Geophysical Research Abstracts
Vol. 16, EGU2014-11315, 2014
EGU General Assembly 2014

The strong (Mw5.9) earthquake of 28 Dec. 2013 in Cyprus Arc and its seismotectonic implications

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On 28 December 2013 (15:21 GMT) a strong mainshock occurred in the northwestern termination of the Cyprus Arc in the east basin of the Mediterranean Sea. The earthquake was strongly felt in several localities of Cyprus as well as of SW Turkey. According to preliminary determinations (e.g. GFZ, NEIC, Harvard etc.) the earthquake moment magnitude was around 5.9 and its focal depth between 45 and 50 km. This earthquake is of particular importance since it occurred in a region where the seismotectonics is not well-known. To better understand the geodynamic relation of this earthquake activity with the subduction zone of Cyprus we have relocated the main event and its aftershocks and determined their fault plane solutions. Relocation was performed using a local velocity model and the NonLinLoc algorithm (Lomax et al. 2000). We used phase data from stations available around the earthquake source at reasonably small epicentral distances of about less than 4°. We applied moment tensor inversion to determine focal mechanism, seismic moment and moment magnitude. For this purpose, three–component broadband data retrieved from the ORFEUS data base were selected and analyzed applying the software of Ammon (Randal et al., 1995). To calculate moment tensors, data from at least five stations having wide azimuth coverage and situated at epicentral distances of no more than 350 km were used. After deconvolution of instrument response, 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. The seismotectonics of the area is reconsidered under the light of the new results obtained which may also better explain particular episodes of the historical seismicity of the region, such as the very strong earthquake activity of AD 1481.