



Microseismicity in the volcanic arc of the Hellenic Subduction zone

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The Hellenic Subduction zone is the prominent seismotectonic feature in the South Aegean region. Microseismicity was studied in order to define seismogenic zones in the island arc of the Hellenic Subduction zone and to study seismicity related to the island arc volcanism and active faults. Adequately located digital-recording networks with sufficient azimuth coverage are needed for these investigations.

Recently, a temporal local seismic network has been installed on the Cyclades in the central part of the volcanic arc (CYC-NET, Bohnhoff et al., 2004). Up to 22 seismic stations were deployed on 16 islands covering an area of about 110 km NS to 180 km EW. In the previous 18 months of registration about 3000 seismic events in a magnitude range from 0 to 4.2 were located. Results of single event location using a 1D-velocity model with special applications to depth determination were used to identify major structures in hypocentre distribution. Structural models along profiles extending from the forearc to the volcanic arc based on wide angle seismics (Bohnhoff et al., 2001), receiver functions analysis (Endrun et al., 2004) and surface wave studies (Meier et al., 2004a) were compared to hypocentre distribution. The structural information provide a basis for a first order 3D-velocity model applied for relocating seismicity using a non linear search algorithm (NonLinLoc, Lomax et al., 2000). This location method allows an error estimation in hypocentre distribution. Most of the seismicity beneath the Cyclades is located in the crust. High activity was found in the upper 10 km. Less activity is observed down to the Moho which is located at about 23 km beneath the central volcanic arc. Crustal seismicity in the Cyclades shows strong spatiotemporal clustering. Clustering is manifested in the spatial distribution as well as in some temporal clusters. Some clusters with high similarity in waveforms were

identified which are well suitable for relative localisation.

The seismically most active area is located northeast of the island Santorini where the submarine volcano Columbo is situated. Further to northeast the Santorini-Amorgos fault zone is found which shows as well a high rate of seismicity. A large portion of other microseismic clusters are located next to the small islands.

In the Aegean mantle below 23 km hardly any seismicity is observed. That means the mantle wedge shows little microseismic activity. The Wadati-Benioff zone of the downgoing African oceanic plate can be imaged by intermediate depth events. Maximum depth of the Wadati-Benioff zone increases from about 120 km in the west down to 160 km beneath the eastern Cyclades.

In order to get an image of seismogenic zones from the forearc around Crete towards the volcanic arc we combined results obtained by CYC-NET with results of previous temporary local networks around Crete (Meier et al., 2004b). A comparison of the hypocentre distribution with the structural models allows to identify different seismogenic zones from the forearc to the volcanic arc.

References:

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