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Observations from four high-resolution GPS profiles across the active margin of the Pamir, Central Asia: Can we discriminate interseismic fault slip-rates, slip partitioning, and even co-seismically triggered slip?

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The Pamir's northern and northwestern margin belongs to the tectonically most active intra-continental regions on Earth. Most of the recent northward motion, caused by the indenting Indian craton, is accommodated by the Pamir Main Thrust System in the North (10-15 mm/yr). But it is unclear how and where the dominant shortening signal is transformed and partitioned into shear and thrust along the northwestern margin. The two most active faults here are the sinistral Darvaz fault that outlines the Pamir border towards northwest and west, and the NE-SW trending Vaksh fault further north. The Vaksh fault acts as a barrier between the relatively stable South Tien Shan to the north and the Pamir foothills.

We present inter- and co-seismic displacement data based on GPS time-series of four high-resolution profiles across the margin that were gradually installed since 2013. Two 40km-long, N-S profiles cross the Pamir Main Thrust System and provide continuous (1Hz) and campaign data with a spacing of 2-20 km. A third, 120km-long, NW-SE campaign profile crosses the Darvaz and Vaksh fault with an average spacing of 10 km, and a forth, 80km-long, W-E campaign profile monitors the activity of the Darvaz fault further south.

We show that the shear component of the Pamir Main Thrust System increases towards West and that the high strain area forks along the Vaksh fault and the Darvaz fault. The Vaksh fault accommodates surprisingly high shortening of $\sim$15mm/yr and shear of $\sim$10mm/yr. The Darvaz fault accommodates 5-15 mm/yr of shear. This rate is poorly constrained, as the 2016 campaign data contain a significant co-seismic offset (10 mm and more) caused by the 2015 M7.2 Sarez earthquake that occurred 100-150 km further west in the Central Pamir. The co-seismic observations across the Darvaz fault are more complex than a distance-dependent, quasi-exponentional decay model generally used to predict far field displacement. This phenomena is confirmed on one continuous GPS profile across the Main Pamir Thrust System. Hence, before constraining the interseismic slip-rate of the Darvaz fault, we must properly study this complex slip pattern and compare it to available pre-2015, high-resolution data from a temporary seismic network. Overall, the whole data set builds a chance to improve our knowledge of the co-seismic behavior of faults located in the far-field of an earthquake rupture, which is important to properly constrain the seismic potential of faults.