



The EMSO-Azores deep-sea observatory – 8 years of operation

Julien Legrand (), Pierre Marie Sarradin (), and Mathilde Cannat ()

(1) Ifremer REM, ZI de la pointe du diable, CS10070, F-29280 PLOUZANE France, (2) Institut de Physique du Globe de Paris, C.N.R.S. UMR 7154, Equipe de Géosciences Marines, 1 rue Jussieu, 75238 Paris Cedex 05, France

The MoMAR “Monitoring the Mid-Atlantic Ridge” project was initiated in 1998 to study the environmental instability resulting from active mid-ocean-ridge processes at hydrothermal vent fields south of the Azores. It is a component of the EMSO European Research Infrastructure Consortium, which coordinates observatory regional facilities in European seas (<http://emso.eu>). The EMSO-Azores observatory focuses on two main questions: What are the feedbacks between volcanism, deformation, seismicity, and hydrothermalism at a slow spreading mid-ocean ridge and how does the hydrothermal ecosystem couple with these sub-seabed processes?

The uncabled observing system was first deployed in 2010 in the Lucky Strike hydrothermal vent field (Mid Atlantic Ridge) at 1700 m depth. It comprises two Sea Monitoring Nodes providing the energy, controlling the sensors, archiving and transmitting the data. The first node is deployed on the Lucky Strike fossil lava lake and measures the seismic activity and the vertical deformation of the sea floor. The second one is deployed at the base of the Tour Eiffel active edifice. It allows the study of the variability of a mussel assemblage and its environment (HD camera and chemical sensors, thermistor string), the microbial colonization and the chlorinity of an active vents (Colonization module and BARS sensor) and the localized micro seismicity (seabed array of 4 hydrophones). The two nodes are acoustically linked to a surface relay instrumented buoy, ensuring satellite communication to the land base station in Brest -France.

The observing capacity of the marine infrastructure was upgraded in 2016 and 2017 after the development of a new electronic core (COSTO₂) based on Ethernet communication and implemented on the two nodes. Great improvement were done on the data management process. Data are archived, published with a doi and are available on the EMSO-Azores web page: <http://www.emso-fr.org/EMSO-Azores>.

In addition, the observatory setup comprises several sets of autonomous instruments, whose data are collected during the yearly maintenance cruises. The autonomous instruments deployed in the area comprises 4 OBS, 2 pressure gauges, a physical oceanography mooring near the vent field, an array of temperature probes distributed in hot and diffuse vents, 3 bottom currentmeters, and a prototype of sequential hot fluid sampler (DEAFS). In 2017, the EMSO Generic Instrumentation Module was also deployed in the vicinity of Tour Eiffel.

A complementary site studies program is implemented during the cruises and contributes to increase the set of accessible parameters (fluid sampling, ecological studies, survey of active and inactive areas, in situ experimentations. . .) and to extend the spatial coverage of the study.

The observatory is maintained every year during the Momarsat cruises (<https://doi.org/10.18142/130>). All the components of the system are recovered, serviced on board and redeployed using the ROV Victor 6000.

The studied area is part of a Marine Protected Area in the Portuguese EEZ.

This work has received funding from the European Union Seventh Framework Programme (FP7/2007-2013) under grant agreement n° [312463], the French ANR project Luckyscales ANR-14-CE02-0008.