

Geothermal activities in and around the summit crater of Mt.Usu

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The 2000 eruptive activities of Mt. Usu lasted for five months to open many craters and to form the 2000 new mountain (200m a.s.l.) at the western foot of the mountain. After the growth of the new mountain stopped, a few craters have kept vigorous volcanic gas emission and steaming ground has extended over the central part of the new mountain (Saba, 2004). The eruption also accompanied the ground deformation over the mountain, and noticeable faults and surface ruptures appear in and around the summit crater. Such deformation suggested intrusion of the magma beneath the summit crater. However, geothermal activities in the summit crater do not seem to be affected by the eruption because of no recognizable change in the activities. To examine this observation, we carried out geothermal survey in and around summit crater on October 2004. We also measured the underground temperature in 1 m depth along three survey lines to understand shallow underground temperature near a fumarole.

The region of higher than 20 C. in the underground temperature at a depth of 1 m distributes on and around the I crater, Kitabobu-yama and Ogari-yama, the southeastern slope of Ko-Usu lava dome, and the rim of the south to western somma. Among these regions, the new mountain road reveals that three regions on the outer wall of the southwestern somma range northwest and southeast. These regions probably exist before the eruption because two regions located at the end are already known. The extent of the region over 20 C. is nearly equal to it in 1990. The region of higher than 40 C. on the inner wall of southwestern-western wall and on Kitabyobu-yama expands into it in 1987. This expansion implies that shallow hydrothermal system activates by the violent ground deformation again. On the other hand, the region around I crater becomes slightly small. The heat discharge rate by plume from I crater also fairly decreases to 3MW from 11MW in 1990, although the temperature of volcanic gas is on the long-term trend of the temperature falling. Supposing that the temperature of fumaroles indicates cooling of heat source, this fall of the temperature indicates that no heat is supplied from the 2000 magma. The decrease in the heat discharge rate and the region over 40 C. can be explained by the increase in the heat discharge from extended regions over the 40 C. on the inner wall of southwestern-western and around Kitabyobu-yama. The 2000 eruption maybe affects just shallow hydrothermal system not the heat source, although quantitative analysis have not finished yet.

The underground temperature at a depth of 1m shows exponentially decreases with the distance from fumaroles in every survey lines. This feature can be qualitatively explained by the thermal conduction model that the heat source is the vent in which volcanic gas ascends.