Geophysical Research Abstracts
Vol. 21, EGU2019-5390, 2019
EGU General Assembly 2019

Holocene slip rate of the Mudurnu Valley Segment: Implications for the strain partitioning of the North Anatolian Shear Zone in the eastern Marmara Region, Turkey

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Estimating slip rates of active faults is critical not only for assessing of seismic potential of these structures but also for understanding their geodynamics. The North Anatolian Fault (NAF) forms the boundary between Anatolia and Eurasia with the total slip rate of 24.6±0.2 mm/yr, deduced by GPS-based elastic block modelling. However, the quantification of total strain along the NAF is also a challenging problem where the fault leaves its single going narrow deformation zone and bifurcates into two strands (Düzce and Mudurnu Valley Segments) to the west of Bolu.

In order to reveal the long term slip rate of the Mudurnu Valley Segment, we conducted a new slip rate study at the Taşkesti Site to the south of the Almacık Block by using high resolution UAV-based DEMs and multiple geochronological techniques. Our geological mapping shows a depositional river terrace, having a dextral offset of 52-62 metres where its age is constrained to 5.79±0.13 ka (radiocarbon) as an upper boundary and 5.36±0.19 ka (OSL) as a lower boundary. By using a boxcar uncertainty model, we calculate 10.3 +2.4/-2.3 mm/yr as the Holocene slip-rate of the Mudurnu Valley Segment.

We compare our results with other nearby geodetic, and other geologic rate studies to determine (a) the total strain accumulation along the western section of the NASZ and (b) to understand the ratio of strain partitioning between Düzce and Mudurnu Valley segments. Our preliminary results strongly suggest strain partitioning between parallel/sub-parallel elements of the North Anatolian Shear Zone. The implication of this study also contributes to an understanding of the spatial and temporal slip behaviours of other major continental strike-slip faults.