few hours temperature can vary with 10° C, salinity with 3 PSU, oxygen with 70% air saturation, pCO2 with 150 µatm and pH with 0.2 units.

Fast and efficient methods have been developed to verify the biofouling status of the sensors and to lift and clean the observatory. The later procedure normally takes no more than one hour and no divers or ROVs are required.

Placed on panel No. 6
Harnessing future sub-sea communications cables for ocean observation and disaster warning: potential links with, and opportunities for EMSO

Barnes C. R.(1), Bueti C. M.(2), Meldrum D. T.(3)

(1) SEOS, University of Victoria, Victoria, Canada
(2) International Telecommunication Union, Geneva, Switzerland
(3) Scottish Marine Institute, OBAN, Scotland

Aspects of the health and status of marine environments could be monitored globally in real-time through a new generation of ocean mini-observatories hosted on telecommunication cables. Ocean temperature is a critical variable, particularly regarding climate change, sea level rise and ecosystem stress. Another issue is the extent and impact of periodic seabed destruction and ecosystem and coastal modification by tsunamis and associated slope failures. Three UN specialized agencies (International Telecommunication Union (ITU), World Meteorological Organization (WMO) and Intergovernmental Oceanographic Commission (IOC) of UNESCO) have jointly proposed the development of trans-ocean mini-observatories to measure ocean seafloor observables. The Joint Task Force (JTF) established in 2012, has a wide membership including scientists, engineers, cable owners and operators, regulators and legal experts. With a recent workshop (Madrid, 19-20 September 2013) and ITU secretariat support, the JTF is developing a strategy and roadmap with the aim of deploying modified “green” submarine cable systems equipped with environmental sensors (temperature, pressure and acceleration) for climate monitoring and disaster risk reduction (particularly tsunamis). If successful in gaining support from industry and regulatory bodies, a network of mini-observatories could be established progressively across the world’s ocean floors, accurately measuring these important parameters over several decades. The initiative addresses two main needs: a) sustained climate-quality data from the sparsely observed deep oceans; and b) increased reliability and integrity of the global tsunami warning network. There are several potential links to EMSO: many telecommunication cables do and will cross European seas and bordering oceans; the scientific and technology issues and real-time databases are complementary; and there is a potential to test systems/pilots/sensors at European observatories and at industry facilities. A pilot project is being planned with the active involvement of cable industry owners and suppliers and ocean observatory researchers: expressions of interest or in JTF membership are invited. http://www.itu.int/en/ITU-T/climatechange/task-force-sc

Placed on panel No. 7
Temperature variation records at diffuse and focused outflow in Lucky Strike hydrothermal field (EMSO-Azores): characterization of long-term outflow dynamics

Barreyre T.(1), Escartin J.(2), Cannat M.(2)

(1) IPGP
(2) CNRS-IPGP

As part of the MOMAR-EMSO experiment to monitor hydrothermal activity, we used an ROV to deploy autonomous temperatures sensors at black smoker chimneys, cracks, and diffuse flow areas throughout the Lucky Strike hydrothermal field (Mid-Atlantic Ridge, ~37°17'N) between summer 2009 and summer 2012. We deployed a set of high- and low-temperature thermal probes sampling at intervals that varied from <1 min to 24 min. Microseismicity and bottom pressure were also monitored, and recorded with an ocean bottom seismometer network and a pressure gauge respectively. We place particular emphasis on temporal variability at semi-diurnal tidal periods, and use poroelastic theory, to constrain hydrologic parameters of the sub-surface circulation system, a key parameter to understand the dynamics of fluid flow and their interactions with the ecosystems at the seafloor. We identify two main types of temporal variability in the temperature records: (1) episodic variability with rapid temperature changes of ~5°-150°C, and (2) systematic variability at tidal periods. The episodic variability is stochastic and very local (i.e., typically not correlated between multiple probes among vents at the scale of the site), and does not appear to be correlated with local or regional seismicity. Most temperature records display systematic tide-related variability, with the strongest signal at the principal semidiurnal tidal periods (M2, S2, N2 and K2). Cross-spectral multi-taper methods applied to the temperature and bottom pressure records reveal robust phase relationships, particularly for the high-temperature, black-smoker records, as predicted by poroelastic theory. These results demonstrate the tidal pressures diffusely propagate through the porous matrix hosting sub-surface flow, which results in phase lags between the surface pressure and the fluid discharge temperature. We use this observation to constrain the poroelastic skin depth, bulk permeability, and vertical Darcy flow velocity of the sub-surface regime at the Lucky Strike field.
A multidisciplinary approach to the study and conservation of cetaceans in the Mediterranean Sea

Bellia G.\(^{(1, 2)}\), Giacoma C.\(^{(3)}\), Pavan G.\(^{(4)}\), Agodi A.\(^{(5)}\), Alonge G.\(^{(6)}\), Barchitta M.\(^{(5)}\), Biondo A.E.\(^{(7)}\), Buscaïno G.\(^{(8)}\), Calabrò C.\(^{(9)}\), Caruso F.\(^{(9, 2)}\), Conti E.\(^{(10)}\), Costa G.\(^{(10)}\), Cuttone G.\(^{(2)}\), De Domenico E.\(^{(9)}\), Favali P.\(^{(11)}\), Ferrante M.\(^{(5)}\), Ferrito V.\(^{(10)}\), Lombardo B.M.\(^{(10)}\), Maccarrone V.\(^{(6)}\), Maiolino C.\(^{(2)}\), Mazzola S.\(^{(8)}\), Messina G.\(^{(10)}\), Nicosia T.\(^{(6)}\), Papale E.\(^{(3)}\), Pappalardo A.M.\(^{(10)}\), Pulvirenti S.\(^{(2)}\), Reitano R.\(^{(1)}\), Riccobene G.\(^{(2)}\), Santonocito D.\(^{(2)}\), Sciacca V.\(^{(9, 2)}\), Spanò N.\(^{(9)}\), Trischitta F.\(^{(9)}\), Viola S\(^{(2)}\).

\(^{(1)}\) Dipartimento di Fisica e Astronomia, Università di Catania, Catania
\(^{(2)}\) INFN – Laboratori Nazionali del Sud, Catania
\(^{(3)}\) Dipartimento di Scienze della Vita e Biologia dei Sistemi, Università di Torino, Torino,
\(^{(4)}\) Centro Interdisciplinare di Bioacustica e Ricerche Ambientali, Università di Pavia, Pavia,
\(^{(5)}\) Dipartimento “GF Ingrassia”, Università di Catania, Catania
\(^{(6)}\) ENEA – Unità Tecnica Modellistica Energetica Ambientale, Palermo e Unità Tecnica Tecnologie di Trisaia, Matera
\(^{(7)}\) Dipartimento di Economia e Impresa, Università di Catania – Catania
\(^{(8)}\) CNR, Istituto per l’Ambiente Marino Costiero U.O.S. di Capo Granitola, Torretta Granitola, Trapani
\(^{(9)}\) Dipartimento di Scienze Biologiche e Ambientali, Università di Messina, Messina
\(^{(10)}\) Dipartimento di Scienze Biologiche, Geologiche e Ambientali, Università of Catania, Catania
\(^{(11)}\) Istituto Nazionale di Geofisica e Vulcanologia, Roma

Since the deployment of the first test structures for underwater neutrino detector (NEMO - OnDE) and the beginning of the collaboration between INFN and INGV, the scientific community has shown deep interest in biological underwater acoustic signals detected by the EMSO and KM3NeT infrastructures placed on the seabed of the Western Ionian Sea. These facilities gave the chance to take advantage as a powerful tool to study better and more deeply the life of marine mammals in the Mediterranean Sea.

Biologists and physicists from different academic and scientific institutions gathered to realize a common project, according to their own competences, to investigate the behaviour, the hunting methods, the social life and other aspects regarding these marine mammals.

CABIRIA is the Italian acronym chosen to indicate this network of researchers, involving the University of Torino, Pavia, Messina and Catania, CNR and ENEA, with the support of INFN and INGV leading the KM3NeT Italia and EMSO infrastructures. One of the aims of this group is the presentation of projects for funding on the protection and conservation of cetaceans, with particular reference to sperm whales.

