



Technical Advances in Near Real Time Seafloor Monitoring Implemented for the MoMAR-D Project

Jérôme Blandin (1), Julien Legrand (1), and the MoMAR-D engineering & science (1), (2), (3), (4) Team
(1) IFREMER, PLOUZANE, France (jerome.blandin@ifremer.fr), (2) IPGP, PARIS, France, (3) NOCS, University of Southampton, SOUTHAMPTON, United Kingdom, (4) IMAR, University of Azores, HORTA, Portugal

The MoMAR-D (Monitoring the Mid-Atlantic Ridge – Demonstration mission) project is one of the six missions selected by ESONET NoE* to demonstrate its partners' capability of implementing and operating long term marine observatories, from their design to exploitation phases. MoMAR-D focuses on seafloor geological, chemical and biological processes occurring on the Mid-Atlantic ridge on the Lucky Strike vent field, located 200 nautical miles offshore the Azores at a depth of 1700 m. The observatory was installed in October 2010 during the MoMARSAT cruise (see presentation by Sarradin et al.) and since then transmits four times per day observations from the seafloor to a data base onshore. This infrastructure is complemented with autonomous sensors throughout and around the vent field. The expected duration of the monitoring experiment is twelve months. The marine data acquisition and transmission infrastructure will be described, with an emphasis placed on the recent technical advances and key choices that made this experiment successful.

The marine infrastructure consists of two Sea Monitoring Nodes (SEAMON) located on the sea floor, each serving a set of local sensors, and a surface buoy (BOREL) relaying the transmission to shore, via satellite, of the acoustically received seafloor measurement data.

The two SEAMON nodes benefit from the same architecture. They provide their sensors with the means to record and transmit their measurements for one year: energy, measurement sequencing, local data storage, data transmission to the installing submersible, remote data transmission, and protection against bio-fouling.

SEAMON West is dedicated to geophysical monitoring and installed on the Lucky Strike lava lake. It serves an instrument developed by the Institut de Physique du Globe de Paris that combines a permanent pressure gauge and an ocean bottom seismometer. The geophysical sensor frame was lowered to the seafloor separately from SEAMON West, then electrically connected to it by the means of an innovative underwater connecting device operated by the ROV Victor 6000.

SEAMON East was installed at the base of the 11 m active Tour Eiffel edifice, 600 m to the East of its sister SEAMON West. This node is dedicated to studying the links between faunal dynamics and physico-chemical factors. Seamon East is composed of a newly developed high definition video camera with associated Light Emitting Diodes, an Aanderaa optode (dissolved oxygen) and two in situ chemical analysers. All the sensors were fitted on two daughter frames installed on the SEAMON chassis and electrically connected to it on the ship deck. The frames were deployed from the node by Victor 6000 after the whole module was lowered to the seafloor. We report the successful first time use of an underwater Wifi data link between the HD camera and Victor 6000, allowing real time in situ video streaming used for camera tuning from the ROV control room.

Carefully installed within acoustic range of the two SEAMONs on the ocean surface, the BOREL relay buoy comprises two independent and redundant communication channels, each composed of a newly developed acoustic modem (Evologics GmbH, Germany) selected for its high energy efficiency, a local management unit and an Iridium modem (NAL Research Corporation, USA). The use of Iridium RUDICS (Router-Based Unrestricted Digital Interworking Connectivity Solution) service, associated to a specific data protocol allows efficient satellite transmission of a large amount of data. In addition to transmitting the periodic data flow from the sea bottom to the shore, the buoy allows the instant transmission of alarms from the seafloor and the modification from shore of the functioning parameters of the various observatory components.

The technical results obtained at the date of the session (during and after the installation cruise) will be presented and discussed.

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