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The JRU EMSO-Italy is composed by different Italian research institutions which are collaborating to increase the contribution to EMSO from the initial facility Western Ionian Sea to additional ones (highlighted in the map). These facilities will expand the monitoring coverage of EMSO in the deep and intermediate waters of Central Mediterranean, and some of them will contribute as shallow-water test sites.



Northern Ligurian Sea – Spar buoy and mooring

SCIENTIFIC FRAMEWORK: located in the centre of the Ligurian Sea, within the Pelagos Sanctuary, an area characterized by high productivity and a very complex and rich ecosystem, 80 km off the coasts, anchored at ca. 1200 m depth.

PROCESSES: Air-sea interactions; surface and deep circulation; zooplankton migration; underwater ambient noise.

Two main installations forming the **W1M3A observatory:**

SPAR BUOY: known as ODAS Italia 1, 51 meter long and 12 tons weight, held in place permanently by a long slack mooring and collecting atmospheric and upper ocean measurements (0-40 m);

Equipment: Meteo-station, T and S at 4 depths, dissolved oxygen, Chla, CO₂, pH and nutrients sensors on the subsurface

SUB-SURFACE MOORING: (100- 1200 m) deployed close-by the main surface buoy since 2008 and hosting instruments for collecting physical measurements about the ocean.

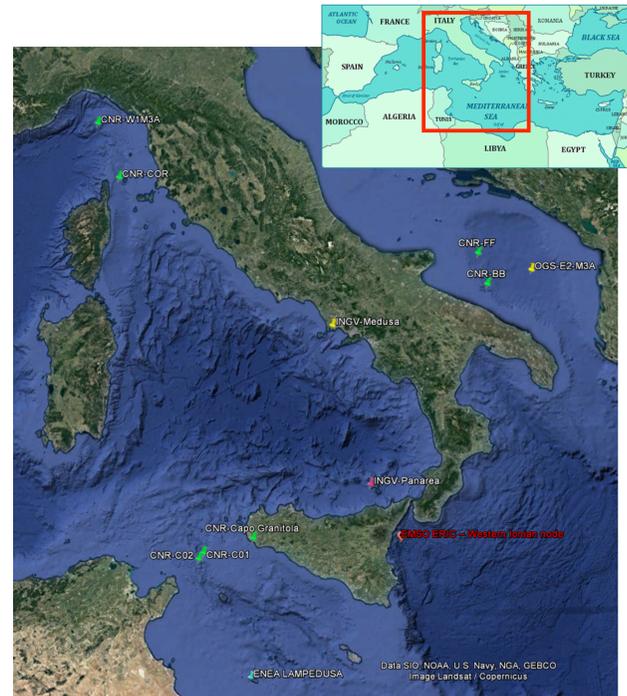
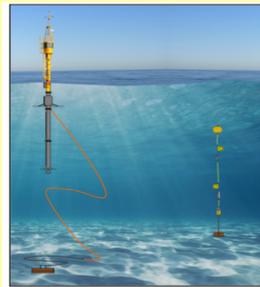
Equipment: ADCP, 2 CTD

An acoustic link between the two structure is present. **Data availability and accessibility:** near real-time for the buoy and after recovery for the mooring.

Observatory portal: www.w1m3a.cnr.it

External data centers:

- CMEMS: www.marine.copernicus.eu
- MONGOOS: www.mongoos.eu/data-center
- EMODNET: www.emodnet-physics.eu/map



Southern Adriatic - Surface buoy and moorings

SCIENTIFIC FRAMEWORK: South Adriatic trench, Almost permanent cyclonic structure, strong influence of atmospheric forcing, deep convection processes, exchange with Ionian. **PROCESSES:** Northern Adriatic Dense Water Cascading, Acidification in deep waters (pCO₂-pH), Exchanges of geochemical fluxes.

Three moorings forming the **E2M3A and CNR FF-BB:**

SURFACE BUOY:

Air-sea interaction: Weather, Solar Radiation; Surface properties: CTD, Dissolved Oxygen (2m, 15m); Carbonate system: pCO₂, pH (2m).

SUBSURFACE MOORINGS:

Superficial layer circulation and convection processes: water current measurements by means of ADCP (0-300m); Levantine Intermediate Water (LIW): CTD, Dissolved Oxygen (350m, 550m, 750m); Outflow Layer: CTD, Dissolved Oxygen (900m, 1000m); Circulation and characteristics of deep layers: CTD, Dissolved Oxygen, single-point water current measurements (1200m); Sediment traps: Downward flow of particulate matter in the euphotic zone (150m) and at sea bottom (1200m).

Data availability and accessibility: near-real-time OGS: <http://nettuno.ogs.trieste.it/e2-m3a/MonGOOS>; <http://www.mongoos.eu/data-center>; MyOcean: <http://marine.copernicus.eu/delayed-time-OGS-NODC>; <http://nodc.ogs.trieste.it/nodc/metadata/doi>; CNR FF-BB Data Repository in Delayed mode <http://www.ismar.cnr.it/infrastructures/observational-systems/moorings/mare-adriatico-meridionale>



EMSO Western Ionian node – seafloor cabled platform

| Parameter | Unit | Depth (m) | Frequency (Hz) |
|-----------------------------------|-------|-----------|----------------|
| DC Conductivity | MS/cm | 0-1000 | 100 |
| Differential Pressure Stage (DPS) | MPa | 0-1000 | 100 |
| Temperature (T) | °C | 0-1000 | 100 |
| Salinity (S) | PSU | 0-1000 | 100 |
| Pressure (P) | MPa | 0-1000 | 100 |
| Depth (Z) | m | 0-1000 | 100 |
| Current (C) | cm/s | 0-1000 | 100 |
| Temperature (T) | °C | 0-1000 | 100 |
| Salinity (S) | PSU | 0-1000 | 100 |
| Pressure (P) | MPa | 0-1000 | 100 |
| Depth (Z) | m | 0-1000 | 100 |
| Current (C) | cm/s | 0-1000 | 100 |
| Temperature (T) | °C | 0-1000 | 100 |
| Salinity (S) | PSU | 0-1000 | 100 |
| Pressure (P) | MPa | 0-1000 | 100 |
| Depth (Z) | m | 0-1000 | 100 |
| Current (C) | cm/s | 0-1000 | 100 |

SCIENTIFIC FRAMEWORK: collision boundary between Eurasia and Africa plates, important tectonic, seismogenic/tsunamigenic structures, vicinity to Mt. Etna (largest active volcano of southern Europe).

