A study of pressure source under Iwo-yama, Kirishima Volcanoes using InSAR, precise leveling survey and GNSS observation

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Iwo-yama of Kirishima Volcanoes is an active volcanoe located in Ebino kogen volcanic area, southern Kyushu. The volcanic activity has risen again since 2014 after decades of silence. Increasing of seismicity, fumarolic gas and the expansion of geothermal anomaly area have been estimated around the Iwo-yama. And a phreatic eruption occurred in April 2018. Using precise leveling survey, Morita (2018) inferred a spherical pressure source 700 meters beneath Iwo-yama, and the source was located at the bottom of conductive layer (clay layer) determined by MT survey (Tsukamoto et al., 2018). Using GNSS campaign observation, Koga (2019) inferred the diastrophism during the 2018 phreatic eruption was caused by the inflation of pressure source at the depth of 700m, volume change in the shallow pressure source beneath the peak of Iwo-yama and the magma chamber of Shinmoe-dake.

However, both leveling and GNSS observation are difficult to observe the surface displacement around the peak of Iwo-yama. Interferometric synthetic aperture radar (InSAR), which is mounted on satellites can provide high-resolution deformation maps of the surface displacement around the peak of the volcano that cannot be observed directly. In this case, we will use leveling, GNSS observation and Sentinel-1 satellite InSAR data (COMET LiCS Project) for the displacement measurement and pressure source analysis.

In this research, by comparing the observation result of leveling and InSAR data, we inferred the accuracy of C-band InSAR data can be used to analyze the pressure sources of Iwo-yama because of the lack of vegetation around the crater and the high elevations with small influence of water vapor influence.

For pressure source analysis, we calculate and combine the vertical displacements from leveling and InSAR data, the horizontal displacement from GNSS observation. And we use the Mogi model to estimate two spherical pressure sources beneath Iwo-yama. As a result, the surface deformation from 2015 to 2021 of Iwo-yama can be explained by the inflation and westerly movement of the spherical pressure source under the impervious layer(700m) and the volume change of the shallow spherical pressure source just below the crater(200m).

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