Hydrothermal system around Nishiyama crater area, Usu volcano, Hokkaido.

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The 2002 eruption of Mt. Usu volcano formed the new crater groups (ex. N-1,N-B,N-C) and hydrothermal system in the western part of Nishiyama, the northwestern foot of the volcano. Especially, geothermal area along the ridge of northwestern side of the N-B crater has gradually developed temperature anomaly and fumarolic activity even after the eruption has calmed down.

Geophysical and geochemical observation in this area is important to understand the growth of a local subsurface hydrothermal system in relation to the eruptive event. It also helps to make a better understanding of the whole hydrothermal system of Usu area.

Geological Survey of Hokkaido started two-years research project on the hydrothermal system beneath Nishiyama area in 2006. Seven kinds of investigations have been executed (thermal imaging, ground temperature survey, self-potential mapping, CO_2 flux mapping, VLF-MT resistivity mapping, DC electrical resistivity imaging and the ground water survey). To understand the temporal change of the hydrothermal system, we compared our results with those by Saba et al. (2004) that reported the ground temperature, resistivity and self-potential in the earlier stage from October, 2000 to May, 2002.

The following is the major results.

(1) In October of 2006, geothermal anomaly covered the N-B, N-C crater and its northwestern extension. High ground temperature (close to the boiling point) was locally found on the top of the ridge. On the other hand, any surface manifestation was not seen in the region around the N-1 crater, the southeastern side of the crater group.

(2) Self-potential mapping in and around the geothermal area, clarified the highest SP about 80mV was located at the top of the NW ridge. This positive SP anomaly was roughly corresponding to the high ground temperature zone, suggesting a hydrothermal upwelling.

(3) High CO_2 flux area also corresponded to the high ground temperature zone.

(4) Electrical resistivity from VLF-MT survey was not apparently correlated with the active geothermal area. The lowest resistivity was not located on the NW ridge but around the N-B crater.

(5) The two-dimensional DC resistivity imaging over the NW ridge and the surrounding area has revealed a high resistivity body at a depth of about 50m beneath the ridge. Lower resistivity bed was found on this resistive body.