The starting point is the recognition of the sounds emitted by the animals, their differentiation and identification among dolphins, sperm whales, fin whales and so on.

Further, a focused sight is being reserved to other aspects such as the effects of the antropic activities on the life of cetaceans, the damages they might suffer from the naval traffic, the reasons why many of them run aground on the seashore, the necessity to delimitate protected areas and to design adequate policies aimed to both conservation and protection of these species.

The activities of the network, including also the tracking of sperm whales, the analysis of specific territorial economic policies and the relapses on tourist flows, will be depicted.

Placed on panel No. 9
SmartBay – Ireland’s test, demonstration and validation facility

Breslin J.
SmartBay Ireland Ltd.

SmartBay – Ireland’s national test facility for Marine Technology is facilitating the development of innovative approaches to sensing, communication and data management/visualisation technologies through sensor deployments in a real world marine environment. SmartBay comprises a suite of commercially available technology platforms including a network of buoys, sensor hardware and communication systems against which new technologies can be validated. This presentation will also discuss the status of the proposed power and data cable which SmartBay Ireland will manage.

SmartBay Ireland in collaboration with the Marine Institute, SEAI and the Hydraulics Maritime Research Centre (UCC) have been awarded €2.9M funding to install a subsea power and data cable from Spiddal, Co. Galway to a distance of 4.5km out to sea. The cable will terminate in an underwater hub that will link to an existing ¼ scale ocean energy test facility located within Galway Bay. The sub-sea cable will provide power and data connectivity to the site which will enable researchers and industry to collect data and to test, demonstrate and validate novel sensors and equipment within the marine environment. The sub-sea cable will provide power and data connectivity to the site which will enable ocean energy device developers, researchers, SME’s and MNC’s to observe the performance of wave energy converters and test and develop new sensors and ICT equipment in a near real time environment. The cable will also be connected to a large power buoy which will be used to feed additional power to and dissipate power from prototype Wave Energy Devices which are being tested at the SEAI ¼ scale Ocean Energy Test Site.
The E2M3A Open Ocean Observatory Sea: a tool to monitor the dense water formation process in the Southern Adriatic

Cardin V. R. (1), Bensi M., Brunetti F., Siena G.

(1) OGS- Istituto Nazionale di Oceanografia e di Geofisica Sperimentale

In the Adriatic Sea, thermohaline changes are driven by interactions with the water masses of the Eastern Mediterranean [Gačić et al., 2010] as well as by the variability of local air-sea interactions and river runoff [Gačić et al., 2002; Cardin and Gačić, 2003].

The need of high-frequency sampling to resolve events and rapid processes and the long sustained measurements of multiple interrelated variables from the sea surface to the seafloor is provided by the observatory E2M3A located in the area of the Southern Adriatic Pit at 41°50.0’N, 17°45.0’E. The payload of the site consists of CT and CTD (Conductivity-Temperature-Depth) sensors (including oxygen and light measurements) at different depths, acoustic current meters, ADCP and RCM11, and a complete meteorological station installed on a surface buoy, which allows to measured simultaneously physical, chemical and meteorological parameters. This payload permits to study the sea-air interaction (nettuno.ogs.trieste.it/e2-m3a/).

The observatory has been working continuously since 2006 providing precious information on the interannual variability of the water formation processes. In the framework of EuroSITES EU-FP7 project (http://www.eurosites.info/) a completely redesigned surface buoy system was deployed in summer 2009. Currently, the system is part of the European contribution to OceanSITES global array (www.oceansites.org) and of the Italian net of Observatories (Ritmare). The deployment of pCO2 sensor together with a pH sensor in the mixed layer allows to estimate the ocean carbon system at the site. A surface buoy in a separated mooring line communicates through Globalstar satellite link with the instrumental deep mooring allowing the real time data transmission from the platform to the land station. The data is quality controlled according to the OceanSITES quality control procedures. The delayed mode data is typically quality controlled within 6-8 month after recovery of the instrumentation and stored at the National Oceanographic Data Centre (NODC-OGS) in Trieste.

Placed on panel No. 11
Preliminary analysis of NEMO-SN1 seafloor magnetic data and first interpretation

De Santis A.(1,2), Cianchini G.(1), Qamili E.(1), Carducci A.(2), Favali P.(1), Beranzoli L.(1)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy
(2) Università degli studi Gabriele D’Annunzio, Chieti, Italy

The NEMO- SN1 cabled seafloor Observatory, as part of the Western Ionian sea EMSO site, was again re-deployed in June, 2012, 25 km offshore Catania (Sicily, Italy). This recent mission represents the third one of a previous series of missions. The NEMO- SN1 seafloor observatory, among a variety of multidisciplinary sensors, was also equipped with a remote magnetometric module composed of vector and scalar magnetometers, which was placed 10 meters far from the main Observatory frame. By analysing in the frequency domain 3-month magnetic data recorded by SN-1 in 2012, we have been able to reconstruct a vertical pseudo-section of the apparent conductivity and then to estimate crust and lithospheric depths underneath the site of deployment. This presentation will describe the magnetometric equipment, the kind of data, the preliminary analysis, the results and their first interpretation. The present results will contribute to a better knowledge of the tectonics of the area.
Western Mediterranean Observatory OBSEA updates. 2nd Junction Box Deployment, Citizen Science Project and others

Del Rio J.,(1) Toma D. M., Manuel A., Olive J., Nogueras M., Cadena J.

(1) Universitat Politecnica de Catalunya (UPC), Barcelona, Spain.

The expandable SEAfloor OBservatory (OBSEA; www.obsea.es) is a multiparametric cabled video-platform located in shallow waters at 20 m depth 4 km offshore Vilanova i la Geltrú (Catalonia, Spain) in front of an artificial reef and , interconnected to the coast by an energy and communication mixed cable. Obsea has two permanent sampling sites: on the surface (buoy) from 2011, and another one at the seafloor (cabled observatories) deployed in 2009. A new cabled and very light and movable junction box connected to the first one will be deployed during 2013. It will expand research and test capabilities to the observatory.

OBSEA enables remote, long-term, and continuous surveys of the local ecosystem by acquiring synchronous multiparametric habitat data and bio-data with the following sensors: Conductivity-Temperature-Depth (CTD) sensors for salinity, temperature, pressure and pH; Acoustic Doppler Current Profilers (ADCP) for current speed and direction, including a turbidity meter and a fluorometer (for the determination of chlorophyll concentration); a hydrophone; a seismometer, a video camera for automated image analysis in relation to species classification and tracking and finally a buoy in the surface with meteorological station and video camera. Images collected from a cabled video-observatory were utilized to examine habitat utilization by coastal fishes. Hydrophone data is used to bioacoustics and ambient noise studies. Last deployments at Obsea:

A new very low cost, low size and low power consumption OFDM (Orthogonal Frequency Division Multiplexing) transmitters for underwater sensor networks communication research has been installed at Obsea.

A new specific system for the measurement of marine pH and atmospheric CO2 for the evaluation of ocean acidification.

An underwater cabled seismometer implementing the IEEE Std 1588 have been developed and validated to work in network systems such as the OBSEA. Integrated with land-based networks by transmitting real-time data to Institut Geològic de Catalunya.

Placed on panel No. 13
Understanding the Planetary Life Support System: next generation science in the Ocean Basins

Delaney J. R.

University of Washington

Driven by solar and internal geothermal energy, the complex processes interacting within the global ocean basins constitute the ‘flywheel’ of our planetary life-support system; it is the massive volume of the ocean that drives long-term weather and short-term climatic variations across the seas and onto the continents. Entirely new approaches to understanding the complexity, power, and vagaries of this ‘oceanic modulator’ are arising from the rapid implementation and use of submarine cabled networks that will provide unprecedented electrical power and bandwidth to thousands of increasingly sophisticated robot-sensor systems distributed throughout full-ocean environments. Partly triggered by the advent of a growing number of these cabled research systems, oceanographers are poised to benefit from a host of emergent technologies largely driven by investment from communities external to ocean sciences. Important developments include: robotics, biotechnology, cloud computing, in situ chemical and genomic sensors, extraction of novel biochemical materials, digital imaging, nanotechnology, serious gaming, new visualization technologies, computational simulations and data assimilation, seismo-acoustic tomography, and universal access to the Internet. Far more powerful than any one of these emerging technologies will be the convergence of the ensemble when applied to understanding the innate complexity of our planetary life support system – the global ocean. As these rapidly evolving capabilities are integrated into sophisticated, remote, interactive operations throughout the ocean basins for decades, a new era of a pervasive human tele-presence throughout entire volumes of our once ‘inaccessible’ global ocean will be realized. Such capabilities are required to meet the onset of immense environmental and societal challenges in the coming decades that can only be addressed through optimally informed international collaboration.
Ligurian Sea: a permanent seismological station

Deschamps A., Hello Y.
UNS/CNRS/OCA, Nice, France

A very broad band seismometer is running since 4 years as a site of the permanent French seismological network and has recorded the main worldwide large events.

