

The Seismogenic Thickness in the Dead Sea Area

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Abstract

Four independent distributions of seismicity in the Dead Sea area underline the occurrence of lower-crustal seismic activity down-to at least 27 km and possibly as deep as 33.6 km. From these distributions, the seismogenic thickness is estimated to be 28.4 ± 2.2 km. The existence of a seismogenic zone extending deep into the lower crust is consistent with an average heat flow of only 40 - 45 mWm^{-2} over most regions of Israel, and around 40 mWm^{-2} in the Dead Sea area in particular. The seismogenic thickness in the Dead Sea area is thus nearly twice the average seismogenic thickness of 15 km observed in southern California. The fact that some seismic activity occurs down-to the Moho in the Dead Sea area suggests that the state of fully plastic deformation is probably not reached in the crust under the seismogenic zone.

The ISC - GEM (Storchak et al., 2013) relocation of the M_w 6.3 earthquake of 11 July 1927 from regional and teleseismic instrumental data resulted in a well-constrained epicenter located in the Jordan Valley, not far from the epicenter reported in the 1927 bulletin of the ISS. Since the causative fault of this earthquake is likely to be the Dead Sea transform, we propose a preferred epicenter at $31.92^\circ \text{N} - 35.56^\circ \text{E}$. The focal depth determined instrumentally by the ISC - GEM relocation is 15 ± 6 km, and we found an average macroseismic depth of 21.5 ± 2.5 km. Our results as a whole underline also the seismogenic importance of the transition between the upper and the lower crust in the Dead Sea area for moderate and probably also for large earthquakes.