Interseismic deformation rates of the Salar Grande Fault from GPS and InSAR data. Do geodetic measurements reflect the long term dextral fault motion evidenced from geomorphic markers?

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Strike-slip faults are major features with numerous of them forming systems in the forearc of subduction zones, playing an important role in accommodating oblique convergence. Considering the enormous impact that strike-slip faults produce on the landscape and society, detailed characterization of these structures improves our understanding of their geometry and evolution. In Northern Chile, the Atacama Fault System (AFS) is a strike-slip fault that runs for more than a thousand kilometers near the Coastal Cordillera. In particular, the Northern end of the AFS, located near the Salar Grande area, north of Loa River, exhibits a clear geomorphic expression evidencing right-lateral motion in the Salar Grande Fault. This segment of unknown slip rates, is especially interesting since is immersed in the hyper-arid core of the Atacama Desert with excellent preservation of geomarkers and is located in one of the seismic gap regions of the Chilean subduction zone. In this study, our goal is to estimate geodetic deformation rates of the Salar Grande Fault to compare them to long-term geological estimations, to provide insights into the past and the present-day conditions of the strain loading of this active fault. We use a combination of regional static displacements from GPS stations and interferometric synthetic aperture radar (InSAR) line-of-sight (LOS) observations from Sentinel-1 tracks 47 (ascending) and 54 (descending). Centered on a near-fault GPS site (CRSC), the motion of the Salar Grande area is obtained based on a residual GNSS analysis. For the InSAR dataset, we follow the Small BAseline Subset approach (SBAS) using custom pairs of inteferograms with at least 100 days between acquisitions. We present preliminary results from the InSAR time series analysis and compare them to the GPS signal, evidencing the potential of these datasets in the Atacama Desert and discussing the limitations and corrections that would improve our join inversion.

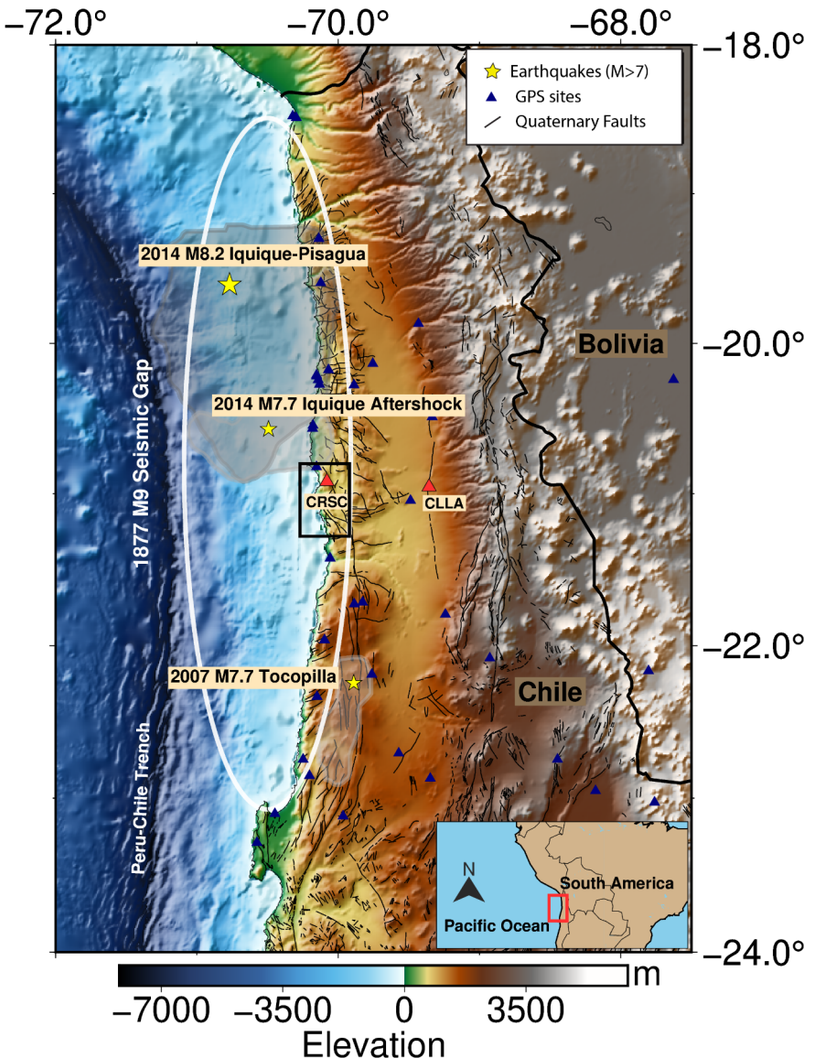

Figure 1: Regional Study Area in Northern Chile. Black rectangle is the geomorphological study area. Yellow stars in epicenter of moderate-large earthquakes in the region and ligh-gray polygon around is rupture area. In blue triangles GPS sites used in the geodetic inversion. In red triangles local GPS sites (CRSC and CLLA) used to calculate local residual motion.