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Geomorphological and Paleoseismological Studies of the Malatya Fault (Malatya-Ovacık Fault Zone, Turkey)

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The Malatya-Ovacık Fault Zone (MOFZ is about 240 km-long sinistral strike-slip tectonic structure within the Anatolian Scholle. Although the MOFZ is claimed to be an inactive structure since 3 Ma (Westaway and Arger, 2001), recent GPS measurements, morphotectonic studies and micro seismicity strongly suggest considerable amount of strain accumulation along this tectonic feature. The GPS-based elastic block model results yield horizontal slip rates of about 1.2 and 1.6 mm/a, for the northeastern and southwestern sections of this fault zone, respectively (Aktuğ et al., 2013). In order to understand the seismic potential of the southwestern section, Malatya Fault (MF), of the MOFZ, we carried out paleoseismological trenching and morphometric analyses in the frame of the TÜBİTAK project no. 114Y580.

The preliminary results of morphometric analyses, including the hypsometric curve and channel longitudinal profiles, suggest that the northernmost part of the MF accommodate more deformation than the southern part, where the fault zone bifurcates into several discrete segments. Relatively high values of hypsometric integral and the shape of hypsometric curves and the longitudinal channel profiles, indicate youthful topography at northern part of the MF.

In the northern section of the MF, Kızık Basin is one of the most remarkable fault-related landforms, which is 9 km long and 2 km wide, and is directly controlled by the extensional step-over of the fault segments. On the northern parts of this relatively narrow depression, a linear scarp prolongs between Kızık and Ahlas villages for about 150 m. In summer 2015, we excavated a single trench on this straight lineament, where mostly braided river-related gravels and sands were exposed. Although we could not observe any evidence of surface faulting inside the erosional channel systems, the bedrock has very well-developed shear fabric at the toe of the observed scarp. We sampled the most bottom section of the undeformed overlying young sediments for radiocarbon dating, in order to understand the minimum time interval that has passed since the last surface rupturing of the MF in this region.

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