

Analysis of the seismo-volcanic and hydrothermal activity recorded on the Marsili submarine volcano

Antonino D'Alessandro [1], Giorgio Mangano [1], Giuseppe D'Anna [1], Dario Luzio [2]

[1] Istituto Nazionale di Geofisica e Vulcanologia, Centro Nazionale Terremoti;
[2] Università degli Studi di Palermo, Dipartimento di Scienza della Terra e del Mare;

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Marsili is a back-arc volcano with a dominant tholeiitic petrochemical affinity. This seamount, having an elevation of about 3000 m above the sea floor, an approximate length of 60 km in a NNE-SSW direction and a mean width of 25 km, is the biggest European volcano. The opening of the Marsili basin was related to a sharp acceleration of the roll-back of the Ionian lithosphere subducting below the Southern Tyrrhenian Basin.

On the basis of all the geophysical, geological and petrological information known, Marsili volcano can be considered as being the key needed to understand the dynamics of spreading and back-arc lithosphere formation in this Tyrrhenian sector. However, despite its importance in the Mediterranean geodynamical context the seismo-volcanic and hydrothermal activity of this seamount remained little known.

For this reason in 2006, in the framework of PRO.ME.TH.E.US project (Program of Mediterranean Exploration for Thermal Energy Use), founded by PRAMA s.r.l (Italy) (now Eurobuilding SpA), a multi-disciplinary research was conducted on the Marsili volcano area.

In the framework of this project the INGV's staff placed a broadband OBS/H (Ocean Bottom Seismometer with Hydrophone) on Marsili's flat top (39° 16,383' lat. Nord, 14° 23,588' long. Est.) at a depth of 790 m. For this experiment the OBS/H operated from July 12th to 21st 2006. In only 9 days the submarine seismic station recorded more than 1000 seismo-volcanic and hydrothermal signals. By comparing the signals recorded with typical volcanic seismic activity, we group the recorded signals into: Volcano-Tectonic type B (817 VTB) events, occurrences of High Frequency Tremor (159 HFT) and quasi-monochromatic Short Duration Events (32 SDE). The small-magnitude VT-B swarms, having a frequency band of 2 - 6 Hz and a mean length of about 30 seconds, were almost all recorded during the first 7 days. During the last 2 days, the OBS/H mainly recorded HFT events with frequencies of over 40 Hz and few minutes length.

On February 14th 2010, about three years and half after the first monitoring campaign another OBS/H was deployed in the same point for a long monitoring campaign (9 months).

For this experiment the OBS/H was equipped with a Guralp CMG40T-OBS 3C seismometer, with flat transfer function in the band 60 s - 100 Hz, housed in a glass sphere with an auto-leveling system that allows the sensor leveling in a range of $\pm 70^\circ$ from the vertical. To monitor high frequency seismic and pressure signals the OBS/H was also equipped with a HTI-04-PCA/ULF Hydrophone, with a flat transfer function in the band 100s - 8 kHz. Both the signals were recorded by a 4 channels 21 bits SEND Geolon-MLS datalogger, at a sampling frequency of 200 Hz.

During the nine months of the monitoring experiment the OBS/H recorded some thousand of little magnitude events very similar to that of the first experiment. The signals recorded in both the experiments were analyzed using polarization, spectral and clustering techniques. Both methods and results will be presented during the workshop.