

Research Trends and Results

Technical Development for Displacement Monitoring in Multiple Dams included in the Same Data of Satellite SAR

SATO Hiroyuki, Senior Researcher, ONODERA Aoi, Researcher, SASAKI Takashi (Dr. Eng.),
Head

Large-scale Hydraulic Structure Division, River Department

(Key words) dam life extension, maintenance, monitoring

1. Introduction

In order to address the aging of infrastructure and frequent occurrence of disasters in recent years, development is sought for efficient and effective technologies for monitoring infrastructure. The Japanese Government's Council for Science Technology and Innovation has established the Cross-ministerial Strategic Innovation Promotion Program ("SIP") to promote technical development for the maintenance / renewal management of infrastructure. To address one of the individual issues identified by the SIP, i.e., "Development of a displacement monitoring methodology that detects deterioration in the ground and structures widely at an early stage using satellite SAR," the NILIM has been working for development of efficient and effective monitoring technologies using satellite SAR mainly for dams.

2. Outline of the study

Since satellite SAR can observe changes in the ground surface widely by the radar loaded in an artificial satellite (Figure 1), it is possible to measure displacements in multiple dams at one time that are included in the same observation data. Moreover, since satellite SAR uses reflection of the radar, it can obtain observation data without installing observation instruments on the ground. Since satellite SAR can also measure areawide changes on the ground with a high space resolution of approx. 1 to 10 m, it is possible to detect even a minor sign of deterioration that may be overlooked in conventional surveys or inspection patrols.

We have so far conducted technical development for measuring deformation with high accuracy in five rock-fill dams in Okinawa using the observation data of satellite SAR "Daichi" (Figure 2). As the result of measuring displacements in these five dams for about 4 years using satellite SAR and comparing the results with the displacement data obtained by survey and GPS, mean error was approx. 5 mm.

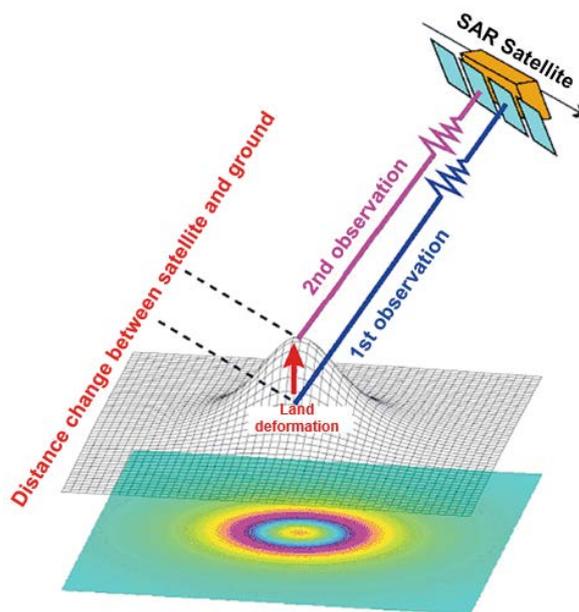


Figure 1: Concept of displacement measurement by satellite SAR¹⁾

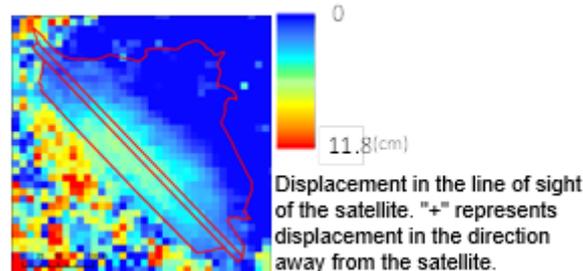


Figure 2: Example for displacement measurement by satellite SAR

3. Future schedule

We continue to improve the accuracy of displacement measurement and conduct technical development for efficient and effective monitoring of displacements in dams utilizing the advantages of both areal data by satellite SAR and point data by survey etc. through combination, and attempt to test our technologies mainly in the dams under direct control aiming for practical use.

[Reference]

- 1) Geospatial Information Authority: Interferometric SAR homepage
<http://vldb.gsi.go.jp/sokuchi/sar/>