

## APPLICATION OF DINSAR TIME SERIES ANALYSIS USING ALOS PALSAR TO EXTERIOR DEFORMATION MONITORING OF DAMS

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The number of aging civil engineering structures is rapidly increasing in Japan. As for dams, it is estimated that 58% of existing dams in the year 2020 will be 50 years old or over after completion. This situation increasingly requires not only efficient deformation monitoring systems for safety management of civil structures but also safe and rapid methods in case of emergencies such as earthquakes.

Remote sensing techniques, especially Synthetic Aperture Radar (SAR), can play an important role to conduct deformation monitoring of civil structures such as dams. Differential Interferometric SAR (DInSAR) analysis using SAR satellite data can be suitable to deformation monitoring in broad areas.

To investigate the applicability of DInSAR analysis for the deformation monitoring, the Taiho Subdam, which is located in the Okinawa Prefecture, Japan, was selected as a study area because the deformation monitoring using GPS have been rigorously conducted since the completion of the dam from December 2006. In this study area, at maximum 114 mm of deformation was measured from December 2006 to December 2010, which corresponds to the observation period by SAR satellite. ALOS PALSAR data, L-band SAR, was used for DInSAR analysis and the results of deformations calculated by DInSAR analysis were compared with the results of the GPS deformation measurements. 28 scenes of ALOS PALSAR data were used: 14 scenes of descending data from December 6, 2006 to December 17, 2010, and 14 scenes of ascending data from January 12, 2007 to January 23, 2011, respectively.

The values of deformations calculated by DInSAR analysis were about 70 or 80% of those measured by GPS during observation period about four years. Although the DInSAR analysis results were expected to have some errors and were different from the GPS measurement results to some extent, DInSAR deformation monitoring is sufficient enough to monitor few-centimeter deformations. Additionally time series changes by DInSAR analysis can well reproduced the tendency of the settlement of the dam. This indicates a possibility that DInSAR analysis is useful for the deformation monitoring for civil structures.

Keywords: Dam, Exterior deformation monitoring, DInSAR, SBAS, GPS