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Local earthquake tomography model for the southern Dead Sea area

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Local earthquake data from a dense temporary seismological network in the southern Dead Sea area have been analyzed within the project DESIRE (Dead Sea Integrated Research Project). Local earthquakes are used for the first precise image of the distribution of the P velocity and the vp/vs ratios. 65 stations registered 655 local events within 18 months of observation time. A subset of 530 well locatable events with 26,730 P- and S-arrival times was used to calculate a tomographic model for the vp and vp/vs distribution. Since the study area is at first order two-dimensional, a gradual approach was chosen, which compromised a 2-D inversion followed by a 3-D inversion. The sedimentary basin fill, clearly imaged through high vp/vs ratios and low vp, shows an asymmetric structure with a vertical eastern boundary and an inclined western boundary. Within the basin fill the Lisan salt diapir is imaged through low vp/vs ratios. Below the basin fill the pre-basin sediments and the reworked crust, indicated by low P velocities and low vp/vs ratios, form a 10 km wide body between 12 and 18 km depth with vertical boundaries. No indications are found for a significant change of the P velocity structure in NS direction. Meanwhile, the change of the vp/vs ratios from high to low values varies in NS direction. This change, interpreted as the lower boundary of the basin fill, is reached already at 10 km depth in the area of the Boqeq fault, but not until 14 km depth below the Lisan peninsula. This difference is most likely related to different amounts of faulting at the transverse normal faults. North of the Boqeq fault the seismic activity between 3 and 15 km depth is mostly related to the fluid containing basin sediments. South of the Boqeq fault the seismic events occur between 12 and 18 km depth, and thus within the pre-basin sediments and the underlying crust.