The velocity structure of the crust across the Dead Sea basin is obtained by applying tomography based on local earthquakes. We use P wave travel-time of 614 earthquakes that occurred in the period 1983-2009. At all depths the basin is characterized by lower velocities relative to both sides. At shallow depths (<15 km) there is more seismic activity on the eastern side of the basin than on the western side, and the northern basin is generally more active than the southern basin. There is an asymmetry in the faults that border of the Dead Sea basin. The eastern fault, with nearly vertical dip faulting, appears to be a clear boundary at all depths down to about 20 km. The depth extension of the western fault of the basin is definitely limited to less than 15 km. The concentration of earthquakes in the central part of the basin at depth larger than 15 km suggests that the Dead Sea fault at those depths act as a one single fault that is located in or near the central axis of the basin. The seismic activity near Mt. Sodom is relatively low and occurs at shallow depths down to 10 km. The seismic activity near the Lisan peninsula extends to a depth of ~15 km. The significant seismic activity at depths of 20 and 25 km, mainly in the center and the northern part of the basin suggests that the upper and the lower crust are relatively cool.