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The first Paleoseismic and New Neotectonic Data from Eskişehir Fault, Major Anatolian Neotectonic Structure, Central Anatolia, Turkey

Akın Kürçer (1), Emrah Pekkan (2), Muammer Tün (2), and Serkan Kahraman (2)

(1) General Directorate of Mineral Research and Exploration, Department of Geological Research, Active Tectonic Research Group, Ankara, Turkey (akin.kurcer@mta.gov.tr, +903122011578), (2) Anadolu University, Institute of Earth and Space Sciences, Eskişehir, Turkey

With regard to seismicity, Turkey is one of the most important active deformation regions of the Eastern Mediterranean Region owing to its geotectonic setting. Neotectonic development of Turkey and its neighboring areas is closely associated with the intracontinental convergence developed due to the continental collision between the African-Arabian and Eurasian Plates and the subsequent geological events. The neotectonics of Turkey and its near vicinity is mainly controlled by the dextral North Anatolian Fault System (NAFS), the sinistral East Anatolian Fault System (EAFS), the Dead Sea Fault System (DSFS) and the Aegean-Cyprian subduction zone, which is an active subduction zone. Apart from these main structures, there are secondary fault systems or fault zones which divide Anatolia into smaller blocks or contribute to the development of the Anatolian Block. These are the sinistral Central Anatolian Fault System, the oblique slip Tuz Gölü Fault Zone, the Akşehir Fault Zone and the İnegöl-Eskişehir Fault System.

The İnegöl-Eskişehir Fault System (İEFS) is an intracontinental active obligue fault system more than 350 km-long, with a general trend of WNW-ESE extends in between Tuz Gölü in the southeast and İnegöl in the northwest and consisted of several fault and/or fault zone. This fault system is a transition zone that separates strike-slip neotectonic regime to the northeast from the extensional neotectonic regime to the southwest. According to the Revised Active Fault Map of Turkey, these faults are called as Bursa fault, İnegöl fault zone, Oylat fault, Dodurga fault, Eskişehir fault, Kaymaz fault and Cihanbeyli fault, respectively from NW to SE.

The Eskişehir Fault is consisted of several geometric fault segments, which are parallel or sub-parallel to each other, varying between 15 and 27.5 km. in length. Kanlıpınar segment, the easternmost segment of Eskişehir Fault, is located on the east of Eskişehir. This segment extends in the N 70° W direction, approximately 17.5 km-long, is an oblique-slip normal fault.

Active tectonic and paleoseismological features of Kanlıpınar segment have been investigated in this study. During the November 2012, in order to lighten the paleoseismic history of Kanlıpınar Segment several trenches have been excavated at the south of Kanlıpınar village. For the site selection, detail microtopographic maps and shallow geophysical profiles like Ground Penetreating Radar (GPR) were used.

Kanlıpınar segment is characterized by a linear fresh fault scarp at the trench site. A cross trench along the Kanlıpınar segment was excavated perpendiculary to the fresh fault scarp. Based on the trench microstratigraphy, fault colluvial geometry, upwards termination of the faults and radiometric dating results (14C-AMS), at least three paleoseismic events were determined during the last 2800 years period from the trench surveys at Kanlıpınar site. The data which is collected from the trench indicates that the last paleoseismic event occurred between in 1280 and 1320 A.D. Apart from the last event, at least two more events are recorded, the penultimate one being dated between in 390 BC and 20 AD and the ante-penultimate event 810 and 770 BC. Additionally, based on the empirical equations, the expected maximum moment magnitude from the Kanlıpınar segment was about 6.56, with a maximum displacement of 53 cm and average displacement of 38 cm.

Furthermore, in this study we have concluded new neotectonic data about the Eskişehir fault, in contrast to the previously suggested characteristics of the fault. According to the fault slip data measured from Kanlıpınar trench, the Kanlıpınar segment is a normal fault with sinistral strike-slip component. Both northern and southern blocks of Eskişehir Fault have been moved by the different neotectonic structures towards to the west/southwest. While the northern side of the fault was affected by NAFS and this part had mowed 24 mm-year to the west,

the southern side of Eskişehir fault has been moving towards to the west-southwest, furthermore this region has more complex fault geometry. The total slip in this region has been partitioned by many faults. Although both side of Eskişehir fault is moving towards the west or west/southwest, because of the differential velocity values and vectors, we assumed that Eskişehir Fault has been realized as having a left lateral strike-slip component.