Placed on panel No. 15
Cabled observatory video-imaging recent advances now enable faunal monitoring at high frequency over extended periods of time (from seconds to years). Temporally-scheduled video imaging can be used to carry out a reliable faunal monitoring avoiding biases in population and biodiversity assessments due to behavioral rhythms (i.e. which can occur under the form of rhythmic massive population displacements). In this study, we carried out a linear video-transect with the Deep sea crawler Wally I. The crawler is empowered and controlled though NEPTUNE ocean observatory network at a cold-seep in a small plateau at ~890 m depth in the Barkley Canyon (Canadian NE Pacific) and can be operated in real-time remotely from any computer worldwide via the internet. We counted the number of megafauna and note ethological events appearing in back and forth video-transects taken at 4-h frequency for five consecutive days every month over eight months. Current speed (as marker of the local internal tidal regime), temperature, salinity, fluorescence, methane and oxygen concentration environmental variables were measured at high temporal resolution (all frequencies <3 minutes, depending on sensor) throughout the observational period. Time series, periodogram and waveform analysis (for period and rhythms phase determination respectively) were carried out. The most abundant species (corresponding to the 90% of the counts) were in descending order of abundance Sablefish (Anaplopoma fimbria), neptunids (Neptunidae spp.), hagfish (Eptatretus spp.), the jellyfish Poralia rufescens, the family of fish Scorpanidae spp. and the Grooved tanner crab (Chionoecetes tanneri). A peak in abundance in early and mid-summer occur both in Sablefish and Grooved tanner crab. Grooved tanner crab show a second peak in March coinciding with the detection of reproduction behavior. A lineal, a quadratic, a cubic and a quartic regression did not show any significant relation of the crawler activity on the megafauna over the monthly five consecutive days of survey. These preliminary results are discussed in relation to the feasibility of video monitoring with crawling mobile platforms of reduced mobility but with the elevated capacity of high frequency data acquisition over long term periods.
Episodic gas seepage occurs at the seafloor in the Gulf of Izmit (Sea of Marmara, NW Turkey) along the submerged segment of the North Anatolian Fault (NAF), which ruptured during the 1999 Mw7.4 Izmit earthquake, and caused tectonic loading of the fault segment in front of the Istanbul metropolitan area. Marmara site was selected as one EMSO node where establish a permanent sea-bottom observatory. As a preliminary installation an autonomous and long-term multiparametric benthic observatory (SN-4) was deployed in order to study gas seepage and seismic energy release along the NAF. SN4 operated in the gulf at the western end of the 1999 Izmit earthquake rupture for about one-year at 166 m water depth. The SN-4 payload included a three-component broad-band seismometer, as well as gas and oceanographic sensors. We analysed data collected continuously for 161 days in the first part of the experiment, from October 2009 to March 2010. The main objective of our work was to verify whether tectonic deformation along the NAF could trigger methane seepage. Results from the SN-4 experiment in the Sea of Marmara suggest that neither low-magnitude local seismicity, nor regional events affect intensity and frequency of gas flows from the seafloor. The SN4 observatory was recently re-deployed in the same site for another one year mission (September 2013) in the framework of MARSITE (New Directions in Seismic Hazard assessment through Focused Earth Observation in the Marmara Supersite) EC project.
Distribution of recent sediments through the strait of Istanbul (Turkey)

Eryilmaz M.(1), Yücesoy Eryılmaz F.

(1) Mersin University

Istanbul Strait has two different currents and the average depth is 36 m. Depth is 70-75 m at Black Sea entrance of the Istanbul Strait. It decreases to 30-35 m towards the exit of the Marmara Sea. Strait of Istanbul gets very narrow between Kanlıca-Emirgan. This stricture is kept maintained until the Beylerbeyi-Ortaköy Line. Slope is very high in this narrow area. The most important morphological structure observed along the Strait is a channel. This channel is observed at -30 m. In addition, pits are seen throughout the Strait and they reach a depth of 110 meters. The pits which are randomly located are usually trough shaped and they lay parallel to the axis of the Strait. Surface current speed of the Strait is \( \frac{1}{2} \) knot \((1 \text{ knot} = 1852 \text{ km/h})\) at the north of Fil Burnu. Surface current speed are seen in front of Anatolia Kavagi is 1.0 to 1.5 knots and in front of Çubuklu 2-3 knots. Maximum current speed (4 knots) is seen in front of Beylerbeyi and Akıntı Burnu. Surface current speed have been observed between Üsküdar-Beşiktaş to be 3 to 4 knots.

579 surface sediment samples were taken with orange-peel and snapper types grap sampler in Istanbul Strait. Type and grain size of sediment samples were determined with wet sieve analysis. We used Folk’s (1974) ternary diagram for sediment classification according to Wentworth (1922) grain size scheme and constructed maps for our study area, illustrating the distribution of gravel + sand, silt and clay percentage. We generated a recent sediment distribution map for the region by combining our sedimentary data with a regional bathymetric map (1: 30.000 scale).

Sediment distribution of the Istanbul Strait are effected from current systems along with the bathymetry and morphological structure. Fine-grained sediments are not seen in the high current speed regions. Usually coarse-grained materials are stored in this area. Fine-grained silt, clay and like mud-component materials are usually stored in the small cove, bay and harbor areas that are located in the shore of the Strait. Blocks of rocks that are seen in the shores of high sloped parts of the Strait are formed by erosioned blocks falled.

There are four main units of sediments in Istanbul Strait. These are gravel, sandy, silty and clayey units. Usually, sand unit spreads to a depth of approximately -10 m. These materials contain large amounts of shell and shell fragments. Sand and silty units take place on the sea bottom between -10 to -20 m depth. Especially, bays are covered with silt, sandy silt, sand and mud materials until -30 m depth which are fed by the sediments transported by streams and creeks. Mud and muddy materials are located in the deep sea areas more than -50 m depth.

Bottom of the Strait of Istanbul generally composed of gravel and sand scale materials. Silt and clay sized materials are observed in bays where current is weak. Since the current speed is extremely high in some areas, the sediment accumulation is either very little or none, where Palaeozoic aged rocks are observed. Between Ahrıkapı and Üsküdar, sea bottom is covered with sand, shell and silt. From Üsküdar to Beylerbeyi sea bottom include sandy shell, sand with shell materials. The sea floor between Beylerbeyi and Kandilli is covered by shelly gravel, gravelly sand, sand with shells. Mud, silty and clayey materials are located in the sea bottom of Golden Horn. The bottom sea along Kandilli-Çubuklu contains sandy shell. Additionally the sandy and rocky areas are usually found in the south part of the Strait. From Çubuklu to Sarıyer, accumulated sandy shell and shell crumbs are found. From the shore of Beykoz Bay toward the sea bottom have muddy
sand, silt with shells unit. In the offshore region of Beykoz, muddy sand and some materials that are bigger than pebbles and a rocky area have been observed. In the area between Sariyer and Anadolu Lighthouse, the sandy material with shell crumbs are more abundant than any other unit of the composition.

Shells, shell fragments, various plant residues are located within the sediments. These materials are biological fragments of sediments. Biological material is seen in many areas along the Strait.

Placed on panel No. 18
Understanding processes in the marine environment is crucial to address challenges such as the potential impact of climate change, preservation of marine ecosystems and mitigation of natural hazards. Processes that take place in the oceans are complex and cause the variation of many physical, chemical and biological parameters. In the past, geo-hazards at sea have been mostly studied with a single-parameter approach on a short time-scale, but it is now becoming clear that continuous long-term multiparameter monitoring is strongly needed. This new approach is particularly needed to identify precursors to very energetic events, such as mega-earthquakes, tsunamis and volcanic eruptions.

