Monitoring Subtle Surface Deformation Due to Deep Dynamics Using the Latest InSAR Technique

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InSAR has been one of the most important techniques for crustal deformation studies, measuring surface displacements at the millimeter scale accuracy in the satellite looking direction. It plays a key role in monitoring fault movements in remote areas where continuous GNSS stations are sparse or absent, e.g., the broad Tibetan Plateau hinterland. Compared to the traditional spaceborne SAR sensors, the latest Sentinel-1 A/B satellites can image the Earth's surface every 12 days for a 250 km width swath, freely providing the most continuous SAR data set. In this work, we use Sentinel-1 data and InSAR time series analysis to detect the small magnitude (<1cm) surface deformation in the Tibetan plateau interior. The multi-year mean InSAR LOS rate maps show that there are obvious cross-fault deformation gradients along several large active fault zones, e.g., the East-Kunlun fault, the Margai-Caka fault, the Beng Co fault, and the Gyaring Co fault. Aside from surface displacements caused by several small (M<5) earthquake clusters, we observed an aseismic slip event in the northern Sangri-Cuona rift where anthropogenic activity induced surface subsidence. This and an earlier aseismic-like slip case suggest that the accumulated strain along active faults within the extensional Tibetan plateau interior may be partially released by unnoticeable silent slips, causing little or even no micro-seismicity on the fault plane.