

Sources under Iwo-yama, Kirishima Volcanoes derived from GNSS observation and Precise leveling survey.

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At Iwo-yama that active volcano located in Ebino kogen volcanic area of Kirishima Volcanoes, fumarolic activity has risen again from December 2015 after dozen year's silence and suddenly increasing of seismicity (50 times and more a day) and volcanic tremors was observed several times. And phreatic eruption occurred in April 2018. Morita (2018) inferred inflation spherical pressure source as Mogi source from leveling survey between June 2015 and December 2015. The source's depth is about 700m beneath Iwo-yama and the source was considered that correspond with bottom of conductive layer inferred clay layer from MT survey (Tsukamoto et al., 2018). But, leveling can detect vertical displacement only and the inferred source is not considered horizontal displacement. So, we will improve pressure source inferred from leveling adding detect horizontal displacement from GNSS observation in this study.

As result of the observation, radial crustal deformation was detected several months before the occurrence of the phreatic eruption and after the eruption occurred. Estimating those displacement using an elevation-modified Mogi model, volume increase of the pressure source located at 700m depth below Iwo-yama was estimated. The depth of this pressure source coincided with the depth of the clay layer and it was found that the pressure source had expanded under the clay layer before the eruption occurred. But, for the GNSS observation point of the edifice before eruption, displacement which can't be explained by the pressure source under the clay layer has been detected. This displacement is thought to be due to the rise of hot water to the shallow part as the pressure source under the clay layer expands.

We conducted GNSS continuous observation point around Iwo-yama established by Japan Meteorological Agency to verify the pressure source under the clay layer. As a result, displacements which can't be explained by this model detected at these observation points. Using the GNSS continuous observation points throughout Kirishima, we estimated the pressure source of this displacement. Then, we could estimate the spherical pressure source located 7 km deep in the vicinity of Ebino-dake. This model is consistent with the source of crustal deformation before and after the eruption of Shinmoe-dake volcano in 2011 estimated by Nakao et al. (2018). Therefore, those displacement is thought to be due to volume change of magma chamber of Shinmoe-dake. In conclusion, the crustal deformation around Iwo-yama is due to these three sources, spherical pressure source under clay layer, displacement due to hot water rising to shallow part of Iwo-yama, magma chamber of Shinmoe-dake.

Keywords: Iwo-yama, GNSS observation, Precise leveling survey

GNSS 観測と精密水準測量から推定される霧島硫黄山の地下圧力源 Sources under Iwo-yama, Kirishima Volcanoes derived from GNSS observation and Precise leveling survey.

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This work was partly supported by MEXT under Integrated Program for Next Generation Volcano Research and Human Resource Development, and under Earthquake and Volcano Hazards Observation and Research Program. Also it was supported by ERI, The University of Tokyo under Joint Usage Program.

キーワード：硫黄山、GNSS 測量、水準測量

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