Change in the thermal state beneath the active fumarolic field of Kuju volcano after the 1995 phreatic eruption

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Kuju volcano in the southwestern part of Oita Prefecture, central Kyushu han an active fumarolic field called Kuju Iwoyama which is devided into three parts, A-,B- and C-region. Phreatic eruptions occurred at about 300m south of the fumarolic field in October and December 1995.

An electrical tomography technique was applied to A-region in order to detect the steam reservoir beneath the fumarolic field. As the result, an extremelyt high resistive zone higher than 1000 ohm meter was detected at a depth of 10 to 50m beneath the fumarolic field.

A short directional hole (27m long and 18m deep below the surface) was dug toward the high resistive zone in May 1991. As the result, we obtained superheated steam and then used it for material testing. The temperature of the steam at the well head was 233 degree C and was estimated to be 278 degree C at the bottom of the hole.

In November 2001, we planned to get hotter steam in order to do another experiment. Then a longer directional hole (47m long and 30m deep below the surface) was dug toward the central part of the high resistive zone. However, we obtained only saturated steam and the temperature at the well head was 98 degree C. The saturated steam was discharged for about one month but stopped discharging because of sublimation of sulphur inside the hole.

A repeat resistivity measurement was conducted at the same measurement line in order to clarify the change in the thermal state in September 2002. As the result, the high resistive zone has disappeared and the resistivity value of the previous resistive zone became to several tens ohm meter. Such a drastic change may be interpreted if we assume that the superheated steam reservoir turned to be the liquid dominated reservoir, that is, the change in the resistivity means cooling of the reservoir. The cold meteoric groundwater around the fumarolic field may be supplied to the steam reservoir.

As mentioned above, phreatic eruptions occurred in October and December 1995. Geophysical monitoring after the eruption shows quick cooling of the central part of the volcano and also a large amout of meteoric water supply to the central part of the volcano. The change in the resistivity structure obtained in this study may be one of the phenomena associated with the 1995 phreatic eruption.