



Slip deficit along the Jordan Valley segment of the Dead Sea Fault: Evidence from paleoseismic trenches and archeoseismology

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We investigate the late Quaternary active deformation along the Jordan Valley section of the Dead Sea Fault. The 110-km-long trace inland is most conspicuous at three sites that were investigated in detail. About 30 km north of the Dead Sea, the Ghor Kated area exhibits two pull-apart basins that illustrate the recent transtensional tectonics along the southern section of the fault. The pull-apart basins have similar geometry and dimensions, and their relationships to the fault segment imply a tectonic process that involves 180 ± 5 m of left-lateral offset. The nearby ~ 60 -m-deep Ghor Katar river incision exposes the fault trace and displays the Lisan and Damya late Quaternary lacustrine formations. It is affected by the fault and offset by a similar 180 ± 5 m of left-lateral displacement. The age of the incision, which is inferred from the well dated upper Lisan deposits suggests the onset of the left-lateral river offset to be younger than 47 ka and older than 36 ka. The fault zone also shows 18.4 ± 0.5 m cumulative vertical separation of the “white cliff” unit (uppermost Lisan deposits) and 26.5 ± 0.5 m for the lower-middle Lisan transition. A few kilometers further north, close to archeological site of Tell Es-Saidiyeh, left-laterally offset drainages document the passage of the fault and suggest the tell may have been strongly affected by past earthquakes. Paleoseismic trenches dug in the northern pull-apart and radiocarbon dating of sedimentary units show that the most recent fault movements have occurred between A.D. 560 and A.D. 1800 (2σ -calibration) and are consistent with

the historical seismicity catalogue. Fault movements may include the A.D. 749 and AD 1033 large earthquakes ($M > 7$) that struck the Jordan Valley. Supplementary excavations from the Tell Es-Saidiyeh site provided constraints on a series of 4 to 5 past events. The late Pleistocene-Holocene fault movements across the river incision and at the pull-apart area yield an estimated slip rate of 3.8 to 5 mm/yr and suggest an average 4 to 5 m of present-day slip deficit along the Jordan Valley fault segment.