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Combined absolute and relative gravity measurement for microgravity monitoring in Aso volcanic field

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Absolute measurement with a portable A10-017 absolute gravimeter at some benchmarks in the Aso volcanic field are valuable for reducing uncertainties of regional gravity variations and will be useful for delineating the long term trends of gravity changes. A10 absolute gravimeter is a new generation of portable absolute instrument and has accuracy 10 microGal. To further the development of a high precision gravity data, we also conducted measurement using two relative gravimeter (Scintrex CG-5 [549] and LaCoste type G-1016) to be combined with an A10 absolute gravimeter. The using absolute gravimeter along with relative gravimeter can reduce drift correction factor and improve the result of gravity change data in microgravity monitoring. Microgravity monitoring is a valued tool for mapping the redistribution of subsurface mass and for assessing changes in the fluid as a dynamic process in volcanic field. Gravity changes enable the characterization of subsurface processes: i.e. the mass of the intrusion or hydrothermal flow. A key assumption behind gravity monitoring is that changes in earth's gravity reflect mass-transport processes at depth [1].

The absolute gravity network was installed at seven benchmarks using on May 2010, which re-occupied in October 2010, and June 2011. The relative gravity measurements were performed at 28 benchmarks in one month before the eruption on May 2011 and then followed by series of gravity monitoring after the eruption in every three to five months. Gravity measurements covered the area more than 60 km2 in the west side of Aso caldera. Some gravity benchmarks were measured using both absolute and relative gravimeter and is used as the reference benchmarks. In longer time period, the combined gravity method will improve the result of gravity change data for monitoring in the Aso volcanic field. As a result, the gravity changes detected the hydrothermal flow in the subsurface which has a correlation to water level fluctuation in the crater. Large residual gravity changes between the surveys of absolute and relative gravimeter are found at benchmarks around Nakadake crater.

Keywords: Microgravity monitoring, Aso volcanic field

References

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