



Flexible slip history on the 1942 Erbaa-Niksar earthquake rupture along the North Anatolian fault system, Turkey

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Repeatability of surface slip distribution through earthquake cycles is basis to evaluate size and timing of future large earthquakes generated by active fault systems. In order to reveal surface slip history associated with paleoearthquakes on the North Anatolian fault system (NAFS), we have extensively performed 3D trenching survey on the 1942 Erbaa-Niksar earthquake (M 7.0) ruptures, to simultaneously reconstruct timing and surface slip associated with past large earthquakes. At Ayvaz site on the 1942 rupture, our 3D trench survey preliminary indicated that the penultimate earthquake, which can be correlated with the great Anatolian earthquake ($M \sim 8.0$) in 1668 AD, recorded larger surface slip of 6.0-8.0 m in comparison with the 1942 slip of 2.5 m. This result paleoseismologically supports historical documents telling that the 1668 event ruptured for >600 km long on the central-eastern NAFS. In order to confirm this flexible slip history according to the magnitude of large earthquakes, we re-excavated 3D trenches to reconstruct longer slip history at the same site. The results are summarized as follows; 1) at the site, high-resolution alluvium exposed on the trench walls records six paleoearthquakes including the 1942 event during the last ~ 2500 years, 2) we reconstructed five discrete slips during the individual events, 3) the amounts of paleo-slips are classified into two categories, the 1942-type smaller slips and the 1668-type larger slips. Thus, the repeatability of surface slip during large earthquakes is not constant like the assumption of the characteristic earthquake model, however, the amounts do not randomly vary from event to event on the assumption of the Gutenberg-Richter model.