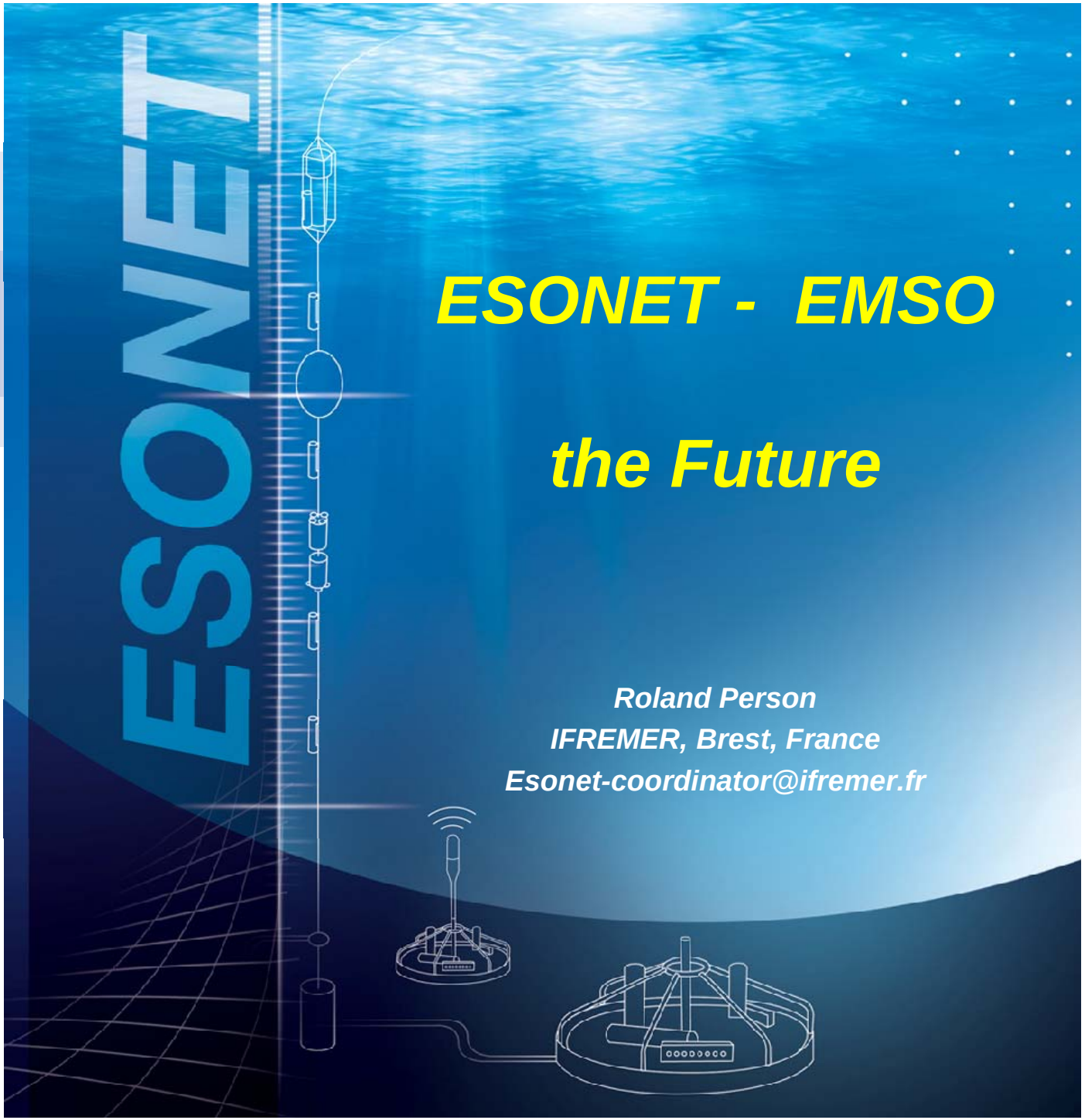
MARINE BOARD



ESONET - EMSO

the Future

Roland Person
IFREMER, Brest, France
Esonet-coordinator@ifremer.fr

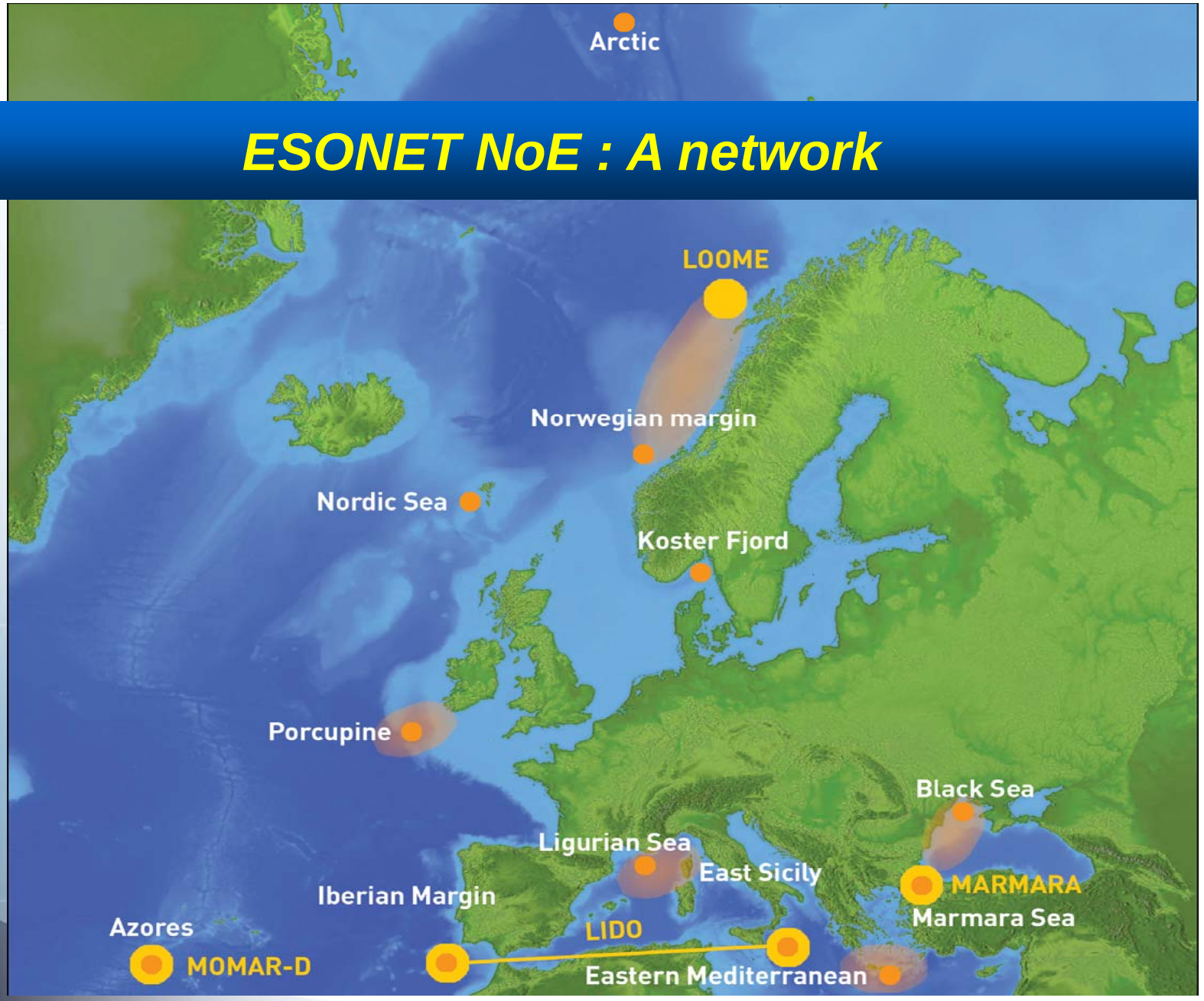
ESONET NOE

History of European Observatory initiatives

A permanent effort:

- Geostar
- Antares, Nemo, Nestor
- ASSEM, ORION-Geostar-
- ESONET CA
- ESONIM
- EXOCET/D
- SN1
- Nearest
- ESONET NoE and EMSO
- Eurosites (FP7 – 2008),
- HYPOX, CoralFish, …

