

ID26-EMSO ERIC: A CHALLENGING INFRASTRUCTURE TO MONITOR ESSENTIAL OCEAN VARIABLES (EOVS) ACROSS EUROPEAN SEAS

JUAN JOSÉ DAÑOBEITIA^(1,2), PAOLO FAVALI^(1,3), LAURA BERANZOLI^(1,3), ALAN BERRY^(1,4), JÉRÔME BLANDIN^(1,5), ROBERTO BOZZANO^(1,6), MATHILDE CANNAT^(1,7), MAFALDA CARAPUÇO^(1,8), VANESSA CARDIN^(1,9), AYOZE CASTRO^(1,10), LAURENT COPPOLA^(1,11), ERIC DELORY^(1,10), JOAQUIN DEL RIO FERNANDEZ^(1,12), DAVIDE EMBRIACO^(1,13), ILKER FER^(1,13), BÉNÉDICTE FERRE^(1,14), MARIA I. FREDELLA⁽¹⁾, ANDREW GATES^(1,15), MARCO GALEOTTI⁽¹⁾, ALESSANDRA GIUNTINI^(1,3), SUSAN HARTMAN^(1,15), NADINE LANTÈR^(1,5), LEONIDAS PERIVOLIOTIS^(1,16), GEORGE PETIHAKIS^(1,16,17), VLAD RADULESCU^(1,18), IVAN RODERO⁽¹⁾, PIERRE-MARIE SARRADIN^(1,5), ZUZIA STROYNOWSKI⁽¹⁾

(1) EMSO ERIC, Via di Vigna Murata, 605-00143 Rome, Italy,

juanjo.danobeitia@emso-eu.org

(2) Marine Tech. Unit-CSIC, Barcelona, Spain

(3) INGV, Rome, Italy

(4) Marine Institute, Galway, Ireland

(5) IFREMER, Brest, France

(6) CNR, Genoa, Italy

(7) IGP-CNRS, Paris, France

(8) IPMA, Lisbon, Portugal

(9) OGS, Trieste, Italy

(10) PLOCAN, Telde, Spain

(11) CNRS, Villefranche-sur-Mer, France

(12) OBSEA-UPC, Barcelona, Spain

(13) Bergen University, Bergen, Norway

(14) Tromsø University, Tromsø, Norway

(15) NOC, Southampton, United Kingdom

(16) HCMR, Athens, Greece

(17) EuroGOOS, Brussels, Belgium

(18) GeoEcoMar, Bucharest, Romania

Abstract

The European Multidisciplinary Seafloor and water Column Observatory (EMSO, www.emso.eu) is a distributed research infrastructure (RI), composed of fixed-point deep-sea observatories and shallow water test sites at strategic environmental locations from the southern entrance of the Arctic Ocean all the way through the North Atlantic through the Mediterranean to the Black Sea. Working as a single powerful system, it is a valuable new tool for researchers and engineers looking for long time series of high-quality and high-resolution data to study and continuously monitor complex processes interactions among the geosphere, biosphere, hydrosphere and atmosphere, as well as to test, validate and demonstrate new marine technologies.

Keywords

European Research Infrastructure, ocean observation systems, deep seafloor and water column, EOVS

INTRODUCTION

EMSO is a European Research Infrastructure Consortium (ERIC) legal entity since September 2016 currently with nine members: Italy, France, Greece, Ireland, Portugal, Romania, Spain the United Kingdom, and the Kingdom of Norway. The host country of EMSO ERIC is Italy and the statutory seat of the organization is established in Rome.

EMSO comprises 14 multisensor Regional Facilities (RFs) distributed in 11 deep-sea observatories (cable and stand-alone) and 3 shallow water test bed (Fig.1), with the aim to lead the advancement of knowledge of ocean processes and to understand and evaluate the anthropogenic effects in the water column, seafloor and sub-sea-floor, promoting an interdisciplinary and multidisciplinary approach [1].

