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THE M_L=5.7, 8 JANUARY 2013 EARTHQUAKE AEGEAN SEA AND THE EVOLUTION OF THE AFTERSHOCK SEQUENCE

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On 8 January 2013 (14:16 UTC) a moderate earthquake, M_L=5.8 occurred off the coast of Lemnos Island, Northern Aegean Sea. The earthquake's geographical coordinates were calculated by NOA (National Observatory of Athens) as φ=39.666°N, λ=25.562°E, depth d=31 km (http://bbnet.gein.noa.gr/alerts_manual/2013/01/evman130108141608_info.html). This event was felt by the population of the surrounding Greek islands, as well as in Turkey (Canakkale, Izmir, Marmara region). The tectonic setting of the area is defined as the continuation of the branch of North Anatolian Fault inside the Aegean Sea. The sequence happened in a region which includes the Agios Efstratios Fault Zone, a segment of which ruptured during the 19 February 1968 earthquake M_L=7.2 (Kiratzi et al., 1991; Pavlides and Tranos, 1991). After the event and for the next 24 hours, 105 intermediate size events ($1.7<M_L<3.4$) occurred, while during the sequence only three earthquakes of magnitude $M_L \geq 4$ were observed. The sequence was well recorded by the stations of the Greek and Turkish Seismological Stations (Kiratzi et al., 2013). For the location of the events broadband stations including stations from NOA's strong motion network were used. Figure 1 represents the aftershock distribution of the 8 January 2013, Aegean Sea earthquake for the next three months. Totally 510 events were recorded with magnitudes between $0.9<M_L<4.8$.

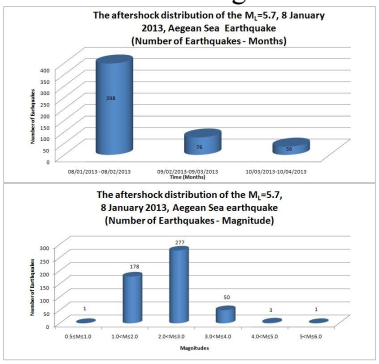

Figure 1. Distribution of the aftershocks recorded for the period 8 January 2013 – 8 April 2013

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The main event as well as all the aftershocks was relocated using the NonLinLoc software (Lomax et al. 2000). A 1-D model velocity proposed by Panagiotopoulos et al. (1985). The phase data set from National Observatory of Athens includes more than 5.900 – P and 2.500 – S wave arrivals. Only events with at least 5 P-wave and 1 S-wave arrival, having an azimuthal gap lower than 180°, location RMS lower than 1.5s and travel time residual lower than 1.5s were selected for processing. A NE – SW striking fault about 40 km off – shore Lemnos Island was revealed after relocation. The relocated aftershocks indicated the activation of two parallel faults striking NE-SW, and located 5 km apart. For the aftershocks with M_L>3.7 we applied the moment tensor inversion to determine the activation of the faulting type, the Seismic Moment (M_0) and the Moment Magnitude (M_w). For this purpose, 3 – component broadband seismological data from the Hellenic Unified Seismological Network (HUSN) were selected and analyzed. The method using the software of Ammon (Randal et al., 1995). To calculate the moment tensor, the data at least 4 stations used at different azimuth coverage and with an epicentral distance not more than 350 km. The preparation of the data, includes the deconvolution of instrument response, following the velocity was integrated to displacement and finally the horizontal components rotated to radial and transverse. The signal was inverted using the reflectivity method of Kennett (1983) as implemented by Randall (1994) in order to determine Green's functions. Initially, iterative inversions were performed considering a crude depth interval of 5 km and the relative misfit functions were computed. In a second stage, inversions were performed considering a finer depth interval of 1–2 km around the depth where the lowest misfit was exhibited. During the analysis the velocity model that proposed by Karagianni et al. (2005) was used. Most of the aftershocks indicated similar active faulting plane with this of the main event. All the focal mechanisms were compared with those from other institutes and they are in agreement.

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