

Fault characteristics, segmentation and paleoseismology along the 9 August 1912 Ganos earthquake-rupture (North Anatolian Fault, Turkey)

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The Ganos fault is the most western segment of the North Anatolian fault that experienced the $M_s = 7.4 / 7.3$ earthquake of 9 August 1912. The earthquake revealed 45-km-long surface ruptures inland, trending $N70^\circ E$, and 5.5 m of maximum right lateral offset near Gaziköy. The earthquake size requires about 100 / 80 -km-long faulting but the offshore extension of the fault is problematic. We measured co-seismic displacements of roads, paths, streams, man-made buildings and field limits using Differential GPS surveys and total station at 39 sites. Dextral displacements range from 2.5 to 5.5 m from Gaziköy to Yeniköy. In addition, we used 1/10 000 and 1/ 35 000 scaled aerial photographs, Landsat TM images, SPOT 5 images and digital elevation models (SRTM) to analyze the geomorphology of the region. Offset distribution, fault geometry and geomorphology have been used to identify 3 sub-segments with variable orientations ($N72^\circ E$ to $N66^\circ E$). The Gölcük and Kavak basins are major step-overs along the fault and limit the sub-segments. The long term deformation of the fault is clearly expressed by several pull-aparts and sag ponds, pressure and shutter ridges and offset streams. Selected sites are studied with microtopographic surveys and paleoseismic trenches to characterize 3 faulting events since the 11th century and 8.3 ± 0.5 m and 19.4 ± 1 m cumulative and successive lateral offsets on present-day streams at Güzelköy. Parallel trenches expose paleo-channels and show a cumulative right-lateral offset of 11 ± 1 m, and a total stream deflection of 21 ± 1.5 . Radiocarbon dating of older channel units imply a minimum 17.5 - 20 mm/year slip rate along this section of the North Anatolian Fault.