ESONET NoE : A network



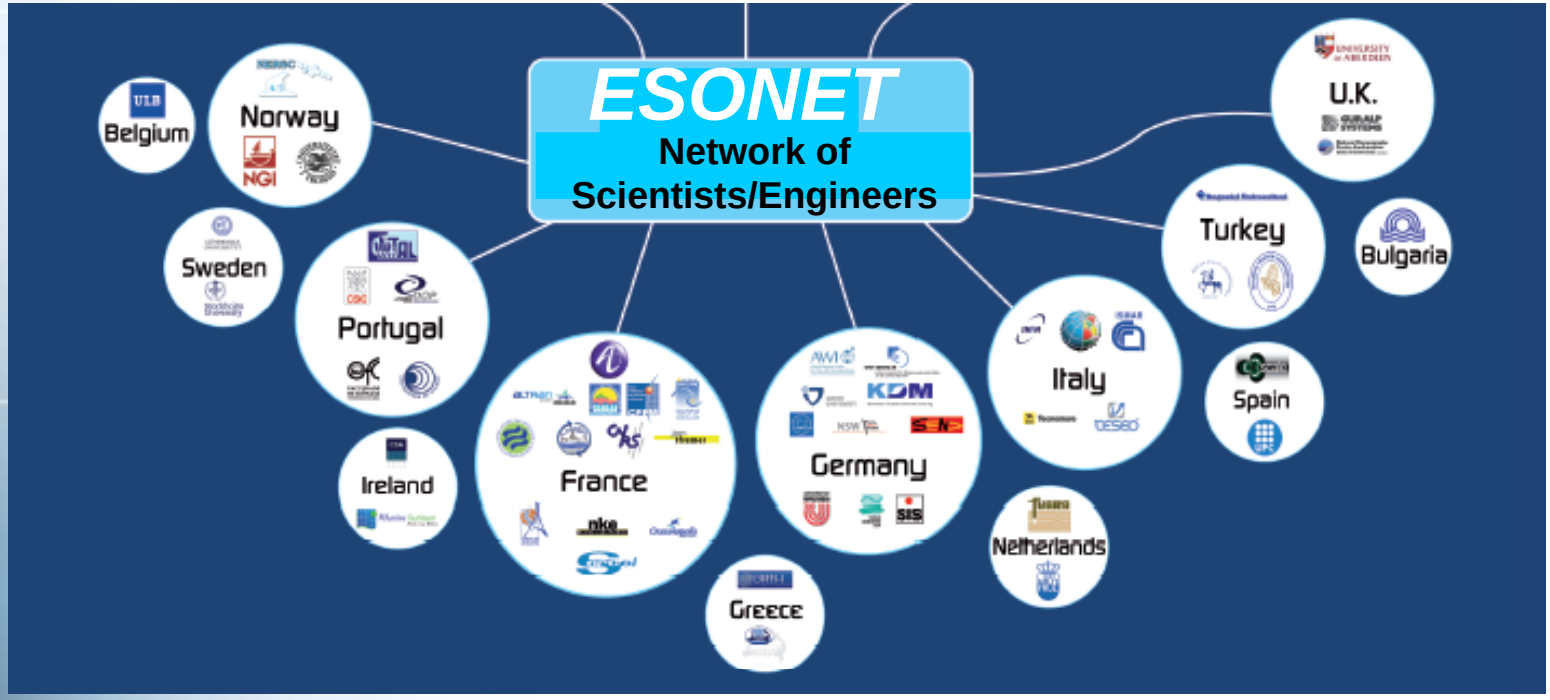
ESONET NOE

european multidisciplinary seafloor observatory

emso

MARINE BOARD

ESONET NoE : A network



ESONET NoE : A network

- ***Numbers:***
  - *more than 300 persons*
  - *54 institutions, + European Commission*
  - *14 countries*
  - *FP6 EU grant: 7 M€,*
  - *Started the 1st March 2007*
  - *Duration : 4 years*

to integrate European research on DEEP sea observatories

http://cordis.europa.eu/esfri/roadmap.htm

EMSO, a Research Infrastructure listed in the **ESFRI Roadmap (European Strategy Forum on Research Infrastructures)**, is an European-scale network of seafloor observatories, constituting a widely distributed infrastructure for long-term monitoring of environmental processes related to ecosystem life and evolution, global changes and geo-hazards. In the EC-FP7 **EMSO-Preparatory-Phase** started in April 2008 for 4 years, with the aim to design and create the entities in charge of managing the infrastructure.

EMSO
European Multidisciplinary Seafloor Observatory

INGV - *Istituto Nazionale di Geofisica e Vulcanologia (Italy)*

IFREMER - *Institut Français de Recherche pour l'exploitation de la MER (France)*

NOCS - *National Oceanography Centre Southampton (United Kingdom)*

KDM - *Konsortium Deutsche Meeresforschung e.V. (Germany)*

NIOZ - *Stichting Koninklijk Nederlands Instituut voor Zeeonderzoek (The Netherlands)*

UTM-CSIC - *Unidad de Tecnologia Marina - Consejo Superior de Investigaciones Cientificas (Spain)*

ITU - *Istanbul Teknik Universi-tesi (Turkey)*

UiT - *University of Tromsø (Norway)*

HCMR - *Hellenic Centre for Marine Research (Greece)*

IMI - *Irish Marine Institute (Ireland)*

UGOT - *Goteborgs Universitet (Sweden)*

FCT - *Fundação para a Ciência e a Tecnologia (Portugal)*

EMSO-Preparatory Phase

Start: 1st April 2008 (4 years)

Coordinator: INGV - Paolo Favali

Main objectives:

- **To establish the governance for the EMSO infrastructure serving scientists and stakeholders in and outside Europe for long-term deep water observations and investigations**
- **To enable the deployment of the infrastructure and its long-term management, including the solution of technical bottlenecks**
- **To promote the catalytic process and synergic effort at EC and National levels, coordinating and harmonising all available resources**

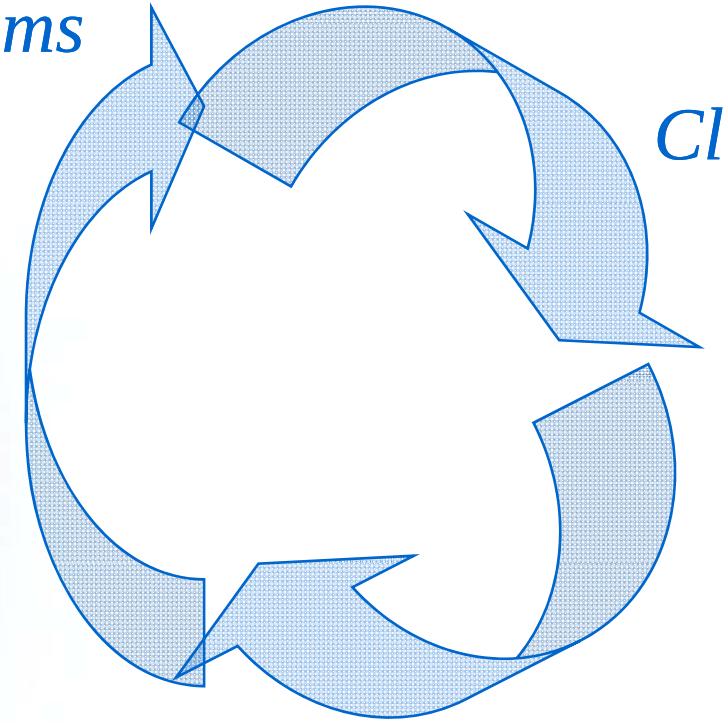
EMSO is

A European distributed marine Research Infrastructure: permanent, large-scale, deep-sea laboratory to address the key issues