We present a review of experiences with GEOSTAR-class (GEophysical and Oceanographic STation for Abyssal Research) observatories deployed at three EMSO (European Multidisciplinary and water-column Observatory; http://www.emso-eu.org) sites in southern European waters where strong geo-hazards are present: the Western Iberian Margin, the Western Ionian Sea, the Marmara Sea and the Marsili basin in the Tyrrhenian Sea. Then we show examples that underline why the seafloor is an interesting observation point for geophysical parameters and how it differs from land sites. Seafloor and water column observatories, in spite of the technical difficulties, are playing a growing role as laboratories for continuous long-term monitoring of parameters of interest for geophysics and other fields.
The Italian contribution to the EMSO Ligurian Sea node


(1) Marine Environment Research Centre ENEA, La Spezia

EMSO, European Multidisciplinary Seafloor and water-column Observatory, is an ESFRI large-scale Research Infrastructure. EMSO is aimed to ocean observatories establishment and operation from the Arctic, the Atlantic Ocean and to the Mediterranean, for long-term observation and study of geo-hazards, climate change and marine ecosystems. One of the site is located in Ligurian Sea where France is implementing permanent installations. This contribution presents the Italian plan for the implementation of the EMSO Ligurian node in the eastern side of the sea. However the Ligurian sea represents a challenging area for geophysical (mainly hazard), oceanographic and biological research. The initial observatory will be cabled and located at 500-m depth close to a small canyon, where coastal processes are directly affected by deep-sea dynamics due to the narrow continental shelf. This will have particular relevance considering that, despite deep-sea environments are high-biodiversity ecosystems, their knowledge is still scarce.

The sensors installed will record hydrological parameters, oceanographic, geophysical (including gravimetric, magnetometric and seismic signals) and acoustic data. It will also be equipped with two cameras: one will identify and monitor benthic and nektobenthic species, the other (a video-acoustic camera) will help to identify mesopelagic species and large squids. These latter play a key role in the area, being the observatory located within a marine protected area for cetaceans, represented by different species with high abundances. The opportunity to carry out continuous and long-term monitoring of deep-sea species, including some important resources for fishery and to correlate biological patterns to oceanographic parameters, will be critical for fisheries management and biodiversity, as well as for physical oceanography and climate change studies.
MoLab: a multidisciplinary and flexible stand-alone array of benthic lander systems and moorings

Flögel S., Pfannkuche O., Linke P., Ashastina X., Karstensen J., Dullo C.

GEOMAR, Kiel, Germany

Here we present a new stand-alone modular ocean laboratory (MoLab) and data from its first deployment in a cold-water coral reef in northern Norway. The MoLab ensemble is characterized by being a multidisciplinary and flexible stand-alone array of benthic lander systems and moorings equipped with identical sensor packages measuring physical and biogeochemical parameters. By using a suite of different benthic lander systems and moorings which are acoustically coupled that can be linked to any shore based facility via satellite or GSM, we can cover a large water volume over time - a 4D- approach.

Cold-water coral communities cover a wide range of possible habitats in terms of latitude, ocean basins, and depth, with ongoing studies continually expanding occurrences in various regions of the global ocean. A range of factors determines the formation of cold-water coral reefs, such as physical, hydrochemical, and biological (e.g., food supply) factors. We have chosen the Stjernsund in northern Norway due its pristine and species-rich reef which makes this site suitable to investigate the underlying long-term physical and biogeochemical controls on cold-water coral growth. This enabled us to define a new set of boundary conditions for a healthy reef, incl. climate sensitive parameters such as temperature, salinity, pH, O2, ... in an arctic setting.
The LoVe cabled observatory - status and plans

Godø O. R.
Institute of Marine Research, Norway

In 2013 a cable with a cable end module (CEM) was launched to the coral reef location outside Vesterålen in North Norway. A sensor platform was attached to the CEM in September this year. A set of acoustic sensors observing marine life in the water column and associated to the coral reefs and water current along with other oceanographic sensors record information consciously. A satellite platform with camera observes corals at intervals. All data are transferred directly to the land station and streamed onto the Internet. Sensors can be operated through the Internet interface and include steering of acoustic transducer and camera system. Some of the sensors were operated through a battery powered platform in the first half of 2013. Description of the technology solutions and some of the first results are presented.
Transport estimates by fixed point observations in combination with gliders

Haugan P. M.

University of Bergen - Geophysical Institute

Recent efforts with gliders in the Norwegian Sea in combination with a shelf slope mooring show potential for monitoring volume and heat transport in the Norwegian Atlantic Current. Observing system design studies should address such combinations and their added value for various science and management questions relative to the established Argo programme.
Global mercury observation system (GMOS) for over water measurements

Horvat M.(1), Wangberg I., Gårdfeldt K., Nerentorp M., Cossa D., Knoery J., Ogrinc N., Kotnik J., Sprovieri F., Pirrone N.

(1) Jožef Stefan Institute, Slovenia

The world's oceans and seas act as sources and sinks of mercury. The transformations of Hg and its compounds which take place in marine waters are of crucial importance to the understanding of the global mercury cycle. The ocean receives 90% of its mercury through wet and dry deposition processes, and a significant fraction of the mercury is in the oxidised form. Gas exchange of mercury between the surface water and the atmosphere is considered as the major mechanisms driving mercury from the seawater to the atmosphere. The major components of total mercury (Hg-tot) in seawater are mercuric chloride complexes, mercuric ions associated with dissolved organic carbon (DOC) and suspended particles. Some of these Hg forms can be reduced to elemental (Hg(0)) through both biotic and abiotic processes. These processes may significantly contribute to the supersaturation of Dissolved Gaseous Mercury (DGM) found in many natural waters and thus to the evasion of mercury to the atmosphere. There are relatively few direct measurements of the air-sea exchange of mercury, however, simultaneous measurements of DGM and Hg in air, when combined with measurements of the sea and air temperature and wind speed, can be used to estimate the evasion and deposition fluxes. The magnitude of these fluxes is one of key parameters in compartmental and atmospheric Hg models. There remains some uncertainty as a result of the, so far, limited spatial and temporal coverage of measurements as well as questionable quality. The overall objective of the over water measurement in GMOS are (i) to retrieve past over-water measurements and to analyze them in terms of their analytical quality and usefulness in the overall objective of GMOS; (ii) to plan and implement additional measurement campaigns; (iii) to develop and implement strict QA/QC programme for over-water measurements; (iv) to establish a database for compilation of past and new data. Close networking among GMOS partners and associated partners is needed to sustain Hg measurements as part of the global observing system.
FRAM: a multidisciplinary observatory in the North Atlantic- Arctic Ocean transition zone

Janssen F.(1), Soltwedel T., Schewe I., Schauer U., Boetius A., and the FRAM Team

(1) AWI - Alfred Wegener Institute Helmholtz Centre for Polar and Marine Research

Since about fifteen years the Alfred Wegener Institute | Helmholtz Centre for Polar and Marine Research (AWI) carries out time-series observations in the North Atlantic – Arctic transition. Activities are focused on water mass exchange through Fram Strait and on ecosystem studies at the deep-sea observatory ‘HAUSGARTEN’. HAUSGARTEN is the first and by now only open-ocean long-term observatory in a polar region and a key site of the EMSO-Network. The location in Fram Strait – being the sole deep connection between the North-Atlantic and the Arctic Ocean – is of special interest with respect to the exchange of heat and freshwater between the Arctic and lower latitudes. The Fram Strait ecosystem is expected to be particularly vulnerable to Global Change related variations in environmental conditions, including the ongoing sea-ice retreat. Obtained time series of physical and ecological observations demonstrate the tight connection between abiotic habitat properties and ecosystem characteristics – including the rates and the nature of vertical particle fluxes as well as the composition of pelagic assemblages and benthic communities from microbes to megafauna. These findings clearly advocate for a multidisciplinary and multiscale approach that combines fixed-point and region-wide time-series observations and form the basis of our current proposal for the integrated deep-sea observatory ‘FRAM’ (FRontiers in Arctic marine Monitoring). In addition to the integration of existing physical and ecosystem observation components to fully exploit synergies, strategies for FRAM also include the implementation of novel instruments (e.g., ice-tethered platforms, profiling moorings, benthic crawlers) to extend observation-capacities in space and time – including periods of limited access due to permanent ice-coverage.