PROCESSES: Diffuse seismicity, volcanic tremor, exposure tsunami waves interchanges between Ionian and Tyrrhenian Sea and circulation driven by strong topographic gradients; man-induced environmental noise, cetaceans routes.



ROV - NEMO-SN1 Underwater operation (2005) @ 2100 m bsl

EGIM - EMSO Generic Instrument Module

| Parameters | Sensors |
|---|---|
| Temperature, Conductivity, Pressure | SEABIRD SBE37-SIP |
| Pressure | SEABIRD SBE 54 Tsunami |
| Dissolved O ₂ , Temperature | AANDERSON AANDERSON DW4831 |
| Turbidity | Wetlabs NTUrt |
| Ocean currents, Compass and tilt meter | Teledyne Workhorse monitor ADCP 300 KHz |
| Passive acoustics, Compass and tilt meter | OceanSonic iCListen SB60L-ETH |

Data availability and accessibility:

Data transmission is in real-time to the shore-station in Catania harbour, Data access is public and data download is possible, from: http://www.moist.it/sites/western_ionian_sea/2 and www.emso.eu

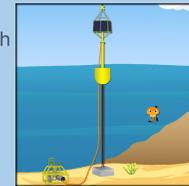
Central Tyrrhenian Sea – network of cabled observatories and buoys

SCIENTIFIC FRAMEWORK: Gulf of Pozzuoli (Naples), acknowledged as one of the most risky area on Earth: the Campi Flegrei caldera. It is especially hazardous for its proximity to Naples megalopolis. **PROCESSES:** seismic and volcanic activity, hydrothermalism, bradiseism.

MEDUSA observatory (Multi-parameter Elastic-beacon Devices and Underwater Sensors Acquisition system): It consists of four meda buoys each connected to a submarine monitoring module, at a depth ranging from 38 to 96 meters, equipped with geophysical and oceanographic sensors.

Each **meda buoy** is equipped with: geodetic receiver, power-supply monitoring device, and, for one of the buoy, a meteorological station, IP web-enabled camera, and radar tide-gauge. Each **seafloor module** is equipped with: Bottom Pressure Recorder, low-frequency and broad-band hydrophones, seismometer, accelerometer, compass sensor, power-supply monitoring system and, for one module, 3-D current-meter with water temperature sensor.

Data availability and accessibility: data are stored in a relational database and the complete time series can be visualised on the data portal: <http://portale2.ov.ingv.it/medusa/>.



Southern Tyrrhenian Sea – Underwater observatory and buoy

SCIENTIFIC FRAMEWORK: Panarea island within the Aeolian Archipelago, an area characterized by active volcanism, presence of natural hydrothermal vents (T=130 °C; pH=2.94) at 23 m depth. **PROCESSES:** volcanic activity, hydrothermal vents, acidification, chemosynthesis

PANAREA observatory is formed by

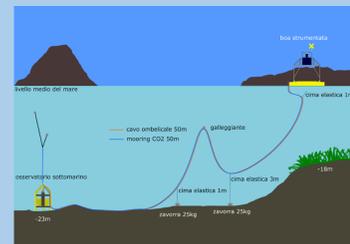
SEABED PLATFORM: sensors for environmental T and vent T; pressure, conductivity, dissolved O₂, pH, pCO₂ and hydrophone;

SURFACE BUOY: meteo station, sensors for environmental T, power supply to the seabed platform



Data availability and accessibility:

Data transmission in near real time to INGV CED in Palermo (Sicily), data access is public, data download is possible, after registration and disclaimer signature at: <http://monsoon.pa.ingv.it>



Sicily channel – Pole buoy and coastal cabled observatory

SCIENTIFIC FRAMEWORK: steady meteo-conditions; negligible exposition to coastal natural and man-induced effects; optimal bio-oceanographic conditions and oligotrophic stability; maritime transport effect on ecosystems. **PROCESSES:** sea surface-air exchanges superficial and intermediate waters exchanges (salinity and heat advection and mass) between Eastern and Western Med basins;

LAMPEDUSA observatory

POLE BUOY OFFSHORE LAMPEDUSA ISLAND -The buoy perform measurements of Remote Sensing Reflectance and / or Normalized Water Leaving Radiance, temperature, pressure, conductivity and oxygen, light attenuation and scattering, fluorescence and surface energy budget.

MOORINGS IN THE WESTERN ENTRANCE OF THE CHANNEL - Two moorings are operating since 1993 and are currently equipped with ADCPs and CTDs for the continuous monitoring of the hydrological characteristics of the water mass with depth.



CAPO GRANITOLA observatory

CABLED SHALLOW WATERSTATION OFFSHORE SOUTH-WESTERN SICILY Real-time connection by electro-optical cable; up to 6 Rs 232 plugs; 1 hydrophone and expandability to host 3 additional hydrophones; multiparameter probe; 2 cameras; radiometer with wavelength range of 320–950 nm.

