**Persistent Scatterers Time Series Fusion with Datasets from Several Periods**

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***ABSTRACT***

Interferometric Synthetic Aperture Radar (InSAR) technology, especially Persistent Scatterers InSAR (PSInSAR), has become a general tool for monitoring large-scale, long-term surface deformations. It is extensively used in earthquake research, land subsidence monitoring, and volcano risk management. These methods require strict qualification on phase signal processing from SAR data, asking for images from the same satellite system, orbit, and acquisition mode. However, the finite lifespan of satellites limits the duration of PSInSAR analysis to the satellite's operational period. Once a satellite is decommissioned, PSInSAR observations cease, and combining datasets from different satellite systems is challenging due to system inconsistencies. This study presents a novel approach to merge two PSInSAR datasets from different SAR missions with a short overlap period. By correcting system biases arising from various reference points in the temporal domain, we create a new, long-period fusion PSInSAR dataset from two shorter-period datasets. This enables time series analysis across datasets from different satellite systems. The fusion dataset is compared with the datasets, with similar monitoring periods, generated from the conventional method, showing consistent deformation trends and validating the feasibility of this method for deformation analysis and GIS applications. This fusion approach mitigates the risks associated with satellite operational lifespans, extending the utility of InSAR technology for long-term monitoring applications.

**Keywords:** SAR, Persistent Scatterers, time series