Placed on panel No. 25
MeBo drilling and borehole observatories for multi-disciplinary time series data

Kopf A., Freudenthal T., Wefer G.
MARUM, Univ. Bremen, Germany

Seafloor drill rigs are cost-effective, remotely operated systems that recover sedimentary records of the upper sub-seafloor (<200m). As a recent milestone, the MeBo seafloor drill rig developed at MARUM (Univ. Bremen, Germany) was used for the installation of shallow borehole observatories. Two different systems are currently used for the MeBo seafloor drill. A simple design, the MeBoPLUG, separates the inner borehole from the overlying ocean by using o-ring seals at the conical threads of the drill pipe. The systems are self-contained and include data loggers, batteries, thermistors and a differential pressure sensor. A second design, the so-called MeBoCORK, is more sophisticated and also hosts an acoustic modem for data transfer and, if desired, fluid sampling capability using osmotic pumps. Of these MeBoCORKs, two systems have to be distinguished: The CORK-A (A = autonomous) can be installed by the MeBo alone and monitors pressure and temperature inside and above the borehole (the latter for reference). The CORK-B (B = bottom) has a higher payload and can additionally be equipped with geochemical, biological or other components. Owing to its larger size, it is installed by ROV and utilises a hotstab connection from beneath which coiled tubing with a conical drop weight is lowered to couple to the formation. These tubes are fluid-saturated and either serve to transmit pore pressure signals or collect pore water in the osmo-sampler. In the near future, a slim BB-seismometer will be added to the MeBoCORK. Likewise, MeBoPUPPIs are currently developed, which host pressure and temperature transducers and a seismometer. In contrast to the former design, the pop-up mechanism will release the data logger and communication so that data transmission via satellite makes a second visit for recovery of the observatory obsolete. Within EMSO, a real-time cable connection will even increase the benefits of these sub-seafloor observatories.

Placed on panel No. 26
MEUST (Mediterranean Eurocentre for Underwater Sciences and Technologies) is a permanent submarine observatory to be deployed offshore of Toulon within the context of the KM3NeT neutrino telescope and EMSO deep-sea observatory European networks. This project encompasses the scientific motivations for neutrino telescope observations and Earth and Sea Sciences (ESS) observations. The ESS (MEUST SE) is based on two complementary components: an Instrumented Interface Module (MII) and an autonomous mooring line. The MII consists in a frame laid down on the seabed and connected to a MEUST node. The MII is instrumented with power consuming sensors and high data rate like video cameras. MII integrates AC/DC converters and electro-optical components for the network. All sensors embedded on the MII will be read in real time from the shore station through the Ethernet link. The MII will also host an acoustic modem designed to establish communication with the distant (2 to 3 km) autonomous mooring line. The mooring line will instrument the 2000 m of the whole water column up to 500m below the surface, with autonomous sensors distributed along its full height. Its autonomy is over one year with regular low cost recovery to calibrate the deployed sensors and change the batteries. Within the mooring line, the sensors data will be transferred through an inductive backbone (on wire ropes) to an embedded computer. Data retrieval will be done daily through this acoustic link which will allow daily data retrieval through the MII and MEUST cabled infrastructure. In addition to reading data remotely, this system is interactive and it will allow us to change adapt the sensor configuration and sampling frequency upon the line parameters such as the frequency of measurement and thus adapt environmental factors evolution like to sea current events.

Placed on panel No. 27
Observations on the deep-sea benthologic fauna using a baited lander in the Santa Maria di Leuca cold-water coral province

Maiorano P., Sion L., Capezzuto F., Carlucci R., Mastrototaro F., Panza M., D’Onghia G., Tursi A.

Department of Biology, University of Bari, Bari, Italy

Video inspections are generally less invasive than traditional sampling gears on fragile deep-sea ecosystems. They could also provide information on the small-scale species distribution, abundance and behaviour. In the context of the CoralFISH EU 7FP project, the MEMO (Marine Environment MOntoring system) baited lander has been developed with the aim to investigate the distribution of the benthopelagic fauna in the Santa Maria di Leuca (SML) cold-water coral province, which is located along the Apulian margin, a few miles off Cape Santa Maria di Leuca (Italy) in the Northern Ionian Sea (Central Mediterranean).

MEMO consists of a stainless steel metallic frame, 2 digital cameras, a multiparametric probe, a currentmeter (doppler), an acoustic modem, and an ICT infrastructure capable of managing the entire system. The lander can work down to 1200 m in depth for 48 consecutive hours.

A total of ten deployments between 547 and 790 m were carried out during 3 video surveys conducted in 2010 and 2011, for a total time of 52 and 38 hours of video records in the coral and non-coral habitats respectively. The different species have been identified through morphological characteristics observed in the video frames.

A total of 19 benthopelagic species and 1 at genus level were identified. The species Paromola cuvieri, Conger conger and Helicolenus dactylopterus resulted the most abundant species in the coral habitat. An evidence of the coral habitat selection of some species was detected.
CREEP-2: Ultra-long-term rock deformation experiments at a cabled deep-sea observatory


(1) University College London, Department of Earth Sciences, Gower Street, London, UK
(2) UCL, London, UK
(3) University of Edinburgh, UK
(4) INFN-LNS, Catania, Italy
(5) INGV, Rome, Italy

It is now well-recognised that, for bulk rock deforming in a brittle manner under triaxial stress conditions, stress corrosion reactions between the rock matrix and pore fluids will lead to highly non-linear time-dependent deformation. This allows rocks to deform even under a constant applied stress that is well below their apparent strength over extended periods of time; a phenomenon known as brittle creep. The highly non-linear stress dependence of brittle creep means that a 5% decrement in applied stress can extend the time-to-failure by as much as an order of magnitude. In turn, this means that experiments to study this phenomenon need to extend from hours to weeks to years. Such long-term experiments are not practical or feasible in a normal rock mechanics laboratory. We have therefore turned to the stable environment of the deep sea, where pressure and temperature remain essentially constant throughout the year. We report on the design of a novel apparatus to perform ultra-long-term deformation experiments on multiple rock samples that uses the water pressure of the deep sea environment to provide both the confining pressure and the deforming stress (CREEP-2). The apparatus will be connected to the INFN-INGV marine cable system at the Catania Test Site, Italy. CREEP-2 will also provide the test-bed for developing and testing models to forecast brittle failure in both experimental and natural (earthquake and volcano) datasets. The model testing will be performed in a real-time, verifiably prospective mode in order to avoid any selection biases that are inherent in retrospective analyses. The project will ultimately quantify the predictability of brittle failure, and how that predictability scales from relatively simple, controlled laboratory conditions to the complex uncontrolled crustal scale of the real world.
A new look at the lithosphere-asthenosphere structure of the SW Iberian Margin from seismic tomography at the EMSO site

Monna S.\(^{(1)}\), Cimini G.B.\(^{(1)}\), Frugoni F.\(^{(1)}\), Montuori C.\(^{(1)}\), Geissler W. H.\(^{(2)}\), Matias L. M.\(^{(3)}\), Favali P.\(^{(1)}\)

(1) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy,  
(2) Alfred Wegener Institute for Polar and Marine Research, Bremerhaven, Germany  
(3) Universidade de Lisboa, Lisbon, Portugal

The Western Iberian Margin has a well-documented history of strong earthquakes and represents one of the most important tsunamigenic areas in Europe. The fault zones where these very large earthquakes occur have not been identified so far, and there is a heated debate on their possible location. An innovative investigation on lithospheric structure in this complex plate boundary setting was conducted at the EMSO site, based on an OBS array and a GEOSTAR-class multiparametric observatory deployed off-shore Cap St. Vincent at 3200 m depth during the EC-NEAREST project. We present a published three-dimensional P wave upper-mantle tomography model of the SW Iberian margin and Alboran Sea, computed down to 600 km depth. The new model highlights interesting features in both domains (Alboran and Atlantic): while it confirms the existence of the fast anomaly below the Alboran seen in previous works, it also shows an interesting lithosphere-asthenosphere system below the Atlantic. A high velocity body is imaged roughly below the Horseshoe Abyssal plain down to sublithospheric depths, this feature suggests either a possible initiation or relic subduction. Furthermore, pronounced low velocity anomalies pervade the upper mantle below the Atlantic domain and separate the lithospheres of the Alboran and Atlantic domains.
Svalbard Integrated Earth Observing System (SIOS) Status under the preparatory phase and challenges towards implementation

Ørbæk J. B.(1), Stenersen K., Andersen B., Biebow N., Ellis-Evans C., Glowacki P., Holmén K., Priamikov S., Rønneberg R., Shin Hyoung C., Vitale V.

