The first report of the 2005 AMT survey for Asama volcano

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Asama volcano erupted September 1, 2004 after 22 years dormancy. From the observation of ground deformation, it is estimated that the E-W trending dike intruded 3km east of Asama volcano at the depth of 3km, and the magma rose to the summit and finally caused the eruption 8 [Aoki et al., 2005]. Shallow earthquakes (B-type and N-type earthquakes) are occurred at the depths of 600 m underneath the west side of the crater (Oikawa et al., 2005). Here we show the first results of AMT and MT measurements in 2005. The survey was carried out in June to December in 2005 using Phoenix MTU-5 (320 - 0.0005 Hz) and MTU-5A (10000 - 0.3 Hz) systems. The objective of the survey is to (1) estimate the resistivity structure around the dike-intruded area, (2) to deduce the depths of the basement layer, and (3) to find the water-saturated zone in the volcano.

First, in order to get structural feature of Asama volcano, averaged impedance are plotted on the map. Fig. 1 shows the pseudo-section (1Hz) with observation sites of AMT and MT. The square root of the determinant of the impedance tensors are shown. We see from Fig. 1 that the west of the volcano are conductive, while the east part of the volcano are resistive in 1Hz. Because the west part are old (90-20 ka) and east are new (20ka to present), this contrast of the impedance may be due to the difference of geological age. The estimated dike are situated at the resistive and high phase area. Taking into account the skin depth and the depth of the estimated dike, the area around the top of the dike may be resistive.

Next we conducted preliminarily 2D analysis on the E-W profile which across the summit. We assumed the regional strike (parallel to the structure) as N-S and conducted 2D inversion using the code of Ogawa and Uchida, [1996]. The impedance tensors are not decomposed. The best-fit resistivity model shows that the conductor is located at the depth of about 500m beneath the summit. Around the summit, electric self potential are relatively positive. This correspondence between conductive zone and positive SP are similar to that of Miyake [Nishida et al, 1996; Zlotnicki et al., 2003;] and Fuji [Aizawa et al., 2005] volcano. This conductor may be interpreted as the hydrothermal or highly altered zone. In order to define the hydrothermal system and investigate the relation to the volcanic earthquakes beneath the summit, we would like to resolve this conductive zone in detail by increasing the observation sites.

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Fig. 1 :
The pseudo-section (1Hz) of Asama volcano with the observation sites of AMT and MT. The square root of the determinant of impedance tensor is shown. Topographic contour interval is 100m.
The estimated dike (http://www.eri.u-tokyo.ac.jp/koho/asama/) is also shown as a white bar.