

Seismic pattern and focal mechanism determination in the Nisyros region (SE Aegean, Greece)

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South Aegean is an active region, dominated by the convergence of two lithospheric tectonic plates, the African and the Eurasian. The backarc area is characterized by the presence of the Hellenic Volcanic Arc. Focusing on the study area, Nisyros Island is a Quaternary composite volcano located close to the eastern termination of the Hellenic Volcanic Arc. The main characteristic is a truncated cone with a base diameter of 8 km and a central caldera of 4 km in diameter. Earthquake occurrence in the broader region is both of tectonic and volcanic origin. The seismicity rate during the last decades is not high, with foci being both shallow and in intermediate depths. A velocity model (1D) was determined to accurately locate events that occurred in the study area during the period 2000 - 2015. Concentration of hypocenters was observed SW of Nisyros and about 7 km north of Nisyros, near Yali Island. In addition, important activity is located in the broader area, i.e. close to Karpathos and Rhodes Islands and east of Kos Island. Furthermore, clustered seismicity was recorded 40 km south of Nisyros and north of Karpathos Islands. Temporary networks, installed in Nisyros and its vicinity, revealed local onshore seismicity, not recorded by the national network. The number of both shallow and intermediate depth events in the broader study area significantly increased since 2006, mainly due to the installation of additional stations belonging to the Hellenic Unified Seismological Network (HUSN). Focal mechanisms of moderate events were determined using regional moment tensor inversion. The results revealed that normal faulting characterizes the shallow earthquakes. On the other hand, events with intermediate focal depth are related to reverse focal mechanisms, with an important strike-slip component. A local earthquake tomography study was also conducted in the study area. Low V_p anomalies accompanied by high values of V_p/V_s ratio were obtained at the northern part of the Nisyros-Kos Caldera that could be related to the identification of possible magmatic chambers. In addition, a prominent feature was recognized to the SW of Nisyros Island with high absolute values of V_p and V_p/V_s ratio that can be attributed to magma intrusion of deeper composition containing fluids and melts.

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