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Tectonic Deformation and Surface Processes of the Tibetan Plateau Constrained by Time Series Analysis of Sentinel-1 InSAR Data

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We quantify deformation patterns resulting from tectonic motions and surface processes across the central Tibetan Plateau (29–45°N, 83–92°E) since late 2014 using ascending and descending passes of the Sentinel-1A and -1B radar satellites. The broad spatial extent of these data (> 10^6 km^2), fine spatial resolution (originally 90 m pixels, resampled to 270 m pixels), and high rate of temporal sampling (12–24-day orbit repeat time) offer unprecedented resolution of surface deformation in space and time. To process such an extensive data set – including more than 100 dates and 300 interferograms per track thus far – we leverage the Advanced Rapid Imaging and Analysis (ARIA) standardized interferometric synthetic aperture radar (InSAR) products and toolbox. We construct time series of surface deformation constrained from our Sentinel-1 interferograms using the small baseline subset approach implemented by the Miami InSAR time series software in Python (MintPy). Our preliminary results from three Sentinel-1 orbits (two descending and one ascending; each comprising 10 frames along track) allow us to quantify deformation in the satellite lines of sight. Combinations of ascending and descending track measurements are used to approximate east-west and vertical ground velocities. The resulting velocity fields will provide a more complete and accurate picture of interseismic strain accumulation rates across active faults in the region such as the Altyn Tagh and Kunlun faults, and allow us to study surface processes such as permafrost active layer dynamics and isostatic adjustment due to lake level changes in unparalleled scope and detail.