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New evidence for spatiotemporal fluctuations of slip rate on the East Anatolian Fault, Turkey from newly installed creepmeters and seismological data

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We started a multidisciplinary project in 2014 on the East Anatolian Fault zone (EAF) in order to investigate the correlation between low seismicity and strong slip rate fluctuations, using GPS, InSAR, creepmeter and seismological observations. Primary results of new geodetic and seismic observations show that the slip rate approaches the far field velocity (10 mm/yr) along the 100-km-long Palu segment, implying that significant portion of the elastic strain is released aseismically. To map the spatiotemporal character of creep on the Palu segment, multi-sensor C-band SAR data archive, using the power of Sentinel 1 A/B, has been analyzed by GMTSAR software (Sandwell et al., 2011) and a velocity field was obtained by STAMPS software (Hooper et al., 2012) constrained by dense near-field (<2km) and far-field GPS observations. These results give a correlation with the spatial-temporal activity of earthquake clusters, some of which exhibit repeating characteristics. Additionally, two creepmeters were installed to monitor fault creep in a railway tunnel crossing the fault where the walls of the tunnel have been offset by 10-20 cm since the construction in the middle of the last century. We observed one creep-event in 3-month data collection period. Its amplitude (2 mm) is much smaller than the apparent damage to the tunnel walls possibly because they bulged parallel to the fault and may have released several years of accumulative deformation. There was considerable spallation of rock. In the first few minutes of the 2 hour creep event the maximum slip velocity on the fault exceeded 0.2 mm/minute (12 mm/hour). These results confirm aseismic behavior of the fault zone and provide insights in the mechanics of strain accumulation and earthquake potential along the East Anatolian Fault.