SEAFLOR OBSERVATORIES: AN EMERGING TECHNOLOGY FOR LONG-TERM GEOPHYSICAL, GEOCHEMICAL AND ENVIRONMENTAL INVESTIGATIONS. 
THE ITALIAN CONTRIBUTION

Since almost ten years Italy is in the forefront of the development of seafloor observatories for multidisciplinary long-term investigation in deep water thanks to the cooperation of companies and research institutions. In particular Istituto Nazionale di Geofisica e Vulcanologia (INGV) and Tecnomare, marine engineering company of the Italian ENI group, are the leaders in this sector. Their cooperation dates back to 1993, when the European Commission awarded a technical and economical feasibility study for an abyssal benthic laboratory to Tecnomare. The proposed concept, filling the gap between the offshore engineering and the increasing demand for reliable and innovative technologies for deep-sea investigations put forward by the scientific community, became the object of a two-phase European Commission project (1995-2001) that led to the development and successful operation of the first European seafloor observatory: GEOSTAR.

Fully complying the commonly adopted definition of “seafloor observatory”, operative since 1998, qualified in scientific missions of up to 7 months duration and up to 3320 m water depth, GEOSTAR has established a standard for successive developments in particular: SN-1 observatory funded by the Italian “Gruppo Nazionale di Difesa dai Terremoti”, ORION-GEOSTAR 3 funded by the European Commission (EC), MABEL funded by the Italia National Programme for the Researches in Antarctica.

SN-1 was conceived as the first node of the Italian submarine geophysical and environmental network, extending the observation capabilities of the permanent land-based networks. SN-1 represents the first evolution of GEOSTAR concept towards a lighter version of observatory, specifically devoted to geophysical and oceanographic investigations. After a successful mission offshore Catania (2105 m w.d.) in the period October 2002-May 2003, SN-1 is going to be again deployed and connected to shore via underwater cable (in the framework of a scientific cooperation with INFN, involved in an experiment of neutrino astronomy in the same site), thus becoming the first cabled geophysical observatory in Europe.

ORION-GEOSTAR 3 is the first underwater network of multiparameter seafloor observatories, based on GEOSTAR and two new multiparameter satellite observatories (nodes). This system was successfully operated in a mission in Southern Tyrrhenian Sea, at the base of Marsili volcano (3320 m w.d., December 03-on going). One of the ORION system satellite node has been integrated in another geotechnical shallow water monitoring network (ASSEM Project, EC) and has taken part to a mission in the Corinth Gulf (Greece, 377 m w.d., April 04-on going).

GMM (Gas Monitoring Module) is a cabled observatory specifically devoted to automatic long-term methane monitoring at seafloor; it is in operation since April 2004 in the Corinth Gulf mission, as node of ASSEM network.
Finally, MABEL is an ongoing project aimed at the development of a multidisciplinary seafloor observatory for polar areas.

All these observatories share the same deployment/recovery procedure and relevant infrastructures; besides, they can interchange several subsystems like the data acquisition and control electronics, battery packs, scientific payload (some of which were object of specific development and adaptation work) and communication system.

The presentation will give an overview of the technological efforts carried out by now, and will present some of the most significant scientific results. Moreover, ongoing and planned developments will be introduced.

Fig. 1 - Map of the sites where Italian seafloor observatories have performed missions.

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