(1) Forskningsrådet - Research Council of Norway (SIOS PPP Coordinator)

The Svalbard Integrated Earth Observing System (SIOS) is a distributed research infrastructure of global significance on the ESFRI Roadmap, localized in and around Svalbard. Building on the extensive research infrastructure already in place, SIOS will upgrade, operate and make available a regional state-of-the-art Arctic observing system for long-term measurements in an Earth System Science perspective. The SIOS Knowledge Centre will establish and manage shared resources and joint activities. It will develop methods for how observational networks are to be designed and implemented. The Centre will lay the foundation for better coordinated services for the international research community with respect to access to infrastructure, data and knowledge management, sharing of data, logistics, training and education. The joint services offered by SIOS will generate added value for all partners beyond what their individual research can provide. The services will benefit the international polar research community as a whole and will make SIOS the leading polar research infrastructure in the Arctic.

The SIOS Preparatory Phase project elaborates the Statutes (reflecting the governance and the administrative and legal plans) for the new joint organisation, the Scientific & technical description (status, needs, tasks and strategy) for the whole research infrastructure, the Business plan for the organisations first five years and further upgrade (reflecting the fact that all investments will come from the participating countries, not the EC), the Governance in the form of rules of procedure (policies on access, data, logistics etc. and by laws) and an Infrastructure strategy plan for the upgraded observing system.

An overview of the multitude of reports connected to the scientific, technical and financial case for SIOS, which is elaborated under the SIOS Preparatory Phase Project to produce the necessary knowledge base on which the final decision making process by the SIOS Stakeholders will depend, is presented in the poster.
Within the EMSO and KM3NeT Italia framework INFN and INGV develop and run deep sea infrastructures and instruments for a wide range of scientific research developed by a network of institutional partners. The marine bioacoustic research began in 2005 with the NEMO-OnDE platform deployed off Catania (Sicily). Wideband acoustic data collected during 2 years of operation revealed an unexpected presence of sperm whales in the Ionian Sea and demonstrated the importance of continuous acoustic monitoring of the deep marine environment.

The seafloor installations now available in the Mediterranean Sea open new research and monitoring perspectives, however new challenges emerge, mostly related to the processing and storage of huge data streams. Dedicated algorithms have been develop to analyze cetacean sounds, ranging from the low frequency calls of fin whales to echolocation pulses of odontocetes, including elusive endangered species such as beaked whales. Mapping seasonal presence of animals may reveal migration patterns or particular use of the areas (feeding, breeding...) and therefore support effective protection actions. These monitoring platforms can fill the gaps linked to traditional surface surveys, usually concentrated during the good season and anyway rarely covering wide areas and long time windows.

Sperm whales are the most easily detectable cetaceans. The development of an algorithm that identifies and analyzes the sperm whales clicks allows to reveal their size and, with some limitation, age and sex, to provide information on the population size and structure.

The goal of the research include the mapping of the presence of fin whales, and the measure of the low frequency background noise that may have an impact on these animals (communication masking, hearing impairment). AIS data, collected by dedicated receivers in Catania and Capo Passero, allows to link measured noise levels to the ship traffic in the area, to identify noisy ships, to model the impact on marine mammals and consequently to develop mitigation plans.

These activities are functional to the implementation of the MSFD (EC/2008/56), in particular for the monitoring of biodiversity and noise, and to provide feedback about conservation policies. Examples of ongoing bioacoustic research will be presented.
SUNRISE “Sensing, monitoring and actuating on the UNderwater world through a federated Research InfraStructure Extending the Future Internet.”

Petrioli C.(1), Potter J. R.(2), Petroccia R.(1)

(1) Computer Science Department, University of Roma "La Sapienza", Rome
(2) NATO STO Centre for Maritime Research and Experimentation, La Spezia

Oceans and lakes cover 71% of the earth’s surface and play a key role in climate and weather. Therefore, we must learn to sustainably exploit and protect our vast seas and oceans. The goal of the SUNRISE project lies in bringing the Internet of Things to the underwater domain with the vision to empower sustainable and remotely-operated development and management of the marine environment, crucial to our future as a species on this overpopulated planet. Our technology combines underwater sensing, communication, networking and navigation capabilities to provide a complete system, controlled over the Internet, consisting of mobile robots, intelligent sensors and actuators which can self-organise to accomplish required tasks. The SUNRISE concept stems from the experience of existing European underwater test beds developed at the partner sites, such as the Littoral Ocean Observatory Network (LOON) semi-permanent installation developed in La Spezia by the NATO STO Centre for Maritime Research and Experimentation (CMRE), with the support of the University of Rome (URM). Five federated underwater (UW) communication networks, based on the LOON infrastructure, will be designed, built and deployed by consortium partners in diverse environments, to be web-accessible and interfaced with other existing facilities to experiment with Future Internet technologies. SUNRISE will therefore combine existing technology with novel communication, networking and cooperation paradigms in open experimental facilities. An innovative software-defined open-architecture will be designed, based on the Software-Defined Open Architecture Modem concept of the CMRE and the SUNSET system developed by URM, to allow the communication, interaction and cooperation of a heterogeneous set of underwater platforms in an intuitive and intelligent way. The SUNRISE network will provide key tools for UW Internet development long after the project ends, with the broad involvement of researchers, manufacturers and users ensuring that appropriate technologies are developed and implemented in products that support sustainable marine management.

Placed on panel No. 33
Deep ocean pressure variability from the Antares neutrino telescope

Pinardi N.\(^{(1,2)}\), Giacomelli L.\(^{(1)}\), Margiotta A.\(^{(1,2)}\), Cecchini\(^{(2)}\), Zavatarelli M.\(^{(1,2)}\) on behalf of the ANTARES Collaboration S.

\(^{(1)}\) Bologna University, Bologna, Italy
\(^{(2)}\) INFN - Bologna Section, Bologna, Italy

The deep pressure time series from the oceanographic instrumented line, IL07, located in the area offshore Toulon, in the North-western Mediterranean has been analyzed for the 2009 and 2010 years. The pressure sensor is located approximately at the depth of 2193 m, about 200 meters above the sea floor. The pressure sensor data, transformed into depth values, and depth anomalies were compared with the tide gauge, sea level record at the Toulon station that is about 40 km distant from the instrumented line.

It was found that barotropic tidal motion and surface pressure deviations (inverse barometer effect) are well correlated between the two stations and that differences can be ascribed to the vertically averaged density components of the total pressure. Such Columnar Density Content (CDC) is of paramount importance to monitor climate variability and change. In particular, during 2009 and 2010, two intense water mass formation events occurred in the area that are recorded in the CDC values from the deep pressure records. It is our understanding that deep pressure ocean sensors are optimal measurements to monitor open ocean tidal motion and any other high frequency barotropic motion and well as thermohaline properties of the deep abyssal ocean basins.
A multidisciplinary approach in the analysis of the low frequency hydrophone aboard the NEMO-SN1 observatory of EMSO: first results on shipping noise and bioacoustics


(1) INFN – LNS, Catania, Italy

The NEMO-SN1 observatory was deployed and connected in June 2012 using the Cabled termination of the Catania cabled infrastructure, part of the Western Ionian Sea node of the EMSO Research Infrastructure. The observatory was equipped with several probes and sensors acquired on-line from shore. A SMID DT405D hydrophone was installed aboard the NEMO-SN1 observatory in the aim of searching for acoustic signals in the frequency range 0.001:1000 Hz. Hydrophone’s signals, are sent to two different read-out channels with +30 dB and +60 dB gain respectively, thus digitised by a 12 bit ADC at 2000 Hz sampling rate frequency. The low-gain channel data is primarily used to search for seismic events, the high-gain channel data is used for acoustic monitoring of sea noise and search for biological signals. All data are continuously recorded on-shore and saved in files for off-line analysis. Data has been analysed in collaboration between the EMSO Italia and SMO teams. Thanks to the use of an AIS (Automatic Identification System) antenna installed at the Catania infrastructure, acoustic data were analysed in correlation with ship-traffic information. Preliminary results show correlation between sea-noise increase and shipping activities. Clear evidence of the presence of fin whales in the area has been also found.