Marine Ecosystems

Climate Change

Geo-Hazards



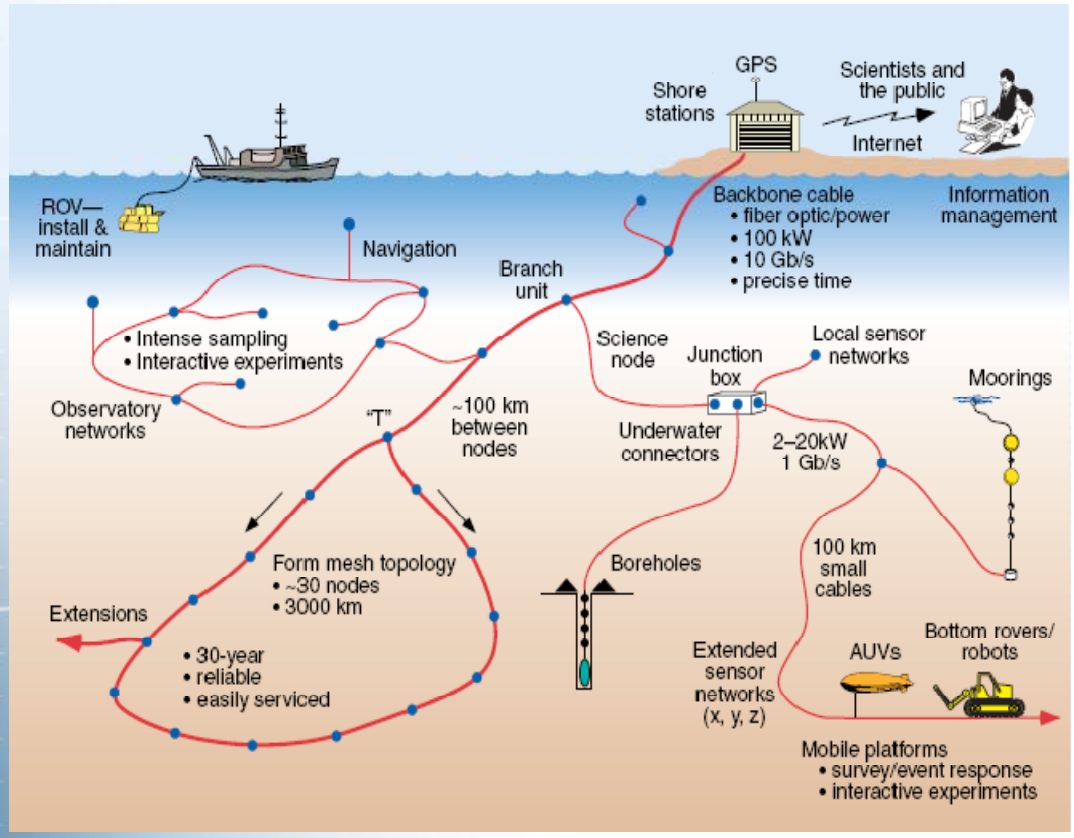
What are fixed observatories?

Unmanned, multi-sensor platforms to make measurements from above the air-sea interface to below the seafloor, and with different configurations related to the communications:

1) **Stand-alone and delayed mode observatories**

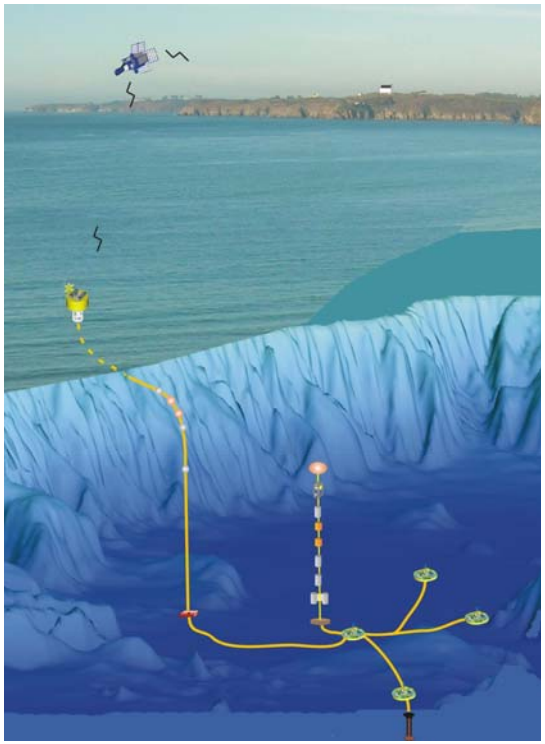
2) **Mooring and seafloor observatories with acoustic or cabled capabilities**

Cabled configuration



NRC, 2003

Mooring with satellite communications



Source "Implementation Strategies for ESONET and EMSO Appendix A", 2009

Need for long-term observations

- **Sustained observations are essential at a sufficiently high frequency to explore the time changing properties of the oceanic environment**

- **Investigation of the complex interrelations between processes and properties from the top of the ocean to the seabed beneath:**

  - Short-time scales (minutes, hours to days)

  - Longer-time scales (annual to decadal)

ESONET/EMSO is addresdding diversity and complexity

- **Physical oceanography**

water mass characterisation, water column processes, thermodynamics, ice cover, climatology, and impacts on climate change

- **Biogeochemistry**

global carbon cycle and elemental cycling within the ocean through both physical and biological processes, and ocean acidification

- **Marine ecology**

distribution and abundance of sea life, ocean productivity, biodiversity, ecosystem function, living resources, and climate feedbacks

- **Geoscience**

transfer from Earth's interior to the crust, hydrosphere and biosphere, fluid flow and gas seepage through sediments and gas hydrate, non-living resources, sediment transfer to deep-sea and climate change

- **Geo-hazards**

earthquake and tsunami hazard, volcanic hazard, slope instability and failure

Observatory Measurements

- **multiparametric long-term (years) time-series**
- **seabed and water column measurements**
- **common set of sensors for basic measurements and further sensors for specific purposes**

- Seismic ground motion
- Gravity
- Magnetism
- Geodesy and seafloor deformation
- Fluid related processes monitoring
- Chemical and Aqueous Transport (CAT)
- Pore pressure
- Gas hydrate monitoring
- Dissolved Fe, Mn and sulfide species
- Acoustic tomography
- CTD equipment for hydrothermal vents
- Methane
- Carbon dioxide
- Heat Flow

- Nutrient analyzers
- pH, Eh and alkalinity
- hydrocarbon fluorescence
- In situ Mass spectrometer
- Particle flux trap
- Image based particle flux
- Pigment fluorescence
- Deep biosphere sensors
- Time-Lapse Cameras
- Holographic imaging
- Video
- Passive acoustics
- Active acoustics
- Zooplankton sampling
- In situ sample processors with molecular/ genetic probes
- In situ respiration

ESONET NOE

european multidisciplinary seafloor observatory emso

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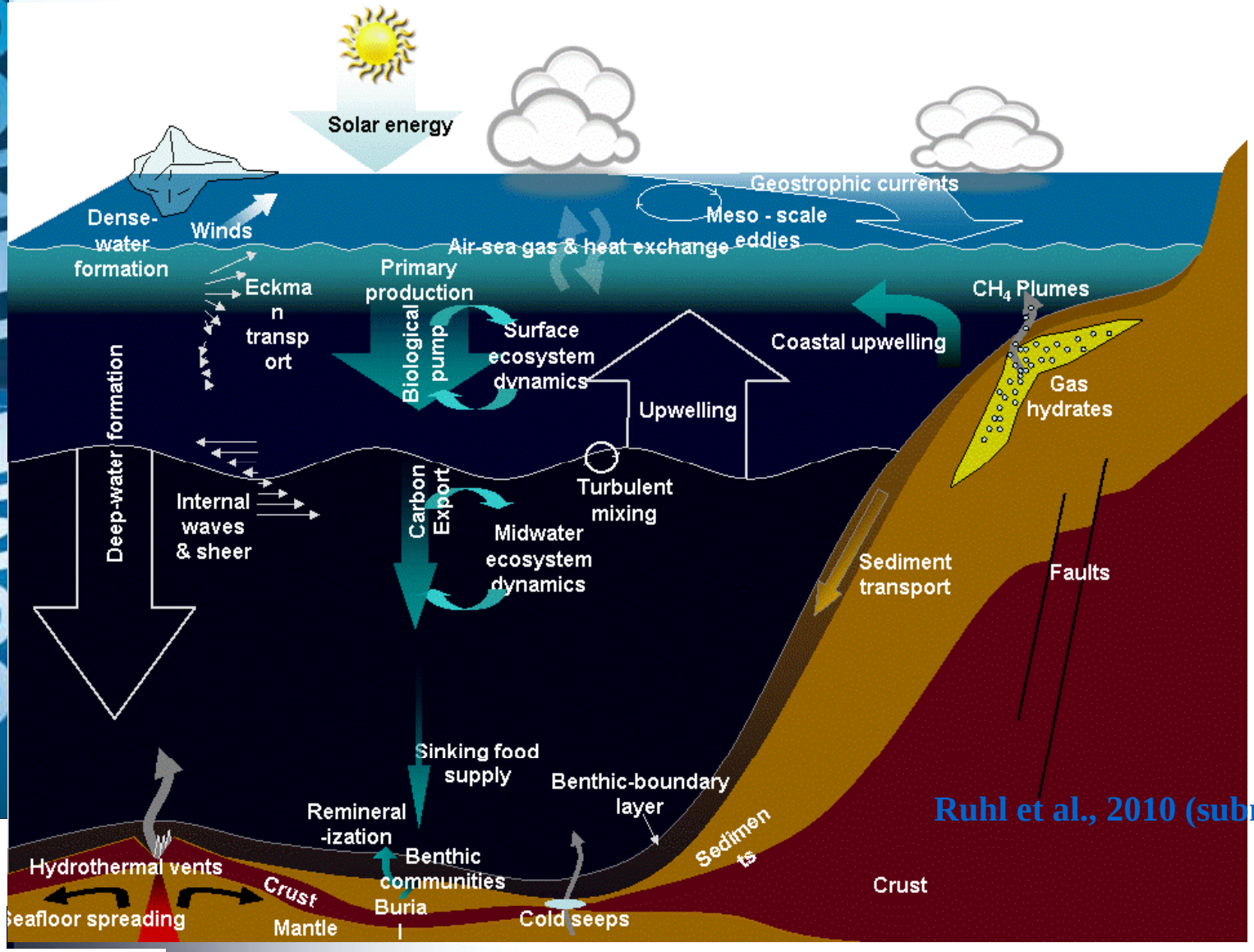
Unravelling the complexity: interactions between atmosphere, ocean, earth processes



