



Short-term and long-term slip rate along the westernmost segment of the North Anatolian Fault using paleoseismic trenching and drainage offsets

Murat-Ersen Aksoy (1,2), Mustapha Meghraoui (2), Ziyadin Cakir (3), Mathieu Ferry (2,4), and Gulsen Ucarukus (1)

(1) Istanbul Technical University, Eurasia Institute of Earth Sciences, Istanbul, (2) Institut Physique du Globe, Institut de Physique du Globe, Geodynamics and Active Deformation, Strasbourg (m.meghraoui@unistra.fr), (3) Dept. of Geological Sciences, Istanbul Technical University, (4) Centro de Geofísica, Universidade de Évora

We investigate the cumulative and co-seismic offsets of the Ganos fault, the westernmost segment of the right-lateral North Anatolian Fault System that ruptured during the 9 August 1912 Mürefte earthquake ($M_s = 7.3$). The earthquake size requires a minimum 120 km fault rupture length. Right-lateral coseismic offsets are measured at 45 sites along the 45-km-long onland section of the fault (from Gaziköy to Saros Bay). The maximum co-seismic slip reached 5.5 m at Güzelköy and Yörgüç and the average displacement was inferred as 2-3 m. Using paleo-channel and stream offsets combined with dated units from trenches we obtain slip rates for the Güzelköy and Yeniköy sites. At Güzelköy, two paleo-channels display 16 ± 0.5 m and 21 ± 0.5 m offset and yield 22.3 ± 0.5 mm/yr for the last ~ 700 years and 26.9 ± 0.5 mm/yr for the last 781 years. Furthermore, the dating of the lowermost sedimentary units of the 46 ± 1 m dextral offset stream at Yeniköy provided a maximum 17 mm/yr slip rate for the last 2840 years. Cumulative displacements determined at 69 localities and tectonic reconstructions provide insight on the long term deformation of the Ganos fault segment. A classification of the stream incisions, related offsets and correlations with climatic events deduced from Black Sea sea level curves indicate the correlations of consecutive 5 groups of deflections (from 70 to 300 m) with subsequent sea level rise periods at 4 ka, 10.2 ka, 12.5 ka, 14.5 ka and 17.5 ka. Slip rate estimations yield a constant slip rate of 17.9 mm/yr for the last 20 ka and a variable slip rate from 17.7 mm/yr to 18.9 mm/yr for the last 17.5 ka. These long term slip rates obtained from cumulative stream offsets are comparable to the paleoseismic rates (17 - 27 mm/yr) obtained for the last ~ 800 years. We discuss the signification of our results and their small variability in comparison with 22 - 26 mm/yr GPS velocities that suggest strain accumulation along the Marmara segment of the North Anatolian Fault.