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Upwelling Fluids and Island-Arc Volcano in Subduction Zone: 3D Electrical Resistivity Structure of Lithosphere in Kyushu

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In the subduction zone, an aqueous fluid (seawater) brought into the Earth's mantle with subducting oceanic plate takes an important role on the formation of the island-arc volcano. The fluid is released by a dehydration reaction as reaching to a certain pressure-temperature condition. It is one of the most important factors for triggering partial melt of the mantle. The physical heterogeneity differences of downgoing plates have an influence on the partial melt and the igneous activity in the mantle. The Kyushu island in the SW Japan arc is a subduction zone, at which the Shikoku basin; a young Philippine Sea plate (PSP), and the old PSP subduct beneath the Eurasian plate. Many quaternary active volcanoes occur along the volcanic front (VF) associated with the PSP, whereas an active volcano in the backarc area of the northern Kyushu exists. Moreover, a non-volcanic zone of about 100 km long is seen along the VF. It is geophysically important to understand the origin of the unique volcanic distribution in Kyushu.

In this study, the Network-Magnetotelluric (MT) data sets, of which the exploration depth covers to the upper mantle, were used in order to determine regional scale electrical resistivity structure. The Network-MT method is particularly effective to the existence of fluids (the slab-derived aqueous fluid and/or melt) due to the electrical means. We applied three-dimensional (3D) inversion analyses using the WSINV3DMT inversion code for the Network-MT data [Uyeshima et al., 2008] for the purpose of investigating the correlation between fluids and the volcano distribution. The most important feature is a conductive anomaly of which the bottom extends to the backarc side exists beneath the each volcano. The existence of such anomaly suggesting upwelling from the back arc side to the VF has been reported in the NE Japan arc with the MT method [Mishina, 2009] and seismic tomography method [e.g., Hasegawa et al., 1991]. However, our results suggest that the conductive anomaly associated with each volcano has its characteristic scale in the horizontally and vertically. In this presentation, we would like to show details on the 3D resistivity structure related to the subducting PSP and the volcano distribution in terms of the fluids migration.