Monitoring survey at Usu volcano and comparison of its activity with 1995 eruption at Kuju volcano.

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We conducted twice(July 31 to August 2, and September 27 to 29, 2000) monitoring surveys at Usu volcano. The aim of the survey was to monitor the volcanic activity, and to compare the variation of the indexing values (gravity, temperature changes), with those observed at 1995 eruption of Kuju volcano.

The surface volcanic activity seemed to be more active in the later survey, although the seismic activity and the ground deformation were inactive, showing that the activity is becoming calm.

The estimated volume of the newly intruded magma is of comparable order to that of 1995 eruption at Kuju, where no ground deformation was observed but large amount of steam discharge continued for a long term. This means that the depth of intruded magma was shallower in Usu, while it was deeper in Kuju.

During the period of July 31 to August 2, 2000, and September 27 to September 29, 2000, the authors conducted twice monitoring surveys at Usu volcano, which erupted on March 31. The aim of the survey was to evaluate and to monitor the eruption activity quantitatively using gravity and thermal measurements, and to compare these variations to those obtained at 1995 eruption of Kuju volcano.

The observational results could be briefly summarized as follows:

1) Temperature measurement of the bottom of Nishiyama crater using IR thermometer

In the first survey, the highest temperature of 181.3(deg) was recorded. In the second survey, the highest temperature 186.5(deg) was recorded. Although the steam discharge rate at this crater seemed to be slightly decreased, the highest temperature was higher in the second survey.

2) 1m depth temperature at Nishiyama crater

On the Nishiyama area, several fumaroles were identified. In order to identify the change of geothermal activity, 1m depth temperature measurements were repeated at eight points.

In the first survey, one-meter depth temperature at this area ranged from 14(deg) to boiling point. In the second survey, the temperatures fell uniformly, which means no expansion of fumarolic activity.

3) Heat discharge rate measurement using a remote sensing method

During the second survey, we have conducted the heat discharge rate measurement using a remote sensing method (Jinguuji and Ehara, 1996). The estimated value of the heat discharge rate at Konpira K-B crater was 350MW. This rate is much smaller than that of 2000MW, obtained just after the eruption, but clearly bigger than that of 100MW which was obtained on July by Hirabayshi et al.(2000).

4) Gravity measurement

In order to clarify the movement of underground water, which is accompanying with the development of the hydrothermal system after the eruption, repeat gravity measurements were conducted at five stations around the Konpira-yama crater. The result showed slight gravity decrease around the crater. This indicates that the steam discharging activity is still going on, but the underground water supply from the surroundings is not sufficient to compensate the discharging mass, which means that the hydrological state of the study area has not reached to the equilibrium state.

5) Sound pressure and ground vibration measurement

The objective of these measurements were to investigate their applicability as a quantitative monitoring technique for the steam discharging activity at craters. As a result, we have confirmed that the sound pressure monotonically decreased with distance from the crater, and the measured values of sound pressure were conformal to the changes of steam discharge activity, judged by visual inspection. We confirmed that the sound pressure measurement is convenient to monitor the steam discharge activity quantitatively.

The estimated mass of the magma concerned is about six million tons (three months after the eruption, Hirabayashi et al., 2000). On the other hand, we have estimated the mass of magma concerned at 1995 phreatic eruption of Kuju volcano was three to six million tons (five years after the eruption). These two estimates of the magmas are of comparable order. At Usu volcano, violent earthquake and ground deformation were observed, while at Kuju, no strong earthquake and ground deformation were observed. Such difference might be originated from the difference in the depth of the magma concerned.