

## **Past earthquakes along the southern Levant (Dead Sea) fault from paleoseismological.**

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The Levant fault is a left-lateral strike slip fault that bounds the Arabic plate to the West. The fault is about 1200 km long, connecting the Red Sea spreading center, to the South, to the compressive belt of the Taurus-Zagros, to the North. The fault is generally split into three sections: The Northern section and the Southern section, both dominated by strike-slip, are separated by the Lebanese restraining bend, where a significant component of the deformation is accommodated by some thrust, in addition to the strike slip. Recent GPS measurements across the fault and measurements of offset geomorphic features, dated from the Late Pleistocene to the Holocene, tend to converge toward a slip rate of  $5 \pm 2$  mm/yr, stable over at least 300 ky.

Although this part of the world has one of the longest historical records, earthquake history along the Levant fault remains largely unknown. Because of the large population living in the direct vicinity of the fault, deciphering the history of large earthquakes along this fault is therefore a critical issue.

Few large historical earthquakes are known to have ruptured parts of the fault, mostly North of the Dead Sea basin. Instrumental seismicity has been very quiet with only two notable events, the M6.25 earthquake in 1927, in the Dead Sea basin, and the Mw7.3 earthquake that occurred in the Gulf of Aqaba in 1995. Information about prehistorical events is also limited, as only few places have been investigated yet. Thereby, along most of the Levant fault the earthquake history remains poorly known and the location of many of the major prehistorical earthquakes is still debated. Hence, a clear picture of the seismic cycle along the Levant fault is still lacking.

We opened a 30-m-long paleo-seismological trench across the southern strand of the Levant fault, the Wadi Araba fault, about 30 km North of Aqaba, in Jordan. The trench is located at the edge of a large playa. The stratigraphy includes numerous distinctive layers, favorable to the recognition of past earthquakes. Two fault zones are visible in the trench about 10 m apart, the eastern part of the trench being down dropped relative to the western part. Numerous cracks and vertical offsets of the layers can be seen, that allow identification of a conservative minimum of 6 paleo-earthquakes. 39 <sup>14</sup>C samples have been dated. The remarkable consistency between the age and stratigraphic position of the samples indicates that our site does not seem to include reworked charcoals, giving us confidence in the interpretation of the ages. Our dates indicate that the time window exposed in the trench extends from present to 4000 yr BP. The seismic activity does not appear to distribute evenly in time but it seems rather clustered, with seismic activity between the 7<sup>th</sup> and the 15<sup>th</sup> century, around 2000BP and between 3000 BP and 4000 BP. In-between periods seems to be seismically quiet. Preliminary interpretation of the rupture pattern and ages suggest that we are able to identify ground ruptures associated to the AD 1068 and the AD 1212 earthquakes, two major earthquakes that severely affected the southern part of the Levant fault, although their location was never clearly established. One later earthquake rupturing the ground surface is also identified without ambiguities, which could be either the AD 1293 or the AD 1458 event.