EMSO distributed Research Infrastructure

EMSO ERIC includes open-ocean, water-column moorings and seafloor observatories at key environmental locations such as the high-latitude Nordic Seas, at the entrance to the Arctic, the North Atlantic, through the Mid-Atlantic Ridge spreading centre, and intraplate volcanic areas in the Canarias entering the Mediterranean through the Eurasia-Africa collision zone and through the seismic and volcanic zo-

nes of the central and eastern Mediterranean ending in the anoxic Black Sea.



Fig. 1. EMSO Regional Facilities deep-sea observatories (empty circles), shallow-water test sites (solid circles) and the new observatories added (red circles)

These large-scale RFs provide high-quality data at continental scale integrating the EMSO time series with data acquired from other locations. EMSO ERIC promotes the development and progress of marine technologies and responds to environmental demands of European society, such as the Blue Growth Strategy, United Nations decade of the Oceans Science for Sustainable Development and Horizon Europe, EU framework programme. Each RF provides important services and products as a distributed infrastructure, EMSO increases data availability and continuity throughout European seas, and address broader questions. Furthermore, the integrated observatory infrastructure can enhance collaboration among the nodes to provide wider-reaching and higher-impact services.

CONCLUSIONS

The sea level rise as well as warming and acidification of the oceans are indicators of ongoing, global change. In addition, contamination of nutrients by anthropogenic activities, the proliferation of toxic algae, and the harmful pollution of millions of tons of plastic waste in the sea, are significant challenges within the marine environment. EMSO ERIC aims at monitoring and disseminating these environmental processes and the complex interactions between geosphere, biosphere and hydrosphere. EMSO's main scientific objective is to help scientists to understand these global processes through time-series on EOVS and to stimulate the development of new technologies and knowledge through the adoption of standards in sensors increasing its interoperability and collaboration between environmental RIs [2]. Modern society requires a better understanding of the ocean [3]. EMSO ERIC, with its wide range of innovative and novel services integrating top-quality

science, engineering, logistics, data management, communication, education, innovation and industry addresses this requirement head-on while also providing valuable social benefits to its member states in the form of employment and economic development.

REFERENCES

[1] Favali, P., Beranzoli, L., De Santis, A. (2015). *Seafloor Observatories: A New Vision of the Earth from the Abyss*. Springer-Praxis books in Geophysical Sciences, Springer-Verlag Berlin Heidelberg, doi:10.1007/978-3-642-11374-1, 676 pp.

[2] Dañobeitia, J.J., Pouliquen, S., Johannessen, T., Basset, A., Cannat, M., Pfeil, B.G., Fregola, M.I., Matera, P., Gourcuff, C., Magnifico, G., Delory, E., del Rio Fernandez, J., Rodero, I., Beranzoli, L., Nardello, I., Ludicone, D., Carval, T., Gonzalez Aranda, J.M., Petihakis, G.,

Blandin, J., Kutsch, W.L., Rintala, J.-M., Gates, A.R., and Favali, P. (2020). *Toward a Comprehensive and Integrated Strategy of the European Marine Research Infrastructures for Ocean Observations*. *Frontiers in Marine Science*, 7, 180, doi:10.3389/fmars.2020.00180.

[3] Ruhl, H.A., André, M., Beranzoli, L., Çağatay, M.N., Colaço, A., Cannat, M., Dañobeitia, J.J., Favali, P., Géli, L., Gillooly, M., Greinert, J., Hall, P.O.J., Huber, R., Karsensen, J., Lampitt, R.S., Larkin, K.E., Lykousis, V., Mienert, J., de Miranda, J.M.A., Person, R., Priede, I.G., Puillat, I., Thomsen, L., and Waldmann, C. (2011). *Societal need for improved understanding of climate change, anthropogenic impacts, and geo-hazard warning drive development of ocean observatories in European Seas*. *Progress in Oceanography*, 91, 1-33.