European Seas Observatory NETwork
Science Objectives & Observatory Design

SIXTH FRAMEWORK PROGRAMME

Concept

ESONET is a collaboration between many academic, government, and industrial partners in fourteen countries: Belgium, Bulgaria, France, Germany, Greece, Ireland, Italy, The Netherlands, Norway, Portugal, Spain, Sweden, Turkey , and the UK. ESONET and it's partners will:

- Create lasting integration of European research using deep-sea observatories capable of meeting societal needs for measuring across broad temporal & spatial scales;
- Demonstrate integration of researchers, institutes, & industrial partners;
- Define detailed objectives & design requirements and systematically address challenges of creating the needed system;
- Produce a practical plan for long-term monitoring of the deep-ocean environment as part of Global Earth Observation System of Systems (GEOSS) & Global Monitoring for Environment and Security (GMES).

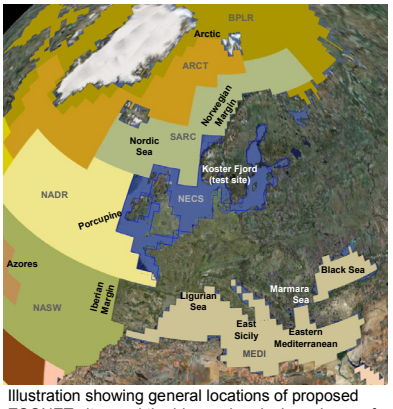
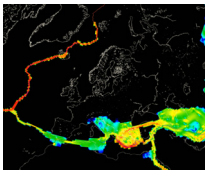
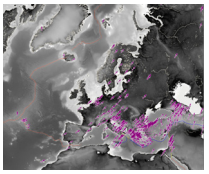


Illustration showing general locations of proposed ESONET sites and the biogeochemical provinces of Longhurst (2006). Mapped in Google Earth.



Regional plate stress warmer colour, more stress

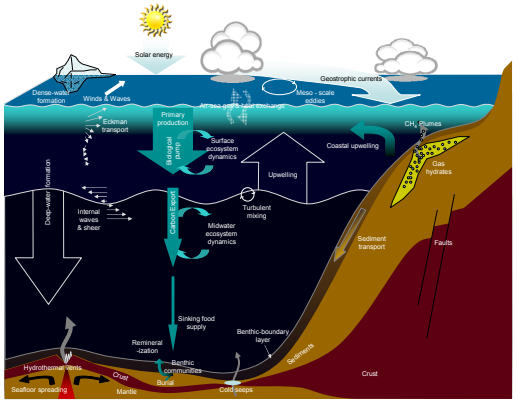


Relative plate motion vectors (*sensu* Kreemer *et al.* 2003)

Science

ESONET will evolve Earth and ocean science through interdisciplinary priorities in:

- **Geoscience** - seismic, slope stability, & tsunami forecasting, fluid vent & seep dynamics, gas hydrate stability, plate tectonics, sedimentary & hydrothermal processes, & non-living resources;
- **Physical oceanography** - fluid flow, water mass character, heat transport, ice cover, climatology, & impacts from climate change & natural variability;
- **Biogeochemistry** - global carbon cycle & elemental cycling within the ocean, which occur through both physical, chemical, & biological processes;
- **Marine ecology** - abundance & distribution life, ecosystem function, productivity, biodiversity, genomics & molecular ecology, living resources, & climate feedbacks;
- **Transformative science** – study ocean processes across disciplines & scales to understand links between processes, services, & socioeconomic impacts (Table 1).



Earth & ocean processes with influences across scales and disciplines

Table 1. Forcing factors link to socioeconomic impacts. Modified from UNEP 2007, Center for Ocean Solutions 2009, & Grehan *et al.* 2009

Forcing factor	Supporting services	Provisioning services	Regulating services	Cultural services	Socioeconomic impacts
Natural disasters	Photosynthetic production	Food resources	Water circulation & exchange	Employment	Increased geohazard risk
Climate change	Chemosynthetic production	Hydrocarbon energy	Climate & weather regulation	Education	Reduced biogeochemical pump efficiency
Ocean warming	Nutrient cycling	Minerals	Carbon sequestration & storage	Scientific advancement	Respiratory stress
Ocean acidification	Carbon sequestration & storage	Genetic resources	Waste absorption & detoxification	Quality of life	Altered heat and nutrient transport
Storm intensity	Biodiversity resilience	Chemical recourses	Biological control of harmful species	Recreation	Heath risks from toxic compounds
Seafloor stability	Habitat	Waste disposal sites	Geoengineering		Food web destabilization
Sea-level rise	Sediment & organic matter transport				Habitat loss
Overfishing	Geomorphology				Human and animal migration
Pollution					Reduced tourism, recreation, aesthetics
Habitat destruction					Food security
Acoustic noise					Marine-related industry activity
Science & Policy	Science		Science & Policy		Policy

Preparation & Integration

- ESONET is working with a sibling program, the European Multidisciplinary Seafloor Observatory (EMSO) preparatory phase programme, to create regional & core legal entities and financial frameworks to operate such a dispersed observing system.
- ESONET is defining its science and design requirements in conjunction with HERMIONE, EuroSITES, CoralFISH, NEAREST, NEAMTWS, DAMOCLES, ECORD, SIOS, GMES, & other programs to realize its goal of being a broad-impact program.
- ESONET is also achieving science & design progress through six demonstration missions:

1. **LOOME (Long-term Observations On Mud-volcano Eruptions)** - geoscience, biogeochemistry, and marine ecology
2. **MARMARA DM** - multidisciplinary observatory in the MARMARA Sea with geoscience focus
3. **LIDO (Listening to the Deep Ocean)** - acoustic monitoring for geoscience & marine ecology
4. **MoMAR (Monitoring the Mid Atlantic Ridge)-D** - autonomous observatory at active hydrothermal site
5. **AOEM (Arctic Ocean ESONET Mission)** including **MASOX (Monitoring Arctic Seafloor – Ocean Exchange)** & **ARCOONE (Arctic Operational Oceanography Network in ESONET)** - including all major ESONET science areas
6. **MODOO (MOdular Deep Ocean Observatory)** - a mobile, interdisciplinary observatory collaboration w/ EuroSITES

Timeline

2007
- Start ESONET NoE from ESONET CA & ESONIM

2008
- Start EMSO preparatory phase
- Demonstration missions started
- Definition of science & basic design features
- Interoperability standards investigated

2009
- Site-specific plans developing
- Regional committees formed
- Virtual institute planning begins
- Site specific objectives & design requirements refined

2010
- Governance, financing, & legal aspects arranged
- ESONET NoE demonstration mission end
- Legal entities launched

2011
- Business, technical, & plans issued by EMSO
- End ESONET NoE
- Virtual institute (VISO) Begins

2012
- End EMSO preparatory phase
- Engineering contracts arranged

www.esonet-emso.org

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