

The oscillation theory generated by hydrothermal dynamics beneath Aso Volcano, southwest Japan: A new understanding using repeated absolute and relative gravity measurement

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At the end of 2010, the water level in the Naka dake crater reduced and then was followed by a small eruption in May 2011. After the eruption and heavy rain, the water level in the crater is recovered. To clarify this crater lake phenomenon in relation to hydrothermal dynamics in the subsurface, we were subjected to repeated gravity measurements. Relative gravity measurements were performed with Scintrex CG-5 (549) and LaCoste Romberg type G-1016 gravimeter at 28 benchmarks in April, August and November 2011, April, August and December 2012. It covered the area more than 60 km² in the west side of Aso caldera. In another measurement, we installed a new microgravity network on May 2010 at seven benchmarks using A10-017 Absolute gravimeter, which we re-occupied in October 2010, and June 2011.

As a result, we able to detect gravity changes that seem as hydrothermal flow that has a correlation to water level fluctuation in the crater. Large residual gravity changes between the surveys are found at benchmarks around Nakadake crater. The 3D inversion models of 4-D gravity data deduce density contrast distribution beneath Aso volcano. The inversion models have good validation from Nakadake dynamic crater during these periods. The oscillation theory generated by hydrothermal dynamics in subsurface reservoirs is indicated by these inversion models. If we able to measure quantitatively this amount, it will contribute to understanding the process of eruption.