Continuous monitoring of ground surface deformation throughout Japan using ALOS-2 data

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1. GSI of Japan

GSI (Geospatial Information Authority of Japan) haves been monitoring ground surface deformation throughout Japan by applying SAR interferometry (InSAR) technique to image data of ALOS-2. In order to continuously monitoring the deformation, we have analyzed ALOS-2 data observed by JAXA following Basic Observation Scenario of ALOS-2. In addition, we have conducted InSAR analyses of ALOS-2 urgently once disaster events such as an activation of volcanic activities or large earthquakes in Japan happened. With the aim of contribution to disaster response, we provided the InSAR-derived deformation to the Earthquake Research Committee, the Coordinating Committee for Prediction of Volcanic Eruptions and others. Furthermore, we published those data on GSI maps (https://maps.gsi.go.jp/) if they are useful for general users.

ALOS-2 will have been in operation for 4 years in August 2018, and thus accumulation of the observation data enables us deeper and wider utilization of them to science. As a result, usefulness of and challenges on utilization of ALOS-2 InSAR to monitoring of ground surface deformation are becoming visible. Therefore, we focused on following three approaches, detection of ground surface deformation, and new challenging attempts in 2017.

(1) Detection of ground surface deformation throughout Japan

While remarkable ground surface deformation by earthquakes did not occur in 2017, relatively small-scale volcanic activities were observed in several volcanos in Japan, Mt. Meakan, Nishinoshima Is., and Mt. Kirishima (Mt. Shinmoedake and Mt. Ioyama). Our InSAR analysis covering the whole area of Japan enabled us to understand spatial distribution and duration of ground surface deformation by these activities.

(2) Analysis of SAR data pairs with long time interval

In our conventional approach for continuous monitoring of the whole area of Japan, we have applied two-pass approach to selected data pairs of SAR images only with time interval of from 3 months to 1 year. However, recent accumulation of observation data enables us to analyze data pairs with longer time interval over 3 years. We analyzed data pairs with time interval of more than 1 year at Kujukuri plane where the subsidence with velocity of less than 2 cm / year, which is already identified by geodetic leveling (Chiba prefecture, 2017). As a result, we obtained the subsidence velocity consistent with those obtained from the geodetic leveling and the analysis with former ALOS data (Yamanaka et al., 2013).

(3) Extraction and publication of areas of active volcanos and large earthquakes from SAR interferograms

GSI has accumulated large number of analyzed data on the intranet as fundamental information for monitoring of ground surface deformation. However, increase in number of SAR data pairs raised the issue of difficulty in prompt access to the interferograms. We experimentally made layers of extracted

interferograms only with areas of active volcanos and large earthquakes, and found them fairly helpful as the archive for quick look. We are preparing for publication of the layers on GSI maps in 2018.

In our presentation, we will show the examples of detected ground surface deformation and progress on the new attempts.

Keywords: DAICHI-2, ALOS-2, SAR, Ground surface deformation, Earthquake, Volcanic activity

