Geophysical Research Abstracts
Vol. 12, EGU2010-2551, 2010
EGU General Assembly 2010
© Author(s) 2010

Fault geometry and slip distribution associated with the 1939 Erzincan Earthquake (M: 7.9), North Anatolian Fault

Omer Emre (1), Hisao Kondo (2), Selim Ozalp (1), Hasan Elmaci (1), and Akin Kurcer (1)

(1) Mineral Research and Exploration, Geology Dept., Ankara, Turkey (emre@mta.gov.tr), (2) Active Fault Research Center, AIST, Site 7, 1-1-1 Higashi, Tsukuba, Ibaraki 305-8567, Japan

The North Anatolian Fault (NAF) ruptured in a westward-migrating sequence of large earthquakes between 1939 and 1999. The 1939 (M:7.9) earthquake which is the first and the largest event in the sequence produced 330 km-long multi-segment surface ruptures. We have performed a serial study on the fault geometry and revision of slip data associated with this event based on detailed field mapping and slip measurements.

The 1939 earthquake (M 7.9) nucleated on the eastern portion of the rupture. Main body of the rupture extended along the master strand of the NAF between Erzincan and Niksar basins. However, a part of 76 km-long the westernmost portion of the rupture directed towards on the Ezinepazarı splay fault. Additionally, triggered surface rupture was formed on the eastern segment of the Erbaa-Niksar fault that mainly ruptured in the 1942 earthquake. The 1939 rupture is divided into five fault segments based on slip distribution and fault jogs. We named the segments as follows; Erzincan, Refahiye, Suşehri, Reşadiye and Ezinepazarı segments from east to west. Length of segments varies from 42 to 90 km. Collected slip data from 95 measurement localities reveal that the amount of average slip varies between 2.30 to 8.8 m. and the slip distribution is not uniform along the entire rupture zone. Slip maxima of 10.5 m was measured on Refahiye segment.

Based on the field data, we conclude that: 1) total length of the surface rupture associated with the 1939 earthquake is 330 km. 2) the amount of slip along the entire 1939 rupture is larger than that in previous study 3) the larger revisited slip distribution suggests that the magnitude of the 1939 event could be revisited based on the empirical law of surface slip and magnitude. 4) Each segment displays different amount of average slip along rupture zone. This may be one of the indicators for individual paleoseismic history on each fault segment. Large slips on the Refahiye and Suşehri segments imply a longer return period than the other segments in the last two events. This result is consistent with the paleoseismological findings (Hartlep et al, 2006). Refahiye segment might have been ruptured in 1254 historical event before 1939 event. The Reşadiye segment probably ruptured in the 1668 Great Anatolian earthquake.

Key Words: segment structure, slip distribution, 1939 surface rupture, North Anatolian Fault.