# Resistivity structure of Tarumai volcano using MT method ---the evaluation of the effect due to regional structure ---

Yusuke Yamaya, Takeshi Hashimoto, Atsuo Suzuki, Yasunori Nishida,
Hiroshi Ichihara and Toru Mogi (ISV, Sci., Hokkaido Univ.)

Tarumai volcano is an active volcano located in the northern part of Southwest Hokkaido. It generated a lava dome in the summit crater during magma eruption in 1909. Since then, volcanic gas activity continues around the dome up to the present. After the 2003 Tokachi-Oki earthquake, low frequency earthquake swarm was observed beneath the volcano and gas emission has been activated at some fumaroles in the southwestern part of the lava dome (Terada *et al.*, 2004). Aoyama *et al.* (2004) suggested that hydrothermal water beneath the volcano may have contributed to these activities. These facts suggest the existence of the hydrothermal system or aquifer below Tarumai volcano. Such hydrothermal water should be imaged as a conductive body by using the electrical resistivity sounding method. Through our previous survey in 2004 using the wide-band MT, we have obtained a two-dimensional resistivity cross-section indicating a conductive body below 10 Ohm-m around the sea level beneath the summit dome (Yamaya *et al.*, 2004). More precise imaging to delineate the dimension and position of this conductor entailed a 3-D modeling using larger number of measuring sites with an appropriate spatial coverage.

We then carried out an additional survey in 2005. Total number of MT sites has increased to 23 including 14 sites at which only the electric field was observed. The data was remote-referenced to the permanent station of GSI at Esashi before the manual editing of the bad time-segment. While at most of the sites apparent resistivity, impedance phase and transfer function indicated small error bars, at some sites in the western part they indicated large error bars due to noises from high power lines running close to these sites.

As a first step before the precise modeling of the volcano itself, we should evaluate the response due to regional structure. For this purpose we calculated magnetic transfer functions by forward modeling. Although we have only nine sites observing three components of the magnetic field to calculate transfer function, it may be enough to evaluate the simple effect of surrounding seas and regional sediments. At first, we modeled a simple 3-D resistivity structure in which surrounding seas to the south and north were taken into account. Calculated induction vectors point to the south at frequency 0.1 Hz, whereas they point to the northwest in a frequency range between 0.01 and 0.001 Hz. This tendency, which is not according with the observed induction vectors, are due to the thick sea water locating about 80 km away from the study area. Then, we added a conductive layer (10 Ohm-m; thickness of 3 km) to the model to consider conductive sediments due to Ishikari plain to the east. In this case, calculated induction vectors generally point to the southeast in a frequency range between 0.1 and 0.01 Hz, while they mostly point eastward at 0.001 Hz. These results coincide well with the observed induction vectors (Fig. 1), featuring the effects of surrounding conductors due to seawater and sediments of several kilometers thick on Ishikari plain.

In this report, we suggested that the magnetic transfer functions observed in study area was mostly influenced by regional structure as sea waters and Ishikari plain. It is expected inevitably that MT responses (apparent resistivity and impedance phase) be influenced similarly. It is therefore necessary to take such regional structure into account for the precise 3-D modeling using MT responses.

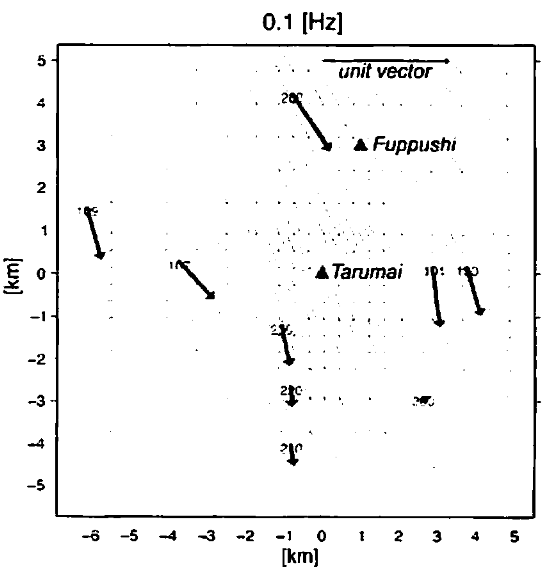


**Fig. 1**: Induction vectors around Tarumai volcano at 0.1 Hz. Black arrows show observed and gray arrows show calculated as assuming a distribution of Ishikari plain and the ocean.