# The last 5 ka Morphochronological slip-rate history of the Ilgaz-Karlıova section of the North Anatolian Fault, Turkey

Zabcı, C. (1), Akyüz, H. S. (1), Sançar, T. (2), Kıyak, N. G. (3)

(1) İstanbul Teknik Üniversitesi, Ayazağa Yerleşkesi, Maden Fakültesi, Jeoloji Müh. Bölümü, 34469 Maslak İstanbul, Turkey
(2) Tunceli Üniversitesi, Mühendislik Fakültesi, Jeoloji Müh. Bölümü, 62000 Tunceli, Turkey
(3) Işık Üniversitesi, Maslak Yerleşkesi, Fizik Bölümü, 34398 İstanbul, Turkey
Corresponding Author: Zabcı, C. (zabci@itu.edu.tr)

To understand the behavior of active faults in different spatial and temporal scales is one of the most important and fundamental issues in earthquake geology. Geodetic measurements, which are taken as snapshots, provide only limited information for relatively a short time interval of the deformation history in an earthquake cycle. Integrating the geologic and geodetic estimates of the slip-rate provides very valuable results on understanding earthquake mechanisms. Block model, derived from GPS measurements made between 1988 and 2005, provides slip-rates changing from 24.2±0.2 to 25.8±0.2 mm/a for the single strand section of the North Anatolian Fault between Bolu in the west and Karlıova (Bingöl) in the east. However, the geomorphology and geochronology based geologic slip-rates are determined to be between 17 to 21 mm/a for the same part of this fault system. In this study, we documented new geologic slip-rates for the structurally simple single strand section of the NAF, between Tosya (Kastamonu) in the west and Karlıova (Bingöl) in the east, to provide a better understanding on this system's behavior in different temporal and spatial scales. This morphochronologic study mainly depends on identification of sites with proper offset features, precise displacement measurements of these structures and lastly Optical Stimulated Luminescence (OSL) dating of each related geologic unit. We calculated 7 independent slip-rates from dating of geomorphic markers in 5 new and 2 revised previously known sites. These new data tripled the morphochronological constraints on the Ilgaz-Karlıova section of the NAF. The analysis of these new results with the previous studies yields an average slip-rate 18.4 +1.4/-1.3 mm/a (68% confidence) from 4320±508a to present. This calculated uniform slip-rate is ~5 mm/a slower than geodetically constraint rates for this section of the NAF. We suggest two hypothesis about the discrepancy of geologic and geodetic rates: (a) deformation between the Anatolia and Eurasia is not localized and effects a broader region, where folding like structures form in the geologic units, which are younger than the late Miocene and/or (b) strain transient processes in temporal scale. There are no or limited data to support the first hypothesis andadditional studies are definitely necessary to test this statement. However, ongoing postseismic deformation, mainly of 1999 earthquakes, is clearly recorded by geodetic measurements. Moreover, InSAR models reveal the strain transient, which are linked with the postseismic effect of the 1944 Gerede Earthquake, on the creeping İsmetpaşa section of the NAF. The most plausible mechanism to clarify the discrepancy of geologic and geodetic rates is the postseismic process, which started after the 20th century earthquake sequence on the NAF.