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Geochemical monitoring of submarine volcanic environment: example and future perspectives

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The ORION GEOSTAR 3 EC project designed, realised and deployed two seafloor observatories to operate as network for geophysical, oceanographic and geochemical monitoring at the base of Marsili seamount, a volcanic edifice in the south Tyrrhenian Sea (3320 m w.d.), at the end of December 2003. Data were acquired with the following scientific instruments: broad-band seismometers, scalar and vectorial magnetometers, gravity meter, hydrophone, CTD, transmissometer, ADCP, single point currentmeter, chemical analyser and a offline water sampler. The analyser is an electrode-based prototype presently equipped with a pH deep-sea electrode, and the second is a modified commercial automatic time series sampler.

The analyser recorded more than 260 pH continuous data, while the automatic water sampler collected 38 samples for on shore laboratory chemical analyses. The water sampler was modified, by adding filters for ions and minor elements analyses. So, for such a kind of analyses, 23 sampling bags were disconnected from the common inlet, and a 0.45 nm filter was mounted directly on the inlet of each sampling bag, while for the gas analyses samples, the sampling bags configuration remained unaltered. Here are presented the data that reveals some important consideration: some chemical signals could indicate that the Marsili system could be considered still active. A contemporaneous depletion of pH values and SO_4^{2-} concentration could therefore suggest the existence of a hydrothermal circuit associated to a volcanic activity at depth. However, even if the interpretation could be supported also from the correlation of

geophysical data, the seawater chemistry and the interaction between metals and inorganic complexing anion is still far to be deeply known, since their behaviour and their possibilities to be mobilised could be greater than previously thought. This is extremely important, especially in absence of paroxistic phenomena. And this is one of the major question to be solved when approaching a chemical monitoring programme of submarine volcanoes. The interaction between seawater and submerged volcanoes produces chemical powerful signals sometimes not easy to comprehend. Literature reports in some cases behaviour that are common in different locations, while in other cases they seems to be contrasting.

Main purpose of newly presented EU proposal SEACHEMIIST is the realisation of submergible chemical automatic instrumentation for seawater chemistry. This proposal is an ideal prosecution of some spin-off of EU GEOSTAR projects; the development of flexible, automatic chemical monitoring devices for multipurpose, even as early warning systems, offers a great advantage in deepening the knowledge in applied field, offering new and detailed possibilities.