Ruhl et al., 2010 (submitted)

ESONET / EMSO - Rationale

- *Scientific: the sea as key element to understand the dynamics and evolution of the Earth components (geosphere, hydrosphere, biosphere)*
- *Technological: maturity of methodology and approaches for deep sea observations (i.e. long-term time series)*
- *Strategic: environmental control for preservation (habitat, biodiversity), mitigation of hazards, new resources exploitation*
- *Cultural: strengthen the European Research Area (ERA) in competition with USA/Canada and Japan*

Main results from ESONET

- **Steps toward regional integration**

-2nd All Regions Workshop held in Paris, Oct. 09:

- Status of observatory projects (Science, infrastructure, Strategy, lobby…)

- Status of running demonstration missions

- Funding strategy discussion

- Official establishment of Regional Core groups

Main results from ESONET

- ***Scientific objectives revised*** ***(H. Ruhl, NOCS)***
  - ***most recent science***
  - ***top level***
  - ***concerted: EU projects, Esonet/EMSO nodes***

« Science Objectives Workshop », Faro Oct. 08

- ***Scientific modules of sensors:***

generic & specific ones firstly described and discussed,

being updated

Main results from ESONET

- ***Steps toward standardisation & interoperability (C. Waldmann, UNIHB/MARUM)***

  - *1st & 2nd **Best practices Workshop**: Bremen Feb.08, Brest Oct 09:* Constitution of WGs, plan of activities, tasks etc..
  - *specifications of **Sensors Interface** (Plug and Play sensors), **sensor registry**: hardware & meta data description*
  - *Identification of important **quality aspects** for generic sensors packages (A. Holford: UNIABDN)*
  - *Recommendations for **underwater intervention** issued*

  (JF Drogou, IFREMER)

  - ***Testing facilities** Data base and recommendations for testing issued (J. Marvaldi, IFREMER)*

Main results from ESONET

- ***Steps toward standardisation & interoperability***

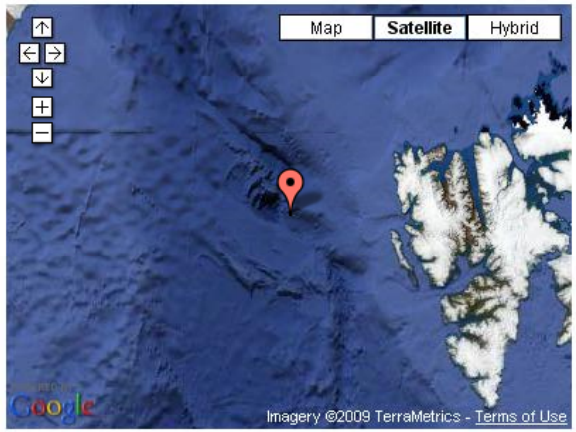
(C. Waldmann, UNIHB/MARUM)

  - Data management and Data infrastructure
    - **Knowledge base**
    - **Data portal**
    - Set up of real time video images recording: tempo mini on VENUS (collaboration IFREMER Neptune Canada) and crawler (Univ. Jacob Bremen)
    - Same data format than EUROSITES and SEADATANET

ESONET data portal

Home | Data archive | Other Information

- Arctic Ocean - Hausgarten
- Black Sea
- Eastern Mediterranean - Hellenic
- East Sicily
- Iberian Margin
- Ligurian Sea
- Marmara Sea
- Azores Observatory
- Nordic Sea
- Norwegian Margin - HMMV
- Norwegian Margin - Storrega
- Porcupine Abyssal Plain
- Koster Fjord



Arctic Ocean - Hausgarten

Abstract

Arctic water exiting into the Atlantic ocean between Europe and Greenland is an important component of the global deep water circulation of the planet and its heat budget. Establishment of a long term station here is important for tracking global change as ice cover decreases but there are also important deep sea habitats such as mud volcanoes in the 'Hausgarten' region, off Svalbard. read more..

ESONET:

Site: Arctic
Coordinates:...,...
Demo mission: MASOX-ARCOONE
...

Legal & Ethical Issues

Archived Data:

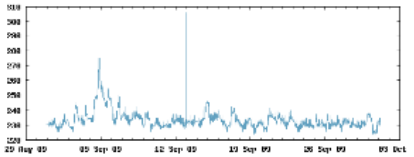
Subscribe to the Hausgarten data news feed here:

1. **Soltwedel, T; von Juterzenka, K; Premke, K et al. (2003):** Sea-bed images of benthos from the AWI-Hausgarten area along OFOS profile PS62/191-1
2. **Bauerfeind, E; Nöthig, E-M; Beszczynska, A et al. (2009):** Biogenic particle and biomarker flux from a mooring time-series at AWI HAUSGARTEN
3. **Hasemann, C (2005):** Investigations on benthic deep-sea meiofauna at station AWI_ATL2-4
4. **Hasemann, C (2005):** Investigations on benthic deep-sea meiofauna at station AWI_ATL2-3
5. **Hasemann, C (2005):** Investigations on benthic deep-sea meiofauna at station AWI_ATL2-2
6. **Hasemann, C (2005):** Investigations on benthic deep-sea

Observatory Data:

Sensor Observation Service (SOS)

→Visit the Hausgarten SOS client
Latest measurements (Wave height (mm)), 2010-01-01



Sensor Registry:

→Visit the Hausgarten Sensor Registry entry XML
Sensors:

- Conductivity - Conductivity Sensor 4319 (Aanderaa Data Instruments Inc.)
- ACDP - ADP 1000 (Sontek/YSI)

Main results from ESONET

- ***steps toward implementation strategies (M. Gillooly - F. Grant - IMI)***

  - *Implementation plan for Generic Cable site and Standalone Sites*
  - *LEE database environmental atlas established, best practices for environmental issues*
  - *Report to EMSO on implementation strategies, governance and long-term funding.*

