



Paleoseismological findings on the western portion of the surface rupture associated with the 1942 Erbaa-Niksar Earthquake, North Anatolian fault system, Turkey

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The seismically active North Anatolian fault system (NAFS) is one of the most major intra-continental transform faults in the world. The NAFS ruptured in a sequence of large earthquakes between 1939 and 1999, generally progressing from east to west. In general, multi-segment surface faulting developed associated with the earthquakes in this sequence. However, the 1942 earthquake (M 7.0) is located between the 1939 and 1943 multi-segment ruptures presents and likely to be a non-characteristic event in this 20th century sequence (Kondo and Emre, 2005). The 1942 event occurred on the Niksar-Erbaa fault and produced a 48 km-long surface rupture (Kondo and Emre, 2005). The surface rupture associated with the 1942 earthquake is divided into two main geometric sections by a restraining stepover. The 12 km-long restraining stepover is characterized with a push-up structure bounding by reverse faults. Probably, the 1942 event nucleated below this restraining stepover and propagated bilaterally. The eastern and western sections of the rupture are 21 and 15 km, respectively. In this study, we present preliminary results of trench survey performed on the western section of the rupture at the Çevresu site northwest of the Erbaa town.

At the Çevresu site (GPS coordinates: 37 286765 E – 45 14356 N), two cross trenches along the 1942 rupture were excavated on the flood plain of the Yeşilirmak and Kelkit rivers. Although agricultural modification has been developed, the rupture trace can be still seen clearly in general morphology. Holocene fault is characterized by an evident of fresh fault scarp extending for one km long on the flood plain. The southern side of the fault is relatively uplifted at the height of 0,7 m. Right lateral displacement of 2 meter associated with the 1942 event was measured along the rupture zone near the trench sites. Two cross trenches were placed 100 meter apart from each other across the linear fresh fault scarp. The dimensions of trenches were 10-m-long, 2.5-m-wide and 2.5-m-deep. On the trench walls, eight different stratigraphic units consisting of stream channel and flood plain sediments were identified. Base on the tectono-stratigraphic relations on the trench walls in addition with radiocarbon dates, three surface faulting events including the 1942 event occurred within the last 1300 years. Judging from the timing of individual events, the recent two events can be correlated with the ones identified at the Ayvaz trench site located on the eastern section of 1942 rupture (Kondo et al, in this meeting). The penultimate event observed in Çevresu trenches corresponds to the 1668 great Anatolian earthquake, which ruptured through longer than half of the NAFS on land. Just below the penultimate event horizon on the both trenches, there is a clear stratigraphic difference at the northern and southern side of the fault zone. While the units in the northern side of the fault zone mostly consist of sandy and gravelly sediments and includes charcoal, the ones in the southern side consists of thinner particules as clay and silt. This suggests that right lateral displacement related with the 1668 event might have been more larger than the 1942 event. The data which are collected from each two trenshes indicate that the ante-penultimate event ocured between in 8th and 13th centuries A.D. The recurrence data also indicates that the Erbaa-Niksar fault has aperiodic recurrence interval during the last 1300 years. In addition, the age of the ante-penultimate event at this site is not consistent with that of the Ayvaz site. This difference of recurrence behavior at two sites implies that the 1942 rupture consists of two fault segments with different paleoseismic history, in accordance with the geometric sections divided by the push-up structure.

