

## Precise Leveling survey around mount Io, Kirishima Volcano (2012 - 2016)

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### Introduction

Since the magma eruption of Kirishima Shinmoedake in southern Kyushu in 2011, volcanic activity of the Kirishima mountain range had been followed by a calm situation.

However, the number of volcanic earthquakes is increased around Ebino plateau (Mount Io) a distance of about 5km northwest from Shinmoedake since December 2013.

In August 2014 occurred volcanic tremor that epicenter near mount Io and, it was also observed tilt change at the same time. Furthermore, geothermal field appeared in the summit area of Mount Io in December 2015, then also it began ejection of volcanic gas.

Mount Io is the vents of dacitic lava flow of 16 and 17th centuries in the eastern part of Ebino plateau. Although in the summit area had also been mining of sulfur up to 1962, in recent years it had declined rapidly its volcanic activity.

In the Kirishima volcanic area, level route has been established in 1968 by the University of Tokyo Earthquake Research Institute, and the phenomenon of subsidence and contraction of Mount Io have been observed in several times (Koyama et al., 1991). Ozawa et al. (2003) reported the local subsidence of Mount Io by using the interference SAR. We thought that activation of volcanic activity in the vicinity of Ebino plateau from the end of 2013 is a new magmatic activity, in order to understand the crustal deformation associated with this magma intrusion in detail, was carried out the leveling of near Ebino plateau.

### Data and methods

Immediately after the eruption of Shinmoedake in 2011, Hokkaido University made a leveling of three times with about 25km section of Ebino city- Ebino plateau - Kirishima Shin'yu hot spring (Mori et al., 2012) . We carried out a re-measurement of about 8km section between Ebino plateau - Kirishima Shin'yu in June, 2015, and we have established a new route of about 2.5km in Mount Io direction. Also in 2015 December 19 to 22 we carried out to re-survey in the vicinity of Ebino plateau.

### Result

With reference to the level point BM1120 level route western margin, the difference between the June measurement value and in December 2015 measured value at each level point are shown in the figure. Uplift amount is larger as it approaches the Mount Io from Ebino plateau (BM3015), uplift of up to 10.4 mm was recorded in west trailhead of Mount Io (BM3050). Uplift becomes gradually smaller when cross the mountain pass, and have returned to almost 0mm in BM3130 route northeast end.

Using the MaGCAP-V which the Meteorological Research Institute has developed, the elevation corrected Mogi model was determined by grid search. As a result, increasing pressure source of  $3.1 \times 10^4 \text{m}^3$  East 150m of Mount Io fumarole area, was estimated at an altitude of 600m. The vertical variation, which is calculated from this model is consistent with the crustal deformation observed by Earth Science and Disaster Prevention Research Institute using interference SAR analysis. The depth of the pressure source, which corresponds to the lower surface of the low-resistivity layer (impermeable layer) that has been estimated by Aizawa et al. (2013).

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