Main results from ESONET

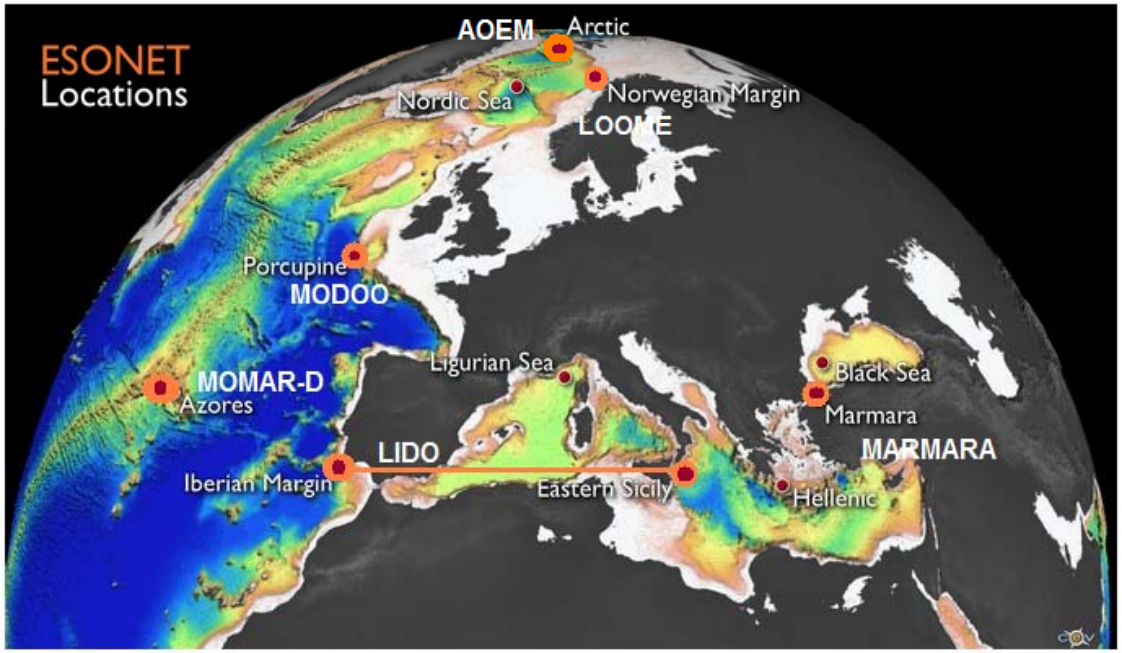
- ***steps toward a permanent structure***
  - *Preparation of a Virtual Institute of Scientists*

    VISO Workshop : Tromsoe, Jun. 09 (J. Mienert - UiT),

  - *Discussion and documents preparation for European research Infranstructure Consortium (ERIC)*

Main results from ESONET: Demonstration missions

- **1st call**
  - *MOMAR- D*
  - *MARMARA DM*
  - *LIDO*
  - *LOOME*
- **2nd call**
  - *AOEM*
  - *MODOO*



Main results from ESONET

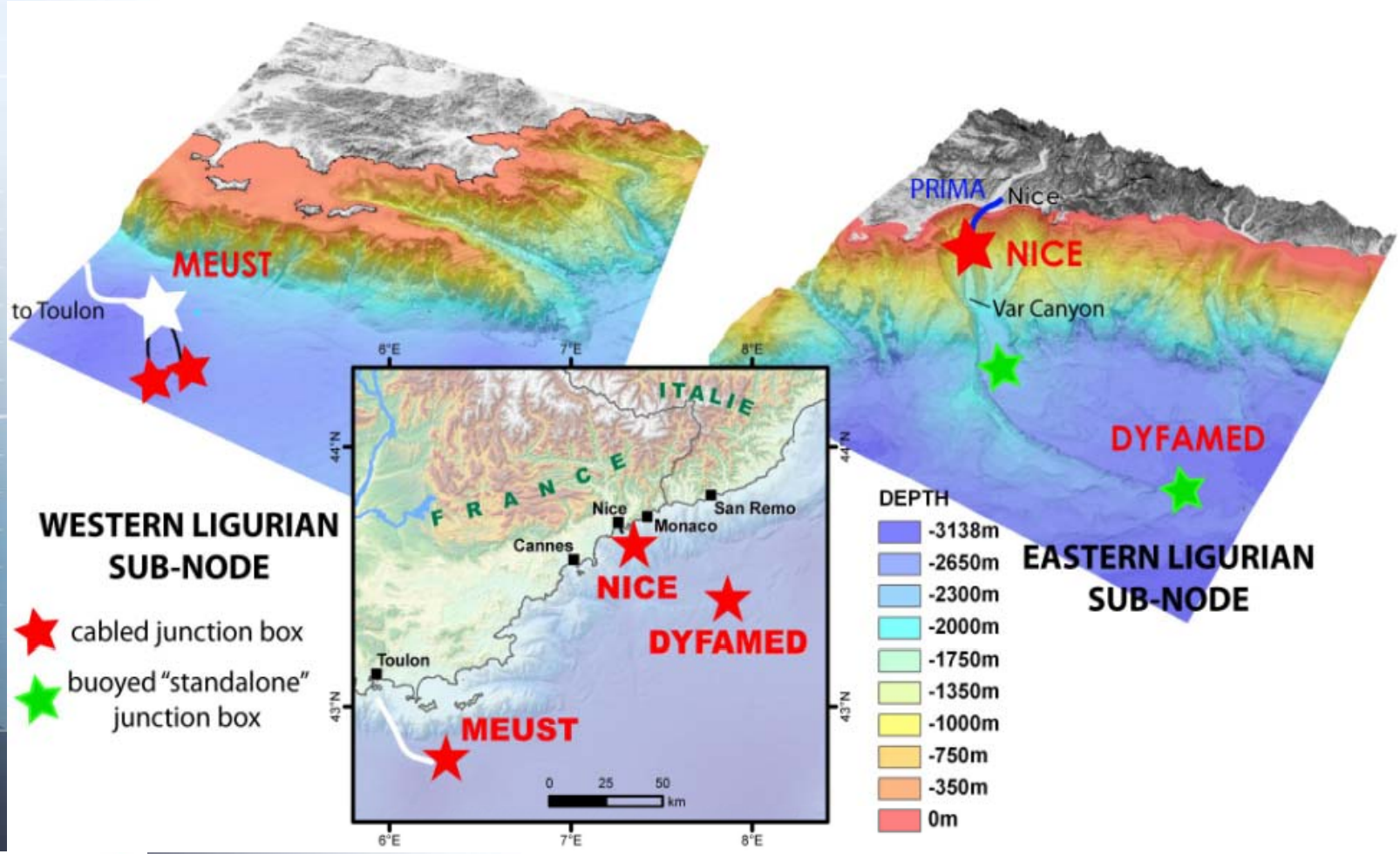
The ESONET Label is a set of criteria to be applied to deep sea observatories in order to give:

- To those observatories a high control quality level with generally free access to the data;
- standardisation and technical exchanges between operators: it would minimize implementation costs and operational operations;
- data conform to GEO portal.

This label could be applied to any type of sea observatories even if they not presently part of ESONET/EMSO :for example by the EUROSITES observatories?

Examples of ESONET/EMSO implementation

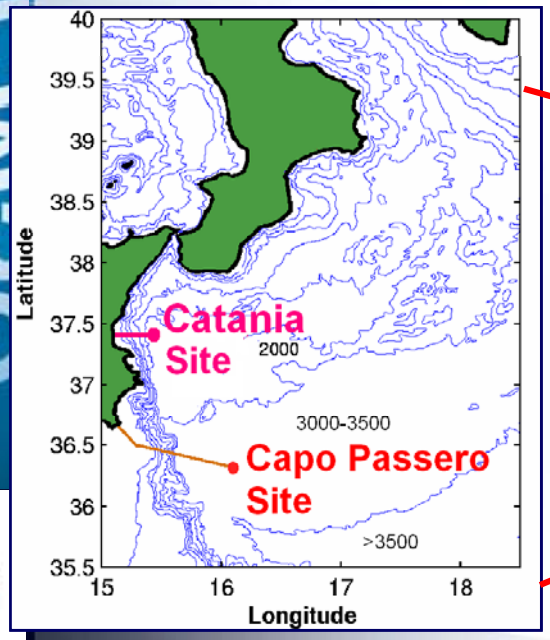
LIGURIAN Sea

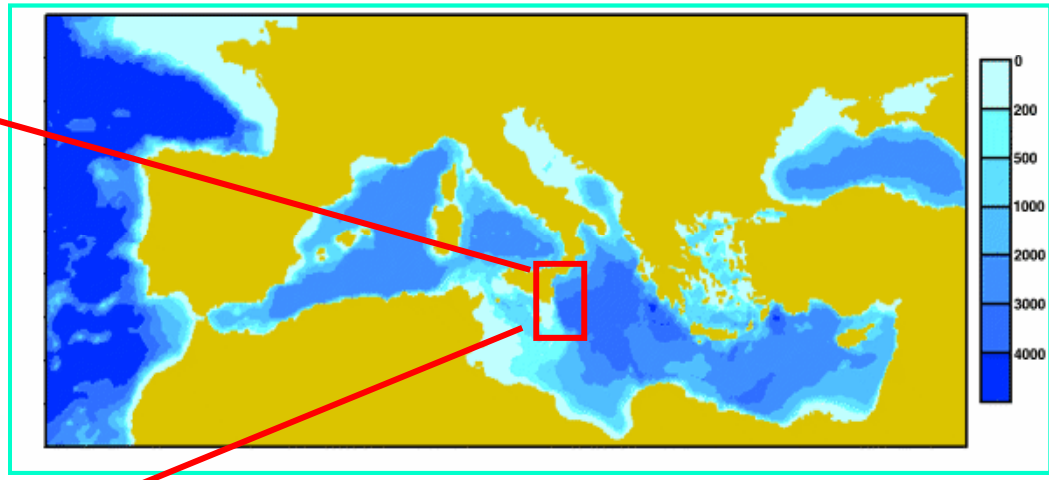


Western Ionian Sea (East-Sicily)

