Paleoseismic and morphometric manifestation of the transition between the Western Anatolian extensional regime and the North Anatolian Fault strike-slip zone

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The strike-slip dominated North Anatolian Fault Zone (NAFZ) prolongs to the west and furcates into several branches where shear is distributed to multiple parallel/subparallel segments. The earlier structures that resulted from the ongoing Western Anatolian extension had a key role in the fact that the western part of the NAFZ has a wider deformation zone. Although the southern boundary of this zone is controversial, it is proposed that there is a strong interaction between the deformation zones of the NAFZ and Western Anatolian Extensional Province (WAEP) along the northern margin of the Uludag Range. Since this pivotal region marks the transition between the extensional regime and continental strike-slip zone, it is necessary to increase knowledge thereof. Within this ongoing study, we focused on the morphotectonic and paleoseismologic properties of the Ulubat and Bursa faults that delimits the northern boundary of the Uludag Range. The results of the morphometric analyses (topographic symmetry factor, asymmetry factor, hypsometric curve and integral, channel concavity, and integral analyses) that performed on 79 drainage basin to the south of these faults suggested that the vertical motion in the northeastern part of the Uludag Range changes abruptly to strike-slip dominated deformation, along with Ulubat Fault, towards the west of the Bursa basin.

The 50 km length, dextral Ulubat Fault was mapped in the field by using offset physiographic features and geological evidence. We divided the ENE-WSW striking Ulubat Fault into three segments that present the releasing double-bend geometry. There are two major changes in trends up to 20 degrees between each segment. The western segment has a length of 17 km in the E-W direction. The middle segment extends toward NE with a length of 20 km. The eastern segment stretches eastward for 13 km with a southward arc-shape geometry. We conducted the first paleoseismological trench studies on middle and eastern segments of the Ulubat Fault and identified at least 6 paleoearthquakes for the last 16 ka on both segments. The paleoseismic behavioral results which are consistent with the geometric segmentation show individual ruptures on each segment. Dated surface ruptures history show that the fault has used the same single trace in Holocene and the last events occurred in 1143 AD and 170 AD along the middle and eastern segments respectively.

Although further studies are needed to evaluate the paleoseismic recurrence interval, our results
show that the Ulubat Fault takes over a considerable activity in the north of Uludag Range. The field evidence and morphometric analyses around the Uludag Range sign out that the Ulubat Fault forms the southernmost member of the NAFZ strike-slip domain. The eastern segment of the dextral Ulubat Fault has vertical component while the Bursa Fault exhibits the characteristics of the WAEP towards further east. This research was supported by the Disaster & Emergency Management Authority of Turkey (UDAP project; G-18-01).