Placed on panel No. 35
The SMO-KM3NeT Italia Acoustic array: technological innovative solutions and first results


(1) INFN – LNS, Catania, Italy

Within the Activities of KM3NeT Italia, a prototype detector was deployed the 23rd March 2013. The detector is the technological demonstrator of the 8 marine structures that will be installed offshore Capo Passero during the next 3 years and that will form the largest high-energy neutrino telescope in the Northern Hemisphere. The prototype is a three dimensional “tower-like” mechanical structure, made of 8 stories (8 m horizontal length) interconnected by ropes, anchored on the sea bed (3500 m depth) and kept in tension by appropriate buoy, reaching a vertical extension of about 500 m above the seabed. The tower hosts 4 optical modules and 2 hydrophones at each storey, two CTDs and one Doppler current sensor. All sensors are digitised underwater and data are sent continuously to shore via a vertical backbone and a 100 km-long electro optical cable, used also to provide power to the detector from the shore laboratory, in the harbour of Capo Passero (South East Sicily). The hydrophone antenna was designed, built and installed within the SMO (Submarine Multidisciplinary Observatory) project. A successful R&D activity was carried out to select and test large-bandwidth (10 Hz-70 kHz) hydrophones for 4000 m depth application, with optimal and constant sensitivity as a function of depth. Innovative read-out electronics was developed to obtain underwater GPS time stamping of hydrophone data with accuracy better than 1us. The SMO hydrophones fulfil three tasks: provide acoustic positioning to the detector, monitor the acoustic noise in the aim of searching for acoustic neutrino signals, detect biological signals of cetaceans. First results will be presented and discussed.
The acoustic detection infrastructure in East Sicily: a joint EMSO-KM3NeT open infrastructure


(1) INFN – LNS, Catania, Italy

Since 2005 INFN and INGV jointly operate submarine observatories in the Western Sicily EMSO node. The collaboration, signed at a regional, national and European level, has promoted the installation and operation of two cabled deep-sea infrastructures: the Catania node (37°30'N 015°23'E), 2100 m depth, 25 km offshore the harbour of Catania, Sicily and the Capo Passero node (36°17'N, 015°59'E), 3500 m depth 100 km offshore Portopalo di Capo Passero. Both infrastructures are fully operational and they are, together with the ANTARES neutrino telescope, installed offshore Toulon (France), the first cabled facilities available for EMSO and KM3NeT. Passive acoustic monitoring in deep sea represents a field of common interest for both institutes and projects: the Catania infrastructure hosted from 2005 to 2006 the NEMO-OnDE acoustic array (4 large bandwidth hydrophones), and from 2012 hosts the refurbished NEMO-SN1 multidisciplinary observatory (4 large bandwidth hydrophones and 2 low frequency hydrophones) and the EMSO-SMO acoustic array (4 large bandwidth hydrophones). Since March 2013 the SMO acoustic antenna (10 large bandwidth hydrophones) is also operational at the Capo Passero site. Acoustic detectors are sampled underwater and send continuously data to shore providing real-time acoustic monitoring of the deep-sea environment. This is at present the largest acoustic infrastructure in the Mediterranean Sea with application in different research fields. Further extension of the existing acoustic antennas, foreseen in EMSO and KM3NeT will be also presented.
A new microbial Connected In Situ Instrumented Colonizer System (CISICS) at Lucky Strike Observatory (EMSO Azores)

Rommevaux-Jestin C.,(1), Godfroy A.,(2), Legrand J.,(3), Lesongeur F.,(2), Henri P.,(4), Guyader G.,(3), Coail J.Y.,(3) and the MoMARSAT13 scientific Team

(1) IPGP/CNRS Institut de physique du globe de Paris, Paris, France,
(2) LM2E, Ifremer, Brest, France
(3) S2IM, Ifremer, Brest, France
(5) IPGP, Paris, France

At ridge axes, where hydrothermal fluids and nutrients are abundant, chemotrophic microorganisms colonize oceanic basalts and contribute, in addition to seawater and hydrothermal fluids interactions, to rock weathering through redox reactions.

Since 2006, we have benefited from the European and national MoMAR project with the installation of a deep-sea observatory at Lucky Strike hydrothermal field (EMSO Azores) and annual access to the site, to implement in situ microbial colonization experiments using oceanic rocks. Various incubators deployed for various durations around different vents at the Lucky Strike hydrothermal field and on the abyssal plain, have allowed us to show that the microbial diversity and the weathering phases on oceanic rocks are highly variable and related to hydrothermal fluids influence and mineral substrate.

To study the hydrothermal forcing on microbial colonization and their impact on the oceanic crust alteration processes, a new microbial Connected In Situ Instrumented Colonizer System (CISICS) was deployed at AISICS hydrothermal chimney during the MoMARSAT13 cruise (Aug.-Sept. 2013, N.O. PP?). CISICS consists of 12 mini-colonizers filled with basaltic glasses and stacked on two floors (i.e. 3 biotic, 3 abiotic per floor) in a perforated titanium cylindrical chamber. Two MicrelTM temperature sensors record over deployment time the temperature every 5 min on each floor, and a pumping system performs eight fluids samples filtered through 1µm, 0.45µm and Sterivex® 0.22µm filters to recover particles and microorganisms, and stored in 150ml plastic pouches. The first sampling was performed on September 3rd 2013 at 14h (temperatures of 148° and 57°C recorded) with 45 days of intervals between the following samplings. CISICS is connected to the SeaMon East node via a 25m cable and the Borel buoy, allowing the transmission of temperature data of the two sensors, and the possibility to trigger a sample from land if an event (i.e. temperature change) occurs.

Placed on panel No. 38
MoMAR Long Term Monitoring of the Mid Atlantic Ridge

Sarradin P. M.

Ifremer, Brest, France

Hydrothermal circulation at mid-ocean ridges is a fundamental process that impacts the transfer of energy and matter from the interior of the Earth to the crust, hydrosphere and biosphere. The unique faunal communities that develop near these vents are sustained by chemosynthetic microorganisms that use the hot fluid chemicals as a source of energy. Environmental instability resulting from active mid-ocean ridge processes create changes in the flux, composition and temperature of emitted vent fluids and influence the associated hydrothermal communities.

The MoMAR (which stands for Monitoring the Mid-Atlantic Ridge) project was initiated 10 years ago by the InterRidge Program to promote and coordinate long-term multidisciplinary monitoring of hydrothermal vents at MAR. It aims at studying vent environmental dynamics from geophysics to microbiology. More recently, the MoMAR area has been chosen as one of the 11 key sites of the European project ESONET NoE. This paper describes the deployment and first results of an acoustically-linked multidisciplinary observing system at the Lucky Strike vent field, with satellite connection to shore in operation from 2010. Monitoring this large hydrothermal field, located in the centre of one of the most volcanically active segment of the MAR, will offer a high probability of capturing evidence for volcanic events, observing interactions between faulting, magmatism; hydrothermal circulation and, evaluating their impact on the ecosystem.
High-resolution dynamics of a deep hydrothermal mussel assemblage monitored through the MoMAR observatory

Sarrazin J.(1), Cuvelier D., Peton L., Legendre P., Sarradin P. M.