Infrastructures realised by INFN
Funds by EU, Regione Sicilia and MIUR

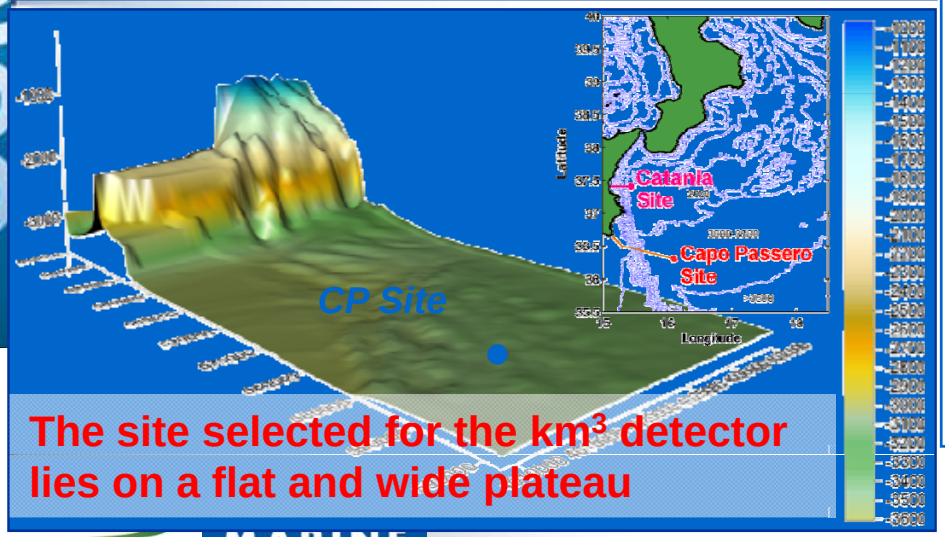
Catania Test Site:
25 km East offshore the Catania harbour, > 2000-m depth
Capo Passero Site:
85 km South East offshore Capo Passero, 3500-m depth





East-Sicily: Capo Passero infrastructure

Shore Laboratory in Capo Passero Harbour



The site selected for the km³ detector lies on a flat and wide plateau

Capo Passero is an infrastructure suitable for km³-scale neutrino telescope installation (KM3NeT)

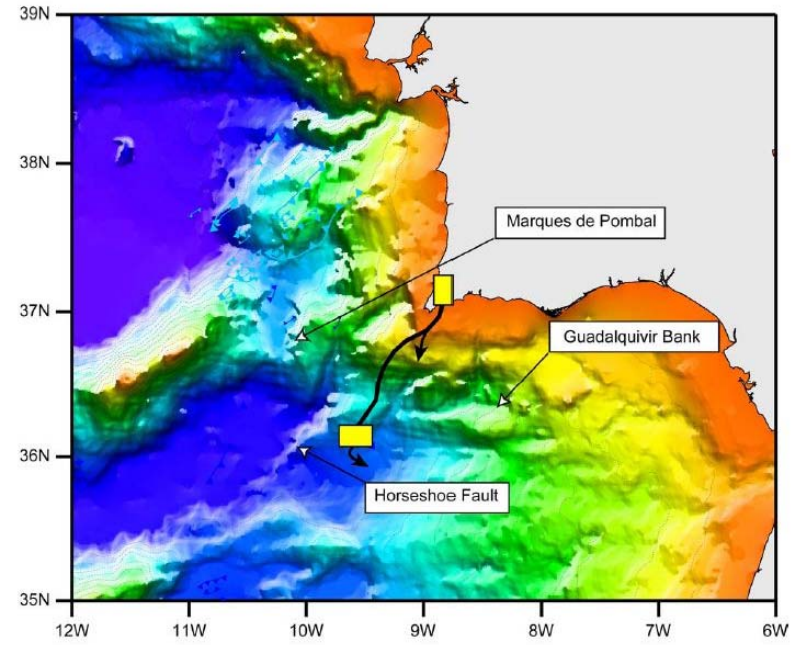
Shore laboratory
Power supplier 10 k
Construction Hall
Data Acquisition Room
Optical fibre to LNS (requested)

Submarine cable
100 km - 20 fibres, DC-sea return

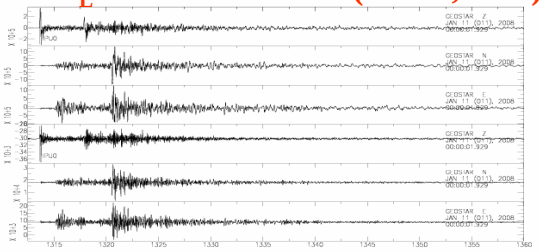
Submarine Infrastructure
DC/DC Converter 10 kV-375 V
NEPTUNE-like design
ROV connectors to end users

Iberian Margin

Partners: Portugal, Spain, Italy, Germany, France, Morocco



M_L=4.7 Gulf of Cadiz (Jan.11, 2008)

