The relationship between the fumaloric activity and 3-D resistivity structure around the lava dome of Tarumai Volcano

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Fumarolic activities of Tarumai Volcano has maintained on and around the lava dome, which was formed in the crater area during the 1909 eruption. These fumaroles are distributed within approximately 500 m in diameter. The A and B fumaroles, which are located by the southern part of the dome, emit particularly high temperature gasses, reaching to 600 ^{o}C (Sapporo District Meteorological Observatory, 2004) and thus the fact suggests that the volcanic gas rises directly from magma. However, the temperature from the other fumaroles indicates below the boiling point. Such difference of temperature depending on locations of the fumaroles can be caused by the subsurface structure beneath the fumaroles. Therefore, we carried out the AMT survey and then supposed the three-dimensional resistivity structure in the crater area. This report discusses the relationship between the fumarolic activities and the resistivity structure.

In order to determine the three-dimensional structure, we carried out a forward modeling, using the AMT data from 20 stations in the crater area. We considered the topographic effect to the measured AMT data due to the lava dome in the crater area, during the modeling. The observed apparent resistivity and phase were mostly recovered at the stage in which the topography and the layered structure have been incorporated. However, since there still remained some disagreements between the measured and calculated induction vectors, some three-dimensional bodies have been inserted in the layered structure to improve the fitness of the induction vectors.

The model obtained through the forward modeling detected the bowl-shaped conductive layer of 50 Ohm-m below the lava dome to the depth of 150 m. The impermeable formation can exist at shallower part, considering the historical records, which mentioned that there were some ponds in the crater area before the 1909 eruption (Ishikawa et al. 1972). In addition, the geochemical study (Ossaka et al, 1984) suggested the ground water beneath the lava dome. Thus, we propose that this conductor corresponds to the water saturated zone beneath the crater area brought by rain-falls through the fractures of the dome. It is a possible interpretation that the volcanic gas rises to the surface without encountering the water saturated zone and then ejects from the crater A and the fumaroles B, keeping high temperature. The high temperature gas rises to the water saturated zone, then heating it, and resulting the low temperature fumaroles.