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Interseismic accumulation across the Khoy fault from InSAR measurement

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The Khoy fault is part of a long right lateral strike slip fault that runs in NW-SE direction between Çaldıran in eastern Turkey and Tabriz in northwest of Iran within the Turkish-Iranian plateau that accommodates the plate convergence between Eurasia and Arabia. It connects the North Tabriz Fault (NTF) with the Gailatu-Siah Chesmeh and Çaldiran faults, and thus is named here the Çaldiran-Tabriz fault (CTF). The CTF, unlike the North and East Anatolian faults to the west, does not have a clear morphological expression in the topography along much of it length. Active fault maps show a distributed deformation zone. Nevertheless, it has produced several devastating large earthquakes both recently (e.g., Ms 7.3, 1976 Çaldiran earthquake), and historical times (e.g., Ms > 7, 1721 and 1780 Tabriz earthquakes).The recent double earthquakes (Mw 6.5 and 6.2) of August 11th, 2012 in Ahar-Varzaghan area 40-45 km north of the NTF manifest the seismic activity of the region. Recent geodetic studies using GPS InSAR suggest 9±2 mm/yr of slip rate for the NTF, which is significantly higher than geologically determined slip rates (e.g., 2-4 mm/yr). In this study, we use InSAR data acquired from 2003 and 2010 on a descending orbit track of ENVISAT satellite, across the Khoy fault zone, which is the north-western continuation of the NTF north of the Urmia Lake. We use the Stanford method of persistent scatter interferometry (StaMPS) technique to overcome the decorelation problem with time and over large areas. The line of sight velocity field we obtained clearly delineates the shear zone that trends NW-SW aligning with the NTF. We project the mean line of sigh velocity field derived by InSAR time series onto fault parallel horizontal velocity field, assumed that vertical offset rate of the Khoy fault is negligible. Single screw dislocation models in elastic half-space model were applied along the fault zone to estimate slip rate, locking depth and fault location within 95 confidence interval limit and through fitting the average deformation rate field by Monte Carlo simulations. Our results reveal a slip rate of 8-11 mm/yr below a locking depth of 7-40 km for the NW-SE trending Khoy fault. These estimates are roughly the same as those inferred for the NTF to the southeast.