THREE-DIMENSIONAL RESISTIVITY STRUCTURE IN TARUMAI VOLCANIC AREA INCLUDING THE EFFECTS OF REGIONAL STRUCTURE AND TOPOGRAPHY

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The three-dimensional (3-D) analysis should be adopted to clarify the actual structure of volcanoes, because the topography and specific structure of volcanoes can be considered as the 3-D geometry. In this study, we carried out the magnetotelluric survey at Tarumai Volcano, which is an active volcano located at the southwestern Hokkaido, NE Japan, and then estimate the structure using the 3-D analysis. The measured MT data included small impedance phases in the low frequency band, and thus could be affected by the regional structure. The measured induction vectors also suggested the effect by the ocean and sedimentary rocks which is called as Ishikari Plain. We evaluated this regional effect, with the aid of the 3-D forward modeling calculation code developed by Fomenko and Mogi (2002). The calculated induction vectors were well explained by the regional effects, and the calculated impedance phase showed the same tendency as the observed one. This fact indicates that the MT impedance is strongly affected by the regional conductive structure. We also estimated the effect due to the 3-D topography of the volcano. The results showed that the apparent resistivity decreased to maximum 20 Ωm (-80 %) at the top of the topography, while the impedance phase increased to maximum 55° (+20 %) there. Finally, we carried on a 3-D modeling based on the MT data, fixing the regional structure and topography. The final model showed the great resistivity boundary dividing the Shikotsu caldera and Ishikari Plain. This feature suggests that Tarumai Volcano was generated along the regional structural boundary which might be also related with the formation of the Shikotsu caldera. Low frequency earthquakes, which suggest the degassing from a magma chamber, occurred at the sea level beneath Tarumai Volcano. Although the magma chamber including the partial melt can be found generally as a conductor, no conductor at such a depth was found in our model. Since the high temperature gas tends to show high resistivity, there can be not the magma chamber but the gas reservoir at the depth.

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