

Long-term faulting history and related seismic cycle of the Dead Sea Fault

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Recent studies in archeo-paleoseismology made along several sites of the Dead Sea Fault provide evidence of earthquake-related faulting and damage. Coseismic offsets and damage of archeological sites have been identified primarily on the Wadi Araba and Jordan Valley Fault segment, between the Sea of Galilee and Hula Basin, and on several sites between the Lebanese restraining bend and the Amik basin to the northern end of the transform fault.

The detailed mapping of rupture zones showing structural restraining bends, releasing step-overs, patch and segment boundaries, and slip distribution along strike illustrate their geometrical complexities. Our results indicate correlations between seismic events and fault segments with predominant earthquake clustering. Taking into account the geologic and geodetic slip rate (2.5 – 6 mm/yr.), a 2.5 to 5.5 m slip deficit is inferred on some sections also showing present-day seismic gaps since nearly 1000 years. In most cases, the clustering of large earthquakes migrates along fault segments and show off sequence seismic events. The mechanical coupling between off sequence distant earthquakes and laterally propagating ruptures depend mostly on the stress change at fault discontinuities and related block tectonics. The temporal clustering and multi-segment earthquakes ruptures during the last 14 ka with coupling between step-overs and stress change suggests the size and probable length of future large earthquakes along this major continental fault.