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Persistent Scatterer InSAR time series analysis of the creeping section of the North Anatolian Fault at Ismetpasa

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Although the creep along the Ismetpasa section of the North Anatolian Fault was noticed over half a century ago, its spatiotemporal nature is still poorly known due to lack of geodetic and seismological studies along the fault. Analysis of ERS (C-band) data acquired between 1992 and 2001 suggested an average creep rate of 9 ± 3 mm along a fault segment of $\sim$70 km long despite the difficulties arising from limited number of images available, atmospheric artefacts and low coherency that are common in classical long-term InSAR studies (Cakir et al., 2005). These inferences have been supported by a recent study of stacked PALSAR (L-band) interferograms spanning the period between 2007 and 2010 (Fialko et al., 2011). In this study, we use the Persistent Scatterer InSAR technique to better constrain the spatiotemporal characteristics of the surface creep. InSAR time series have been calculated using 27 Envisat ASAR images that were acquired between 2003 and 2010 in descending track 479. The results clearly reveal the gradual transition between the creeping and locked segments of the NAF west of Ismetpasa. Its eastern termination cannot be determined since the surface creep appears to continue further east (east of 33.4E) along the fault outside the Envisat image frame. The length of the creeping section therefore appears to be longer than 70 km. The creep rate is also tightly constrained and found to be in the range of 10-11 mm/yr along most of its length, consistent with the GPS measurements from a small-aperture geodetic network near Ismetpasa and recently reported PALSAR measurements (Fialko et al., 2011). Preliminary analysis confirms shallow locking depths for creeping as inferred by the previous studies.