

A study on surface displacement and pressure source of Kozushima Island based on InSAR analysis

*Wataru Uehara¹, Yoshiya Oda¹

1. Tokyo Metropolitan University

Currently, there're more than 100 active volcanoes in Japan. Volcanic activities such as eruption could cause serious disasters. To prevent volcanic disasters, it's necessary to know the details of volcanic activity. To evaluate surface displacement of Kozushima Island, a volcanic island belonging to Tokyo, we've conducted InSAR (Interferometric Synthetic Aperture Radar) analysis. In addition, we've conducted the inversion analysis to evaluate pressure source position.

InSAR analysis is a technic to conduct interferometric analysis for multiple data observed by SAR mounted on the satellite, and we're able to grasp the surface displacement from the analysis result. In this study, we used SAR data observed by ALOS-2, Japanese satellite, and Sentinel-1A, European Union satellite.

As a result, from December 4, 2014 to November 29, 2018, we detected surface displacement of approx. 4 cm several times. In particular, relatively large surface displacement was detected around Mt. Tenjosan located in the northeastern part of the island.

Discoloration of seawater around Kozushima Island was also observed several times during the period when such a large surface displacement was detected. If these discoloration of seawater are related to volcanic activity, the large surface displacement around Mt. Tenjosan could be also related to volcanic activity. We confirmed that the deference between the displacements based on InSAR analysis and those of GPS-based control station were within 3 cm and the result of InSAR analysis using Sentinel-1A indicate same trend.

In order to estimate the pressure source position, we've conducted an inversion analysis Simulated Annealing algorithm (Kirkpatrick et al., 1983). As the results of inversion using the data of large surface displacement during which the seawater discoloration were observed, spherical pressure sources were estimated at approx. 6 km depth in southeast, approx. 1 km depth in northeast, approx. 7 km depth eastern, and approx. 6 km depth northeast of Kozushima Island. The latter three estimated positions correspond with the higher seismicity area during the period 2013 and November 29,2018.

Keywords: Kozushima Island, InSAR analysis, Evaluation of pressure source