Characteristics of Brittle Deformation in the North Anatolian Fault Zone

Caglayan, A. (1), Isik, V. (1), Karabacak, V. (2)

(1) Ankara University, Department of Geological Engineering, Tectonics Research Group, TR-06100, Ankara, Turkey
(2) Eskisehir Osmangazi University, Department of Geological Engineering, 26480, Eskisehir, Turkey
Corresponding Author: : Caglayan, A, (acaglayan@ankara.edu.tr)

The North Anatolian Fault Zone (NAFZ), a major seismically active fault zone, mainly extends along the Sakarya zone and Anatolide-Tauride platform paleo-tectonic units of Turkey. The NAFZ consists of several main segments striking NE and NW. This work focusing on the Gerede segment, characterized by rupture zone of the 1944 earthquake, provides an ideal natural laboratory for examining the geometry of slip surfaces, processes and distribution of fault rocks, kinematics of strike-slip faulting and geomorphic markers along active and exhumed faults of the NAFZ.

The Gerede segment shows approximately 180 km of rupture length with N70°-80°E striking between Abant in west and Bayramören in east. Fault strands in the segment have affected Mesozoic and Cenozoic units in the study area. Surface rupture defining the 1944 earthquake cuts not only Holocene deposits but also bedrocks seen in quarries vicinity of Çaygökpınar. Exhumed faults in the limestone, display slickensides with meters and tens of meters surface area, are characterized by deformed zones that can be divided into two structural domains (fault cores and damage zones). Slickensides contain slickenlines which are parallel or slightly oblique to the strike of the slickensides, suggesting that most of faults in this segment are strike-slip or oblique slip. Mesoscopic and microscopic kinematic indicators (e.g. fractures, v-shaped markings, steps) on the slip surface are consistent with the movement of the NAFZ. Fault rocks along the surface fractures and exhumed faults are characterized by brittle fault rocks with cohesive (breccia, cataclasite) and incohesive (breccia, gouge). Common rock types of these faults are breccias. Crackle, mosaic and chaotic types constitute breccia depending on clast size and clast proportion.

Our preliminary results indicate that structural elements along the NAFZ in the study area have been occurred by cataclastic processes within the shallow depts. We believe that understanding features of brittle deformation in segments, as well as age of faulting and fluid migration within the zones, will lead to a better understanding of nature and seismicity of the NAFZ.