



Slip-rates at different time-scales and paleoseismology along the southern Levant fault

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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 1200km long, linking the Red Sea spreading center, to the South, to the compressive belt of the Taurus-Zagros, to the North. The Southern section, between the Dead Sea and the Gulf of Aqaba, is about 160km long. Although this section can possibly be divided in two contiguous segments of similar length where the azimuth of the fault changes slightly, about midway from both end, the overall geometry of this part of the fault is remarkably simple. Hence, it is assumed that almost all the plate-boundary deformation is accommodated on this single strand. We targeted this section of the fault to measure slip-rates at different time-scales and also to compare slip-rates with the seismic history through time.

In 1999 and 2005 we have measured 17 sites for campaign GPS. Each site has been measured for 48h and the entire dataset has been complemented with permanent GPS from nearby Israel. Special care has been taken to be sure to measure far field points, up to 90km away from the fault, where possible. Using a locked fault model, we estimated the instantaneous slip-rate to be 4.9 ± 1.6 mm/yr over 6 years. Tests for possible creep on the fault show that if it exists it does not seem to be significant.

To estimate the slip rate over longer periods of time, we targeted alluvial fans offset by the fault at 4 sites, that we mapped and sampled for ^{10}Be cosmogenic dating. At one site, preferred offset of 46 ± 4 m of a surface dated at 11 ± 3 kyr yields a slip rate of 4.7 ± 1.9 mm/yr, in very good agreement with the present-day slip rate. At the other sites, preliminary reconstructions show offsets of ~ 600 m to ~ 5400 m with ages ranging from 50 to 350 kyr and suggest a slip-rate of 4 to 9 mm/yr.

These two slip-rates, measured along the same transect of the fault, show a very good agreement despite a major difference in the time scale addressed. Compilation of slip-rates along different large strike-slip faults shows that this observation is actually more common than previously thought.

Slip-rate has also been compared to the seismic history along the same fault segment. A paleo-seismic trench has been excavated along the southern part of this section of the fault, about 30 km North of Aqaba city. It unveils the recent seismic history of this section of the fault. Actually, despite the unusual long historical record of the Eastern Mediterranean region, it often remains difficult to unambiguously assign a specific historical earthquakes, reported in historical documents, to a specific fault segment. Preliminary analysis of our trench, thanks to fine stratigraphy, reveals at least 3 earthquakes, large enough to produce surface ruptures, meaning having magnitude equal or above magnitude 7. Further analyses and dating of the ^{14}C samples collected in the fault should allow us to bracket the age of these earthquakes and to determine if the 1068 devastating earthquake that was felt through the all Mediterranean region broke the southern section of the Levant fault.