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Developments of next generation of seafloor observatories in MARsite project

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The development of new generation of autonomous sea-floor observatories is among the aims of the EC supersite project MARsite (MARMARA Supersite; FP7 EC-funded project, grant n° 308417). An approach based on multiparameter seafloor observatories is considered of basic importance to better understand the role of the fluids in an active tectonic system and their behaviour during the development of the seismogenesis. To continuously collect geochemical and geophysical data from the immediate vicinity of the submerged North Anatolian Fault Zone (NAFZ) is one of the possibilities to contribute to the seismic hazard minimization of the Marmara area.
The planning of next generation of seafloor observatories for geo-hazard monitoring is a task in one of the MARsite Work Packages (WP8). The activity is carried out combining together either the experience got after years of investigating fluids and their interactions with the seafloor and tectonic structures and the long-term experience on the development and management of permanent seafloor observatories in the main frame of the EMSO (European Multidisciplinary Seafloor and water-column Observatory, www.emso-eu.org) Research Infrastructure.
The new generation of seafloor observatories have to support the observation of both slow and quick variations, thus allow collecting low and high-frequency signals besides the storage of long-term dataset and/or enable the near-real-time mode data transmission.
Improvements of some the seafloor equipments have been done so far within MARsite project in terms of the amount of contemporary active instruments, their interlink with "smart sensor" capacities (threshold detection, triggering), quality of the collected data and power consumption reduction. In order to power the multiparameter sensors the digitizer and the microprocessor, an electronic board named PMS (Power Management System) with multi-master, multi-slave, single-ended, serial bus Inter-Integrated Circuit (I^2C) interface has been designed, and the prototype is under test.
To reduce energy consumption an embedded system has been used. All the parts of the data acquisition module are integrated in a compact and reliable aluminum frame that can be easily fitted inside vessels for tests in the marine environment. The module also includes two solid-state drives for data storage and connectors for integration with other devices and sensors.
The ongoing testing activity is aimed to check the three main advances obtained so far: an open architecture of the system, very low power consumption and the possibility of digitizing at 24 bit signals from a large variety of analog sensors. The tests are carried out in the extreme marine environment of the submarine hydrothermal system of Panarea (Aeolian islands), where tectonic and volcanic activities are the responsible for the November 2002 submarine explosion which is the only submarine volcanic event recorded in the Mediterranean sea in recent times. The tests include corrosion resistance of the materials, data recording, storage and transmission. The tests are carried out using two sets of sensors, very different in terms of data acquisition frequency: temperature and pressure probes and hydrophones.