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Multidisciplinary data from single-frame seafloor observatories

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In the period 1995-2004 the European Commission funded a series of projects, for the development of multidisciplinary seafloor observatories designed as single-frame platforms (GEOSTAR, GEOSTAR 2, ORION-GEOSTAR 3 projects coordinated by INGV, ASSEM project coordinated by IFREMER). In addition an Italian project (SN-1) was aimed at developing an observatory to be linked onshore via submarine cable. The result is today a fleet of 5 units. These observatories can operate from the deep sea to shallow waters, can have multidisciplinary payload, long-term operability, capability of [near]-real-time data transmission, possibility to be integrated with on-land networks. All the observatories can host into a single frame a wide range of geophysical and oceanographic sensors, sharing a unique time reference, including seismometers, hydrophones, magnetometers, gravity meters, current meters, ADCP, CTD, chemical and gas sensors, water samplers.

So far, the 5 observatories have carried out 6 missions in the Adriatic Sea (GEOSTAR mission, shallow waters, offshore Ravenna), Tyrrhenian Sea (GEOSTAR 2 and GEOSTAR 3 missions in proximity of Ustica Island and Marsili deep-sea respectively), Ionian Sea (offshore Etna volcano, by SN-1) and Corinth Gulf (ORION Node 4 and GMM-Gas Monitoring Module). These missions produced a huge amount of continuous and long-term time-series data, equivalent to about a thousand days, in the order of one hundred Gbytes (binary data).

All data have been processed following quality check procedures (local and onshore data management), as key tasks that always precedes subsequent actions of elaboration, data banking and dissemination. The data quality control is also fundamental to assess the correct use and installation of the sensors within the observatory (e.g.,

seismometer-ground coupling), allowing improvements for future missions. The interpretation of the data is then performed with a multidisciplinary approach, by comparing the signals (patterns, trends, anomalies, peak/drop events, seismic events) from all the sensors used in the same mission. In this way it has been possible to recognise causal links and to understand better the processes inducing the phenomena observed.