



## **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  $180 \pm 5$  m of left-lateral offset. The nearby  $\sim 60$ -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  $180 \pm 5$  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  $18.4 \pm 0.5$  m cumulative vertical separation of the “white cliff” unit (uppermost Lisan deposits) and  $26.5 \pm 0.5$  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 ( $2\sigma$ -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.