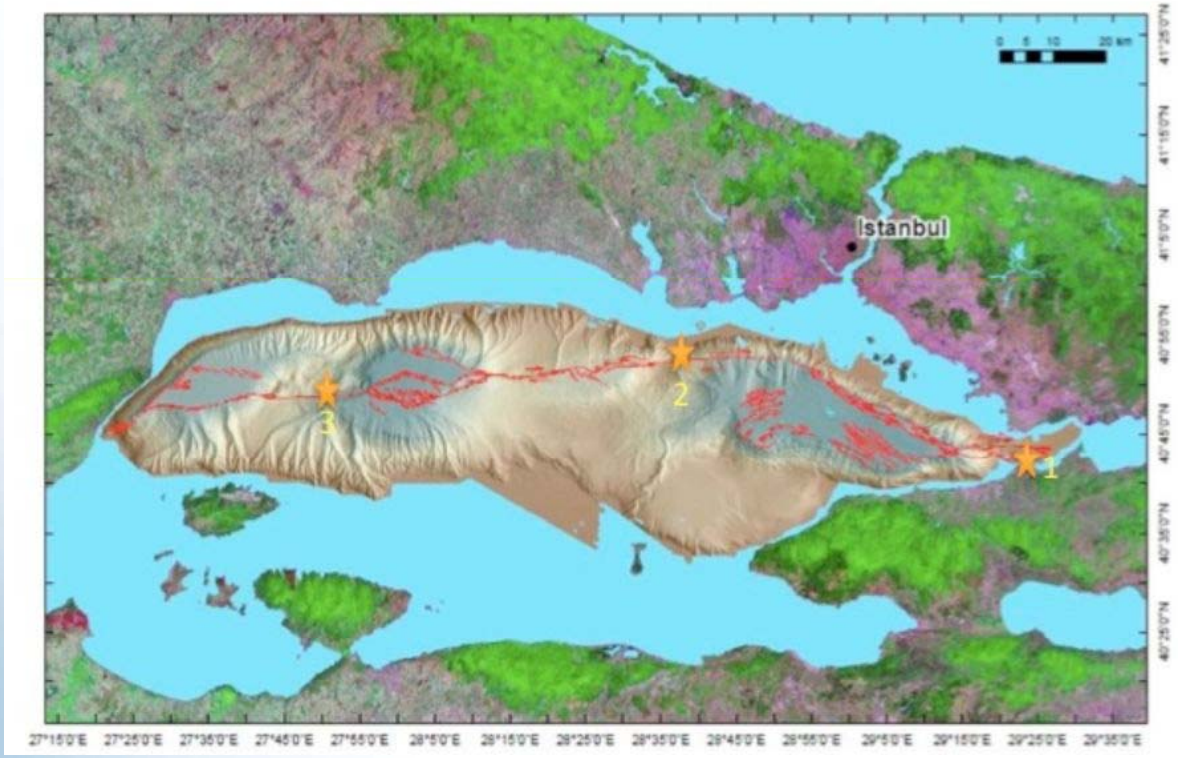


SISM

ACC

Marmara Sea

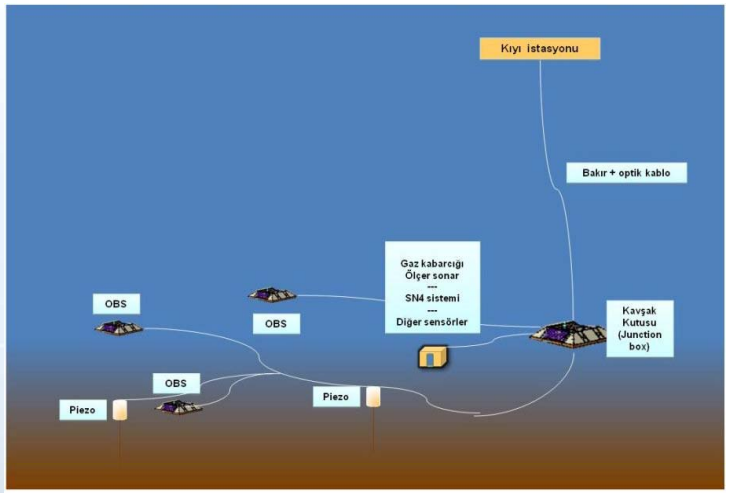
Partners: Turkey, Italy, France

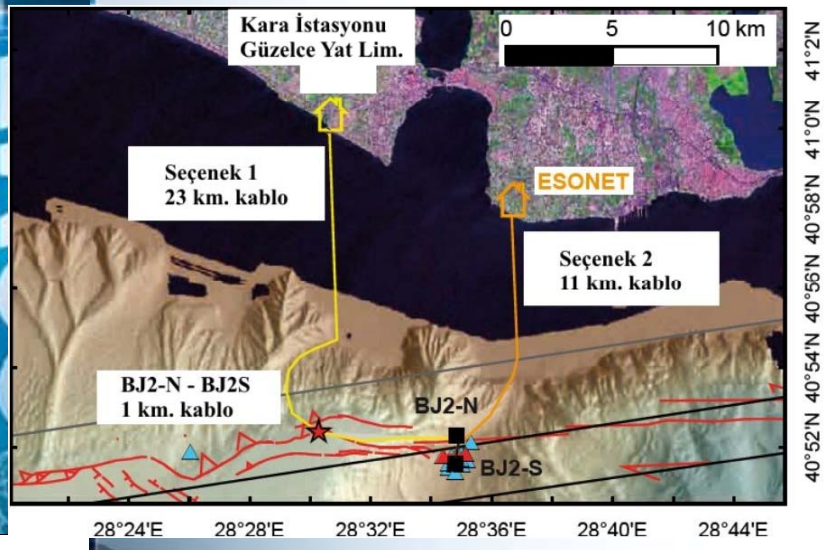


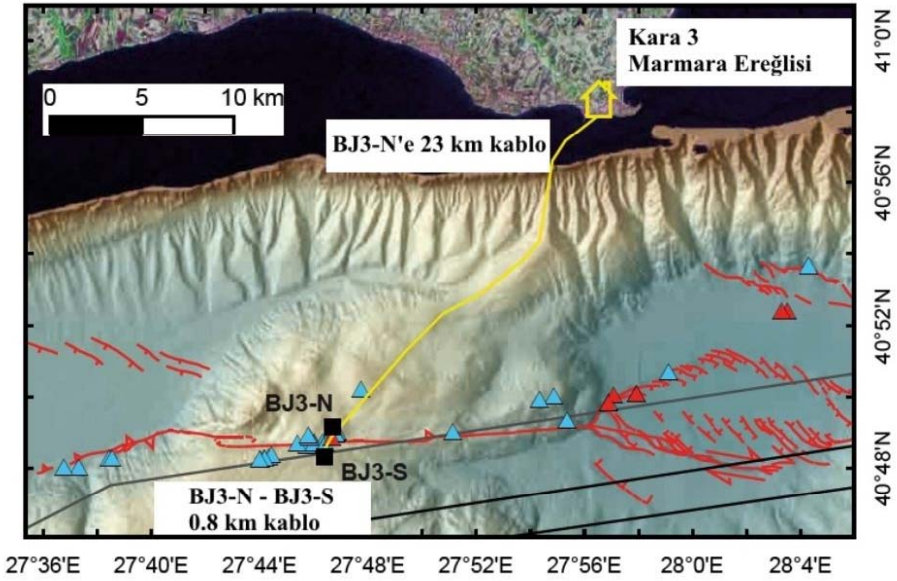
Main goals: Relationship between Seismicity & Gas seepage

Marmara Sea

Partners: Turkey, Italy, France







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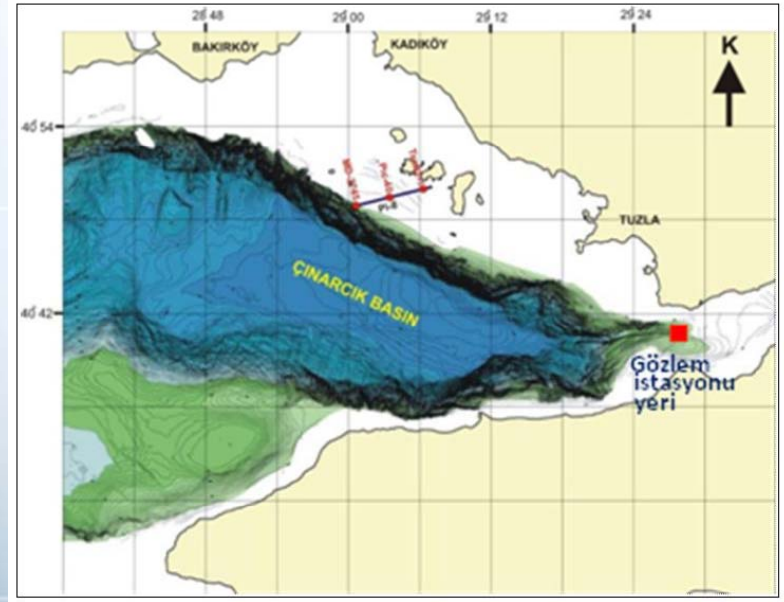
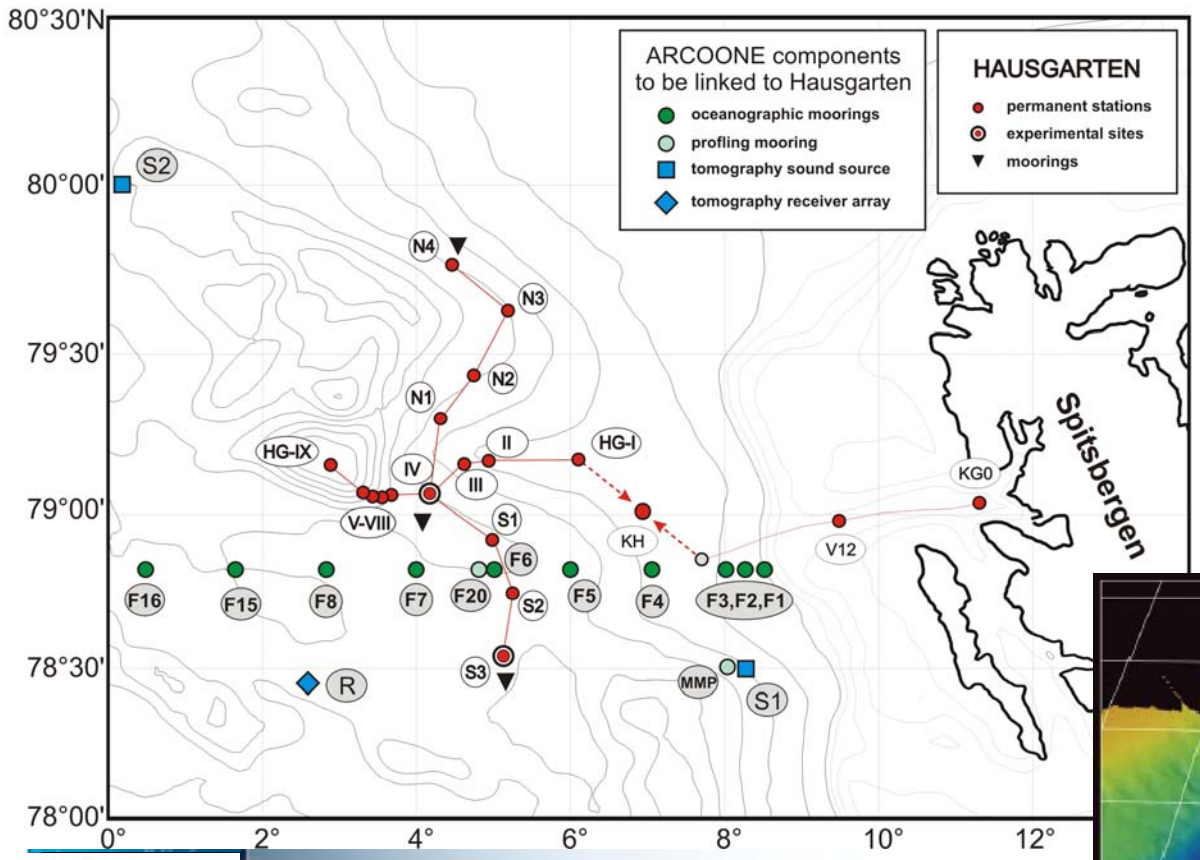
Marmara Sea

