Multidisciplinary Investigations of the Seismogenic Structure of Casamicciola area (Ischia Island) - MISS Casamicciola

Abstract

The project is aimed at characterising the geometry and the mechanism of strain load and release along the seismogenic structure located in Casamicciola area. This fault is associated with the 2017, MW=3.9, earthquake, the first considerable seismic event recorded instrumentally at Ischia - which caused serious damages and 2 fatalities at Casamicciola. Recent studies reveal that this structure is also responsible for catastrophic historical earthquakes, such as 1881 and 1883 (~2300 casualties). Also considering the about 65,000 inhabitants, and the more 3,000,000 tourists visiting the island every year, the seismic history of Ischia makes this island a high seismic risk area. Thus, assessing the seismic potential of this structure appears fundamental in defining the seismic hazard of the island, helping in reducing the potential losses from natural disasters and in improving the disaster risk management. This last goal will also be pursued within the frame of the present proposal by means of specific activities of dissemination among the population exposed to the seismic hazard.

The project has a strongly multidisciplinary approach, with the whole cycle of data collection, analysis, interpretation, and modelling. Firstly we will focus on the detailed definition of the fault geometry, by means of geophysical and geochemical investigations. We will gather new gravimetric, magnetotelluric, and geochemical data along the study fault. The resulting data will be integrated with existing resistivity and magnetic data, previously acquired by our research team, or available in literature. Also, the precise relocation of the recent instrumental seismicity, although not abundant, might help in defining the geometry of the fault. The mechanism of strain load and release will be investigated in the long- and short-term perspectives. The former will be analysed by considering the relationship between the time of occurrence of the historical earthquakes and the average approximate coseismic dislocation, as derived from the events' magnitude. The latter will be investigated by analysing the satellite geodetic data, which will allow a detailed investigation of possible inhomogeneous behaviour of different sectors of the study fault. We will also attempt to determine the stress drop of the most recent strongest, well-recorded earthquakes, useful to assess dynamic parameters of the fault.

The results obtained by the analyses described above will constitute the base for a 3D modelling of the fault dynamics, aimed at determining the most important elements contributing to the genesis of the damaging earthquakes in the northern sector of the Island. In particular, we will focus on the interaction among fault dynamics, the geothermal system, and the observed long-term island subsidence of the Island. In these regards, we expect the geochemical data to provide fundamental information to constrain pressure and temperature of the geothermal system.