Monitoring and simulation of cooling process after 1995 phreatic eruption at Kuju volcano, Japan.

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Kuju volcano is situated in the central part of Kyushu Island, Japan. A phreatic eruption occurred on October 1995 at about 600m souths from its active fumarolic field. After the eruption, several repeat geophysical observation such as gravity, ground deformation measurement by GPS, and temperature measurement were conducted around the Kuju volcano. Since 2000, we have conducted repeat magnetic survey at 25 points. In 1991, an electrical resisitivity survey and short distance drilling were conducted in the fumarolic field. For comparison, we have conducted an electrical resistivity survey and a drilling on the same line, same drilling point.

From the magnetic survey, increase in geomagnetic field at the northern part and decrease at the southern part of the survey area were observed. It means that the subsurface reservoir is cooled and temperature is decreasing. The inversion result for determining the magnetizing source showed that the source magnetic dipole is situated at about 500m depths in the active fumarolic field.

From the inverted results of 1991 and 2001 resistivity survey, very resistive body at several tens of meters depth, which was interpreted as a superheated steam reservoir, diminished in ten years. We interpreted that the super heated reservoir was cooled, and turned to be a water-dominated reservoir.

Temporal gravity change in the study area showed a gravity decrease around the new craters for two years after the eruption. After 1999, gravity has been increasing around the fumarolic area. According to the mass balance calculation basing on the gravity variations, the recharging from the surroundings must be several times bigger than those of before 1995 eruption.

To interpret these phenomena quantitatively, we have conducted a three-dimensional hydrothermal simulation using finite difference method. The result showed that the sudden pressure decrease could cause the drastic change in ground water flow system, and large amount of meteoric water flow into the reservoir. The simulated result agreed well to the observed phenomena.