(1) IFEMER

Although the spatial distribution of hydrothermal vent assemblages in relation with environmental conditions has been assessed in several papers, very few data are available on the temporal variation of the fauna and corresponding abiotic factors within a vent community. This study presents one of the longest integrated (faunal and environmental data) time series ever obtained in a hydrothermal ecosystem. The data were acquired using the TEMPO ecological module that was deployed between 2006 and 2008 on the Mid-Atlantic Ridge. It provided the very first insights on the day-to-day variations in a Bathymodiolus azoricus mussel assemblage from the Lucky Strike vent field. It also imparted valuable information on longer-term variation in temperature and iron concentrations.
Observations on the behaviour of deep-sea sharks in the Santa Maria di Leuca cold-water coral province

Sion L., Capezzuto F., Carlucci R., Carluccio A., Indennidate A., Maiorano P., D’Onghia G.

Department of Biology, University of Bari Aldo Moro, Bari, Italy

Baited cameras on benthic landers attract deep-sea fish in order to provide information on their abundance, activity and behaviour. As part of the CoralFISH 7FP EU project and OBAMA-PRIN research funded by the Italian Government, the baited lander MEMO (Marine Environment MOnitoring system) was deployed in the Santa Maria di Leuca (SML) cold-water coral province (Central Mediterranean) in June and November 2010, and March-April 2011. A total of ten deployments between 547 and 790 m were carried out, for a total time of about 90 hours of video records. The different species were identified through morphological characteristics observed in the video frames. The total number of individuals by species was counted. The behaviour was noted with respect to investigation activity, response to the bait and ingestion of the bait.

A total of 4 shark species (Centrophorus granulosus, Dalatias licha, Etmopterus spinax and Hexanchus griseus) were observed in the Santa Maria di Leuca cold-water coral province. The dominant behaviour of the sharks was investigation of the bait at the foot of the lander. Feeding activity on the bait was only shown in H. griseus and C. granulosus.
The JERICO project aims to integrate key autonomously operating coastal observatories in Europe, by addressing their future within a shared pan-European framework that will enhance harmonization, performance and sustainability at the transnational level. It aims to provide a common, transparent platform for the identification and dissemination of best practices for the design, implementation and maintenance of such observatories, and will contribute to the definition of data quality and dissemination standards for coastal data.

To highlight its potential as a resource to the wider user community, some of the infrastructures networked by JERICO are offering free access to users through its Trans National Access (TNA) programme for international research and technological development. To date, JERICO has organized and closed two TNA calls, involving four classes of facilities: ferryboxes, fixed platforms, gliders, and calibration laboratories. Fourteen out of nineteen submitted proposals were selected by an independent Panel of Experts, and the related projects are or have been supported by JERICO. The operators of the targeted facilities are contributing to these projects by providing all the logistical, technological and scientific support as well as specific training, if needed.

The activities developed in the framework of JERICO TNA are helping to build long-term collaborations between users and JERICO partners, and are serving to promote innovation and the transfer of know-how in the coastal marine sector that offers rich promise for the future. Moreover, besides promoting the existing coastal infrastructures beyond national borders, outcomes of the TNA calls evidence the major existing client communities and their scientific and technological needs, and also the presently most attractive services amongst those offered. If this result is an indicator of priorities for future development of the network for some, for others it can be a challenge/incentive to develop new services and new marketing strategies to attract other communities.

Acknowledgements: JERICO – Towards a Joint European Research Infrastructure network for Coastal Observatories is funded by the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° 262584.
Mobile platform for the investigation of spatial and temporal variability in the deep seafloor

Thomsen L.

Jacobs University Bremen

Environmental conditions within deep-sea ecosystems vary temporally and spatially over a range of scales. To date, short periods of intense ship-borne activity or low resolution, fixed location studies by Lander systems have been the main investigative methods used to investigate such sites. Cabled research infrastructures now enable sensor packages to receive power and transmit data from the deep-sea in real-time. By attaching mobile research platforms to these cabled networks, the investigation of spatial and temporal variability in environmental conditions and/or faunal behaviour across the deep sea seafloor is now a possibility. Here we describe one such mobile platform: a tracked Deep Sea Crawler, controlled in real-time via the Internet from any computer worldwide. Data and the next generation of the crawler will be presented.
Towards the development of the integrated PLOCAN observatory

Villagarcía M. G., Delory E., Barrera C., Cianca A., Rueda M.J., Llinás O.

Oceanic Platform of the Canary Islands (PLOCAN), Canary Islands, Spain

The acquired experience taken over the last 17 years of missions to the ESTOC (European Station for Time series in the Ocean, Canary Islands) oceanic station has provided a historical background about surface and mid-water meteorological, physical and biogeochemical variables.

The recent transfer of mandate of ESTOC to PLOCAN (Oceanic Platform of the Canary Islands) guarantees the operational sustainability of this deep observatory until 2023. This oceanic observatory has become one of the three means of observation that the singular infrastructure has. The other two are: i) the coastal observatory, which is a real time permanent observing system used as an instrumentation test site too, and which includes a cabled system for observation; and ii) the extended observatory, a mobile observing system carrying out coastal, regional and global observation missions.

This integral and complex observatory aims to become part of the emerging pan-European networks, offering an extension towards the southern boundaries of interest. The management of a base for underwater vehicles and instruments, jointly with the test-site instrumentation and the existence of a long-term oceanic time series at ESTOC, will permit to focus on, upgrade and enhance the quality, quantity, projection and usefulness of such an integrated observatory. The data collected expects to contribute to the understanding of factors affecting the ocean in key issues like climate change, acidification, biogeochemistry, upwelling and Saharan dust affection, among others.

By 2015, PLOCAN will also be operating a scientific offshore platform on the East Coast of Gran Canaria. ESTOC will benefit from the platform day-to-day operations and an easier periodic deployment of ocean gliders back and forth to the ESTOC station. Beside logistical, technological and scientific support, gliders are available for complementary measurements in the vicinity of the station. Altogether, PLOCAN represents an open space infrastructure for science and technology at international scope.

Placed on panel No. 44
Sustained Observations off Northern Chile

Weller R. A.

Woods Hole Oceanographic Institute, MA, US

Time series of surface meteorology and of the air-sea exchanges of heat, freshwater, and momentum from a long-term surface mooring located 1,600 km west of the coast of northern Chile collected are analyzed. The observations, spanning 2000 to 2010, are subject to rigorous calibration and quality control procedures and have been withheld from assimilation into numerical weather prediction models. As such, they provide a unique in-situ record of surface meteorology and atmosphere-ocean coupling in a trade wind region characterized by persistent stratocumulus clouds. Ocean cooling is seen in association with the La Niña event in 2006-2008. Linear fits to the annual means had slopes significantly different from zero for the wind speed, the wind stress, the net heat, and the latent heat flux. The significant increases have been in the wind speed, the wind stress, and the latent heat flux over nine full calendar years.

Placed on panel No. 45
Submarine hill, underwater spring and sediment characteristics of the Harmantaşı locality, Northern Saros Gulf (Turkey)

Yücesoy Eryılmaz F.(1), Eryılmaz M., Meriç E., Avşar N.

(1) Mersin University, Mersin, Turkey

Harmantaşı submarine hill located 1 mile offshore and at 30 meters water depth in the north of Saros Gulf and there underwater springs surfacing and their impact on seawater and sediments were studied. For this purpose water and sediment samples were taken along lines and temperature, salinity, pH, DO and organic carbon, total carbonate and heavy metals (Fe, Mn, Cu, Ni, Zn) were analysed. Also determination of the foraminifer types was done.

At some specific points along the 4 lines studied, underwater freshwater springs are found by the help of analysed water parameters. The measurement depth being between surface water and mid depth water and cycle currents being at different direction and speed, is effecting spreading of the freshwater.

Organic carbon content in surface sediment samples are varies between 0.5%-2%. CaCO3 is measured in the range of 6%-83%. Especially intensive shell existence in the stations close to the center caused CaCO3 to be in higher concentrations.

General distribution of measured 5 heavy metals (Cu, Zn, Ni, Mn, Fe) are supporting each other. Metal contents of the northwestern part of the Harmantaşı submarine hill are relatively higher when compared with those from northeastern part. Changes in submarine hill's morphology abundant occurrences of shelled organisms at some stations, differences in speed and direction of currents, are influencing inorganic sediments accumulation which determines the heavy metal concentration.

From the foraminifer species, CaCO3 shelled Haurenid types exist abundantly in spring centers and closeby and getting farther away, aglutinant shell textulariid forms are increased.