

A multi-sensor approach for monitoring landslides in the Three Gorges region, China, using frequently acquired SAR images.

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Landslides have long been the most frequent and widespread geohazard in the Three Gorges region. Over the last decade, the construction of the Three Gorges dam project has created a 600 km long reservoir with a bi-annual fluctuating water-level which has also been shown to reactivate ancient landslides. InSAR techniques have demonstrated the ability to monitor ground deformation with millimeter precision over large areas and offer the most comprehensive method for monitoring landslides in the Three Gorges region. Within the study area, major limitations include atmospheric water vapour, steep slopes and temporal decorrelation between SAR image acquisitions caused by dense vegetation. The identification of natural persistent scatterers in a time-series of SAR images creates a wider network of stable phase measurements from which terrain displacement can be measured, and has been applied to urban areas within the Three Gorges. This study therefore aims to extend slope stability monitoring to non-urban areas using Small Baseline InSAR time-series. In landslide areas with a poor density of stable phase measurements, pixel offset techniques from SAR amplitude images are employed to enhance the coverage of measurements and to provide additional information on landslide movements.

A vast amount of data from three different sensors with different wavelengths (Envisat, TerraSAR-X and COSMO SkyMed) have been employed in this study to identify active landslides along a 60 km stretch of the Yangtze River. This approach of overlapping data in time and space helps verify the results without ground reference data and also allows a comparison of satellite data products for landslide monitoring. We discuss the merits of each product, particularly the revisit frequency and the resolution of imagery in relation to three techniques (conventional InSAR, InSAR time-series and pixel offsets) for monitoring the relatively small scale landslide features within the densely vegetated terrain of the Three Gorges.

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