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Westward decelerating failure of the North Anatolian Fault

Fatih Bulut, Aslı Doğru, Tülay Kaya Eken, and Haluk Ozener

Bogazici University , Kandilli Observatory and Earthquake Research Institute , Geodesy Department, Turkey (bulutf@boun.edu.tr)

Forecasting size and time of large earthquakes is closely relevant for human life in seismically active regions. In this study, we quantitatively analyzed past large earthquakes during last millennium along the North Anatolian Fault to elaborate on magnitude and time of future large earthquakes. Historical earthquake catalog covers a few complete failures of the North Anatolian Fault during last millennium. We investigated historical earthquakes to analyze present-day slip deficit and earthquake potential of the North Anatolian Fault. Seismic moments are used to calculate cumulative slip for a constant fault area and compared with geodetic slip to estimate present-day slip deficit and therefore size of forthcoming large earthquakes. Based on present day slip deficit, North Anatolian Fault has potential to generate up to four M$\geq$7.0 earthquakes to complete current east-to-west failure. Stochastically, spatiotemporal behavior of the ruptures along the fault verifies a westward deceleration of the cumulative failure. This suggests that failure of remaining unruptured $\sim$250 km section in the west (Istanbul to Saros) will take substantially longer than the failure of already ruptured section of $\sim$950 km in the east (Karliova to Izmit). Our calculations indicate that the deceleration is caused by westward increase in fault-normal stress, rather than strain partitioning between sub-parallel strands of the North Anatolian Fault.