Combining PSInSAR Datasets to Extend Period of Time Series Analysis

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Interferometric Synthetic Aperture Radar (InSAR) technology, including Persistent Scatterers InSAR (PSInSAR), has gained popularity as an effective tool for large-scale, long-time period surface deformation applications. These methods have been extensively used in various areas, such as earthquake research, land subsidence monitoring, and volcano risk management. According to the strict requirement of phase signal processing in SAR data, images used for differential interferometry must be acquired by the same satellite system, also the same orbit, and the acquisition mode. However, satellites cannot sustain their missions indefinitely, which means that the time interval of PSInSAR analysis is fixed to the life span of the satellite system. Once the satellite system, which provides data, is retired, the PSInSAR observation could not continue anymore. Nevertheless, datasets from another satellite system still cannot be combined together for data processing and analysis. The operation status of satellites becomes a risk for the long-term InSAR application. In this study, an approach is introduced to merge two PSInSAR datasets and generate a new fusion dataset by using the feature of deformation in the overlay time period. As a result, a long-period PSInSAR result is obtained from two different short-period datasets with an overlay part in the middle of the time span. The system error because of different reference points is corrected, and the continuity of the time series analysis across two different PSInSAR datasets could be accomplished. A PSInSAR dataset, with all images in two short-period datasets, is obtained for comparison and validation. The result shows a consistent deformation trend between the native and fusion datasets.

Keywords: PSInSAR, Subsidence, Time series