Detecting Transient Creep Events on the Ismetpasa Segment of the North Anatolian Fault with Continuous GNSS Time Series

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Twenty six years after the Mw 7.3 Gerede Earthquake in 1944, Ambraseys (1970) first recognized, in the offset of a manmade wall, the signature of slow aseismic slip along the central segment of the North Anatolian Fault (NAF). Following this discovery, many studies characterized the behavior of aseismic slip with land-and space-based geodetic techniques, including creepmeters. It is now well recognized that the aseismic slip rate decreases logarithmically from more than 3 cm/yr in the years following the Gerede Earthquake to approximately 6±2 mm/yr today. In the last two decades, InSAR allowed deriving maps of ground velocities suggesting that aseismic slip extends along a 100-km-long section of the fault. Furthermore, aseismic slip rate varies in space along strike, reaching its peak value approximately 15-24 km east of the city of Ismetpasa. Furthermore, creepmeter measurements and InSAR time series indicate that aseismic slip in the region of Ismetpasa behaves episodically rather than continuously, alternating quiescent periods and transient episodes of relatively rapid aseismic slip. These observations raise questions about how slip accommodates tectonic stress along the fault with significant implications in terms of hazard along the seismogenic zone.

In order to monitor spatial and temporal variations in the aseismic slip rate and to detect slow slip events along the fault, we have established ISMENET -Ismetpasa Continuous GNSS Network- in July 2016. ISMENET stations are distributed over approximately 120 km along strike. In order to explore the shallow, fine spatio-temporal behavior of aseismic slip, stations are located within 200 m to 10 km of the fault. We process GNSS data with the Bernese (V5.2) and GAMIT/GLOBK (V10.7) GNSS software. We analyze the GNSS time series to extract the signature of aseismic slip using a principal component analysis to reduce the influence of non-tectonic noises.
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