CRUSTAL STRUCTURE UNDER THE DEAD SEA AND THE SEA OF GALILEE: TOMOGRAPHIC IMAGING OF THE CENTRAL DEAD SEA RIFT

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The crustal structure under the Dead Sea and the Sea of Galilee was calculated using tomographic imaging model of the analysis of seismic events. The model applied travel time simultaneous inversion techniques to calculate the seismic velocity structures of the crust and the uppermost mantle. The data set for the Sea of Galilee area comprised 134 direct P-arrivals of local earthquakes that occurred in northern Israel form 1987 to 1993. The model delineated an anomalous area of low seismic velocity at the 10-15 km depth layer located underneath the axial zone of the Rift north of the Sea of Galilee, where most earthquakes cluster. We also analyzed first arrivals of P-waves from 113 earthquakes in the Dead Sea region and calculated a tomographic model of the lower crust and the uppermost mantle. The model shows two layers, at depths of 10-22 km and 22-32 km with average seismic velocities of 6.5 and 7.7 km/sec respectively. Moho under the Dead Sea is at 22 km, and the seismic velocity in the upper lithospheric mantle is anomalously low. These anomalies indicate that the mantle under the central Dead Sea rift is shallow and anomalously hot, and, possibly, that magmatic diapirs ascend along the boundary faults of the rift. Structural similarity of the upper mantle and the lower crust between the central Dead Sea Rift and the northern Red Sea suggests analogous tectonic regime in these two regions.