

Gravity variation measurements and numerical modeling for the hydrothermal system of the Kuju volcano

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Laboratory of Geothermics, Kyushu University has conducted some observations including microearthquake observations, fumarolic heat discharge rate measurements and gravity variation measurements for the Kuju volcano where the phreatic eruption had occurred in 1995, and has constructed some numerical models of the hydrothermal system to explain mainly the geothermal condition variation including the temporal change of the fumarolic heat discharge rate after the 1995 eruption. This study tried to construct a new numerical model of the hydrothermal system to explain not only the geothermal condition variation but also the results of the gravity variation measurements.

We used a hydrothermal system simulator HYDROTHERM Ver. 2.2 (Hayba and Ingebritsen, 1994) for the numerical modeling. And gravity changes of the numerical model were calculated by the Okabe's formula (Okabe, 1979) using the density change of each block of the model caused by the geothermal water flow. The previous model of our laboratory indicates a similar trend of the gravity change with the observed result at each gravity measurement point but greater changes than the measured values. Then, we tried to improve the previous model.

In several improvements, size reduction of each block that constructs the previous model decreased the calculated gravity changes and brought the gravity changes close to the measured values although we had to stop the block size reduction in the middle of the study because of the specification limit of the computer we used. Therefore, we expect to be able to obtain a numerical model that explains not only the geothermal condition variation but also the gravity variation when we progress this improvement by using the computer system that can execute larger scale calculation.

We are grateful to Mr. Naoaki Ogata who had progressed this study.

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Keywords: Kuju volcano, gravity measurement, hydrothermal system, numerical modeling