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The MOMAR-D-project: a challenge to monitor the Lucky Strike vent field in real-time.

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Hydrothermal circulation at mid-ocean ridges is a fundamental process that impacts the transfer of energy and matter from the interior of the Earth to the crust, hydrosphere and biosphere. The unique faunal communities that develop near these vents are sustained by chemosynthetic micro-organisms that use the hot fluid chemicals as a source of energy. Environmental instability resulting from active mid-ocean ridge processes create changes in the flux, composition and temperature of emitted vent fluids and influence the associated hydrothermal communities. The MoMAR (Monitoring the Mid-Atlantic Ridge) project was initiated 10 years ago by the InterRidge Program to promote and coordinate long-term multidisciplinary monitoring of hydrothermal vents at MAR. It aims at studying vent environmental dynamics from geophysics to microbiology. More recently, the MoMAR area has been chosen as one of the 11 key sites of the European project ESONET NoE. MoMAR-D was selected as a demonstration mission to deploy and manage a deep sea observatory at Lucky Strike during one year. Monitoring this large hydrothermal field, located in the centre of one of the most volcanically active segment of the MAR, will offer a high probability of capturing evidence for volcanic events, observing interactions between faulting, magmatism; hydrothermal circulations and, evaluating their impacts on the ecosystem.

The observatory infrastructure is composed of two Sea Monitoring Nodes (SEAMON) acoustically linked to a surface relay buoy (BOREL), ensuring satellite communication to the land base station in Brest (France). The entire system was deployed during the MoMARSAT cruise (Pourquoi pas?/Victor6000, http://www.ifremer.fr/momarsat2010/) in October 2010. A first SEAMON node, dedicated to large scale geophysical studies, was moored in the centre of the large lava lake present in the Lucky Strike vent field. This node hosts an Ocean Bottom Sismometer (OBS) and a permanent pressure gauge (JPP) that were connected underwater using wet matable connectors. A second node was deployed at the base of the Tour Eiffel active edifice to study the links between faunal dynamics and variations of physico-chemical factors. This node is composed of a High Definition (HD) video camera, 6 LED lights, an Aanderaa optode (oxygen, temperature) and two in situ chemical analysers. These two nodes communicate via underwater acoustics to a BOREL buoy that was moored on the ocean surface within acoustic range of the SEAMON stations. This buoy is equipped with two identical and redundant data transmission channels to ensure the integrity of the data. Scientific and technical data (including a low-resolution photo) are transmitted daily to the data centre in Brest. Autonomous instruments (OBS, ocean bottom tiltmeter, current meters, particle trap, colonisation experiments and temperature probes) were also deployed in the LS vent field. They will store their data over the duration of the experiment (1 year). Treatment of data sets will be conducted in two stages: in near real time for the subset that is transmitted through the SEAMON system; and after the 12 months for the whole data set. The near real time data will serve both as support for scientific interpretation, and as an indicator that an event is occurring. Volcanic (eruption, underground dyking event, or rapid degassing of the magma chamber), tectonic (displacement along axial faults), or hydrothermal events are all expected to occur on the MAR. Understanding the impact of these events on biological communities is one of our key objectives. The data can be viewed online, according to ESONET data policy and European directives (now, temporary access through http://www.ifremer.fr/WC2en/allEulerianNetworks). The system should be recovered in 2011 after 12 months on the bottom.

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