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# New insights on Panarea volcano from terrestrial, marine and airborne data

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The Panarea volcano belongs to the Aeolian arc system and its activity, which recently produced impacts on the environment as well as on human settlements, is known since historical times. This volcano, which includes Panarea island and its archipelago, is the emergent portion of submarine stratovolcano more than 2000 m high and 20 Km across. In November 2002 a submarine gas eruption started offshore 3 Km east of Panarea on top of a shallow rise of 2.3 km2 surrounded by the islets of Lisca Bianca, Bottaro and Lisca Nera. This event has posed new concern on a volcano generally considered extinct.
Soon after the submarine eruption, this area has been surveyed under multidisciplinary programs funded by the Italian Department of the Civil Protection and INGV. Monitoring programs included subaerial and sea bottom DEM of Panarea volcano by merging aerial digital photogrammetry, aerial laser scanning and multibeam bathymetry. A GPS ground deformation network (PANANET) was designed, set up and measured during time span December 2002 - October 2007. GPS data show rates of motion and strain values typical of volcanic areas which are in agreement with the NE-SW and NW-SE tectonic systems. The latter coincide with the main pathways for the upwelling of hydrothermal fluids. GPS data inferred a pre-event uplift followed by a general subsidence and shortening across the area that could be interpreted as the response to the surface of the inflation and deflation of the hydrothermal system reservoir which is progressively reducing its pressure after the 2002 gas eruption. Magnetic and gravimetric data depict the deep and shallow structure of the volcano. From geochemical surveys were calculated energetic conditions at craters. Data were coupled with the computed physic-chemical state of the fluids at the level of the deep reservoir and provided the boundary conditions of the occurred event, and suggesting that a low-energy explosion was responsible for producing the craters at the sea bottom.
Finally, we provide a model constrained by GPS data and Okada formulation, which suggests that the degassing intensity and distribution are strongly influenced by geophysical-geochemical changes within the hydrothermal/geothermal system. These variations may be triggered by changes in the regional stress field as suggested by the geophysical and volcanological events which occurred in 2002 in the Southern Tyrrhenian area.