

Crustal deformation of Iwojima volcano detected by ALOS/PALSAR interferometry

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Iwojima volcano is located in the Izu-Bonin islands arc, about 1250 km south of Tokyo. Small phreatic eruptions occurred more than 15 times in the Iwojima Island since 1889. Crustal deformation has occurred on a remarkable scale at the volcano. The averaged uplift rate is about 20 cm/year estimated from C14 dating.

Geographical Survey Institute (GSI) maintains the GPS earth observation network (GEONET). GSI installed two GEONET stations at the Iwojima. The GEONET station 'Iwojima-1' has been uplifting rapidly (4-25 cm/month) since August 2006. Similar uplifting occurred at a month before the recent phreatic eruption, 2001. So, the uplifting event should be investigated for monitoring volcanic activity of the Iwojima.

We processed ALOS(Daichi)/PALSAR data for appearing crustal deformation field of the Iwojima Island. We applied GSISAR, which is developed by GSI, for processing PALSAR data. Ascending and descending interferograms show shortening LOS lengths at the eastern part of the Iwojima. In addition, concentric circular fringes around the Motoyama area, the center of the northeastern Iwojima, show increasing LOS lengths. Descending interferograms show a clear line of phase step at the western Iwojima. The phase step line is consistent with the Asodai fault. Therefore, the Asodai fault could be activated with the uplifting event.

From ascending and descending interferograms, two distinct LOS vectors are computed. The two vectors lie on one plane, called 'the LOS plane' (Fujiwara et al., 2000). The combination of the ascending and descending interferograms describes the two-dimensional displacement parallel to the LOS plane at all pixels in those interferograms. The two-dimensional spatial distribution of the two-dimensional displacement is called the '2.5-D surface deformation map' (Fujiwara et al., 2000). The 2.5-D surface deformation was calculated from the ascending image and the descending image. The displacement vector was divided into quasi-upward and eastward components.

The quasi-upward map shows an eastern part of the Iwojima Island uplifts more than 40 cm. The center of the Motoyama area subsides concentrically relative to surrounding area. The eastward displacement map shows uplifting and moving eastward at the eastern side of the Asodai fault. The area around the Asodai fault splits the eastern part and the western part. These features are consistent with the GPS campaign observation results.