Geophysical Research Abstracts
Vol. 20, EGU2018-17296, 2018
EGU General Assembly 2018

The 21st August 2017 Ischia (Italy) earthquake source model: an example of integrate multiplatform monitoring system

Vincenzo De Novellis (1) and the (1,2,3,4) VELO Team

(1) IREA - National Research Council (CNR), Engineering - ICT and Technology for Energy and Transport, Napoli, Italy , (2) Osservatorio Vesuviano, Naples, INGV, Italy, (3) Dipartimento della Protezione Civile, Rome, Italy, (4) IMAA - National Research Council (CNR), Potenza, Italy

The Ischia earthquake (Mw 3.9), occurred on 21st August 2017 (18:57 UTC), struck the northern sector of the active volcanic Ischia Island (Southern Italy) causing 2 casualties, 42 injuries and extensive damage to the Casamicciola Terme and its surroundings, along the northern structural rim of Mt. Epomeo. It was followed by a seismic sequence of almost 20 earthquakes with significantly lower magnitude. Moreover, geological coseismic effects, among which fractures, small rock falls and landslides in the volcanoclastic deposits, have been induced over an area of ca. 2.5 km2. This earthquake represents the largest seismic event affecting the Island ever observed with modern techniques. In this study, we use a multidisciplinary approach allowing to investigate the causative source of the IE event, which was characterized by high epicentral intensity values. In particular, we have exploited seismological data, GPS and DInSAR measurements (Sentinel-1 and COSMO-SkyMed), to investigate the seismogenic source through analytical modelling techniques.

The joint inversion of the geodetic coseismic measurements allows us to estimate the fault plane parameters and to retrieve the associated slip distribution. We find a main patch of slip (with values up to 14 cm) located at the center of the fault plane at about 1 km depth. This result provides a picture of the seismogenic mechanism of the earthquake, dominated by a normal fault mechanism where the hanging block (located in the northern part of Mt. Epomeo) moves downwards. In particular, the retrieved seismogenic fault responsible for the earthquake is characterized by (i) a E-W striking fault, (ii) a south-dipping high-angle plane (70°) and (iii) a rake value close to -90°. We further remark that the 2017 seismic sequence occurs in the same area where the previous seismicity of Ischia Island was located. The E-W distribution of the seismic sequence spreads along the main system of faults arranged in parallel segments over an area, whose dimension is compatible with the fault length inferred from our inversion results. The sub-vertical normal fault of the earthquake with a southward dipping is in good agreement with the structural framework of Mt. Epomeo proposed in the available literature and with no field evidences of reverse fault systems. Moreover, the bathymetric surveys performed in the surrounding region of the volcanic Island do not reveal the existence of morphological elements that could be associated with compressional fault structures.

Our study confirms that the seismicity of the northern side of the Island is associated to a local seismogenic structure that is stressed, and periodically reactivated, by the loading of the Mt. Epomeo along its maximum elevation sector. In this context, the retrieved normal fault mechanism is very likely induced by the observed long-term subsidence phase since the lithostatic load represents the principal vertical stress. This finding is particular evident if we superimpose the retrieved fault model on the rheological stratification of the area. Accordingly, our results suggest that the rheology properties of the crust beneath the Ischia Island have an influence on the ongoing volcano-tectonic processes.