

# Segment Structure of the Southern Strand of the North Anatolian Fault System and Paleoseismic Behaviour of the Gemlik Fault, NW Anatolia

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The North Anatolian Fault System (NAFS) is a transform fault that accommodates relative motion between Anatolian and Black Sea microplates. The NAFS bifurcates two strands as the Northern and the Southern in the Marmara region. Recent lateral motion is about 24 mm/yr along the NAFS. According to the recent GPS data, there is a slip partitioning between both strands and the northern strand carries approximately 3 times as much right-lateral motion as does the southern strand. Therefore we interpret that the northern strand is the master zone which accommodate majority of the recent lateral motion. In this study, the southern strand is extending between Dokurcun valley and Bandırma bay is evaluated as a splay instead of a main strand diverging from the NAFS as described in previous studies. This splay is included in NW Anatolia transition zone which characterizes bend structures.

Length of the southern strand is about 140 km between Dokurcun valley and Gemlik bay along Pamukova basin, Lake İznik and Gemlik Bay depressions. The strand can be divided into three main geometric segments in right steeping pattern. Those are Geyve, İznik and Gemlik, from east to west. Length of the Geyve Fault is about 57 km and general trend is N70°E. The İznik Fault is about 56 km-long trending of N75°E. Western section of this segment is under the Lake İznik. General trend of the Gemlik fault is E-W, total length is 27 km and 12 km of it observed on the land. The fault segments separated from the each other by releasing step overs. The stepover between Geyve and İznik faults is located west of Pamukova basin. Another stepover which controls the Lake İznik basin is located between İznik and Gemlik faults. The Gemlik Fault controls the southern boundary of the Armutlu Block which is western half of the Samanlıdağları uplift. Western margin and eastern margin of the fault is delimited by Gemlik bay pull-apart basin and by Lake İznik pull-apart basin, respectively.

According to the historical records, many destructive earthquakes have occurred in the last two millennia along the southern strand. It is known that the recurrence intervals of the large earthquakes are 150-250 years on the western part of the 1999 İzmit rupture on the northern strand based on the recent paleoseismological data. However, there is not sufficient data to evaluate of the paleoseismic behavior of the southern strand. We performed paleoseismological survey along the Gemlik fault and two surface faulting events were identified. The last and penultimate events can be correlated with the 1857 and 1419 earthquakes, respectively, which indicate 438 years for recurrence interval. According to previous studies there is a different surface faulting history on the İznik and Geyve faults. Despite we identified 1857 event on the Gemlik fault that event was not identified on the İznik and Geyve faults. Therefore we can say that the 1857 earthquake should be triggered event on the southern strand by the 1855 Bursa earthquakes. We also suggest that 3.5 m of slip accumulated in the elapsed time of 587 years on the southern strand between İznik Lake and Dokurcun valley based on the 6 mm/yr slip rate.