

Ground-based InSAR and GNSS integration for enhanced dam monitoring

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Abstract

The monitoring of dams is essential to ensure their safe operation for the production of renewable energy. Common tools to monitor dams are permanently installed plumb lines and surveying by means of total station and leveling within a geodetic network. The main drawback of these methods is their limited spatial and temporal resolution. Recent studies have shown promising results using Ground-Based InSAR for geodetic dam monitoring. The fast acquisition speed combined with the surface monitoring capabilities enable to monitor several hundreds to thousands of points on the dam every day or several times a day. However, GB-SAR is a relative phase-measurement technique, and any interruption in the data acquisition leads to difficulties to unwrap differential phase observations and join the disjunct time series. The combination with other absolute measurement tools is promising to create an absolute deformation map of the dam. GNSS is a very efficient and reliable method providing point-wise absolute displacement time series and mm-accuracy. This paper proposes a combination of GNSS and GB-SAR observations to enhance the consistency of the surface-based dam displacement maps obtained by solely GB-SAR measurements. A method to detect unwrapping errors over long time series is proposed. The corrected GB-SAR time displacement maps are compared to a numerical model and confirm the correctness of the applied corrections.

Keywords: GB-SAR, InSAR, GNSS, Dam, Monitoring

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