Partners: Turkey, Italy, France



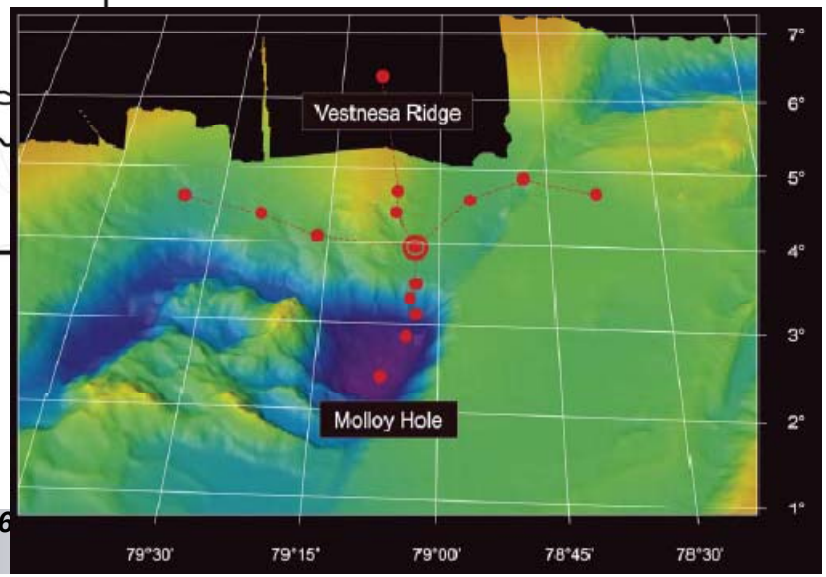
ARTIC Node
In link with SIOS (ESFRI)



Hausgarten

biological and physical observations

The site would be implemented with nodes cabled to Svalbard and at North and South stand alone nodes.



ESONET NOE

european multidisciplinary seafloor observatory emso

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Marine Board 16

Main results expected from EMSO

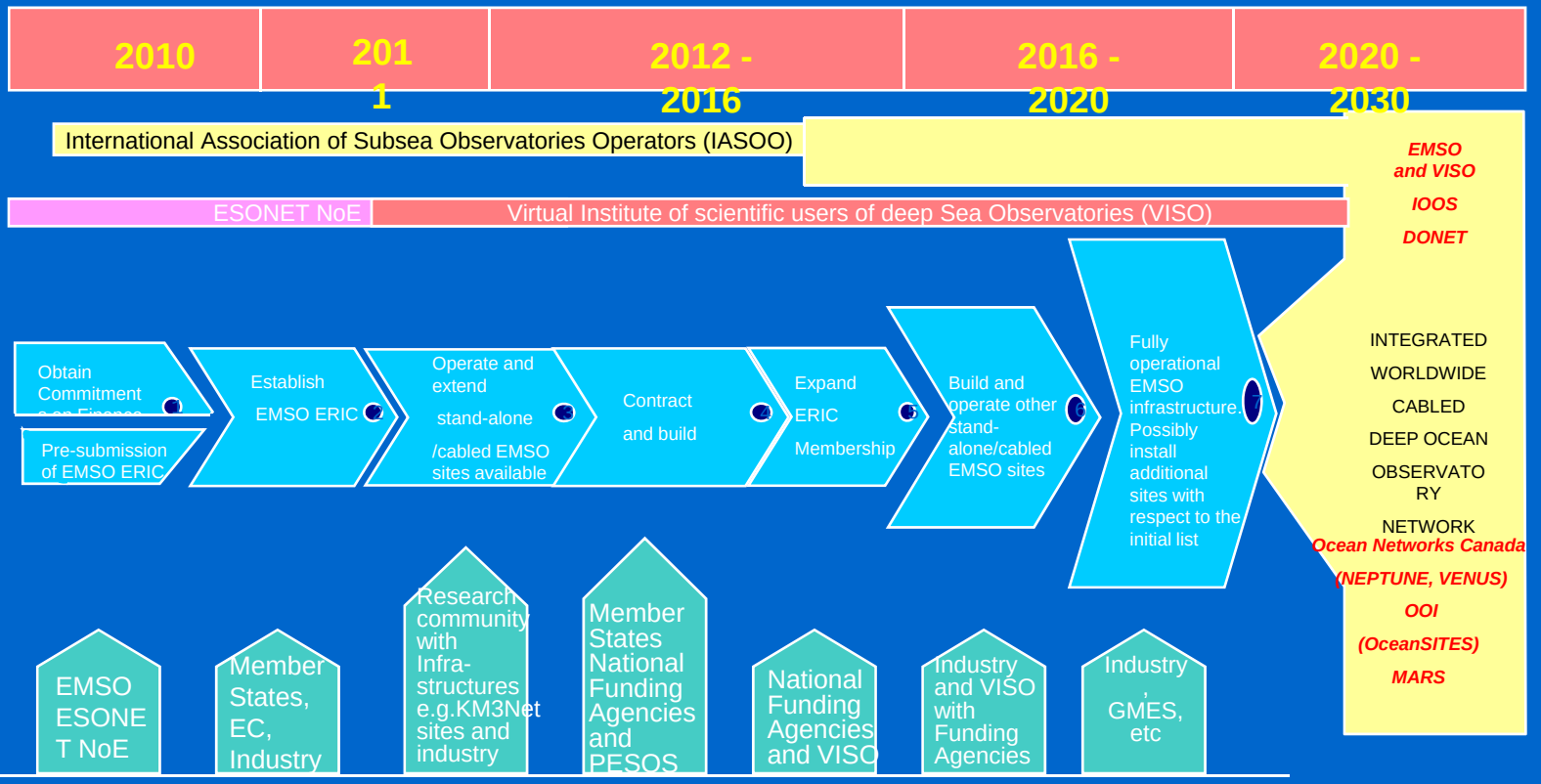
- *A governance (ERIC) for deep sea observatory network (opened to sites no included in the initial ESONET sites)*
- *Implementation plan for Generic Cable and Standalone sites validated on some ESONET site*
- *Implementation of a GIS to optimize the actions needs for a cost efficient accomplishment of the different marine operations related to deployment/maintenance and setup of the different observatories*

Main results expected from EMSO

integration to other organizations and observation programs and their applied techniques inside GEOSS (space borne, Lagrangian floats, neutrino telescope, etc.).

NEXT steps in ESONET

Road Map for Implementation of ESONET/EMSO



NEXT steps after ESONET

- *Esonet was focussed on 10 sites around Europe as case studies.*
- *Some sites are common with Eurosites for a limited number of parameters (Porcupine, Ligurian sea,…).*
- *Standards defined by ESONET could be applied to any site in the world? They were defined in cooperation with other international initiative (OOI, NEPTUNE, SeadataNet, …)*

NEXT

- ***A suggestion : Integration among ESONET/EMSO and EUROSITES toward an***
- ***European Ocean Observatory System in strong link with ARGO***

Questions?

Thank you !