フィリピン・タール火山における MT 法比抵抗構造探査

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Resistivity imaging by magnetotelluric method on Taal volcano, Philippines

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Taal volcano, located in the Taal caldera lake, the southern part of the Luzon Island, is one of the most active volcanoes in Philippines. Since the recent eruptions of Taal have been commonly represented by phreatic and phreat-magmatic explosions, it is important to clarify the distribution of ground water and magma reservoir, in order to predict a volcanic activity in the future. However, there have been very few investigations about the subsurface structure especially about the deeper part than 1 km beneath the Taal volcano. Therefore, we conducted a magnetotelluric survey in the volcano island in March 2011 to detect a resistivity structure down to 10 km deep. AMT and wideband MT data were measured by MTU-5 and MTU-5A, respectively, along two lines, which were crossing the main crater lake (MCL) at the center of the volcano island, and the southwestern flank. The impedance tensor and induction vector were calculated from the time series data through the Fourier transformation. The remote reference technique was applied to the wide band MT data by using the magnetic field data at Esashi, Japan, maintained by GSI, while the single site processing was applied to the AMT data. The obtained sounding curves indicate quite good quality because there is no power line in the volcano island except small private electric generators. The sounding curves of wideband MT and AMT measurements are compatible at the same station, in spite of the difference of remote or single processing. The phase tensor analysis suspected the electromagnetic strike direction in the study area as N35^{o}E, which is approximately perpendicular to our survey lines. The apparent resistivity and impedance phase rotated to the strike direction were inverted to resistivity sections, by using the 2-D resistivity inversion scheme developed by Ogawa and Uchida (1996). The resistivity section across the MCL indicates a relatively resistive body (30 - 100 ohm-m) at 1 - 3 km (b.s.l.) surrounded by conductive layer. Since this feature is common to the other resistivity section, the conductor can shape a kind of the shell spherically covering the resistive body. This resistive body can be interpreted as a volcanic gas reservoir or intruded rocks during past eruptions. The saturation of lake water and alteration due to volcanic fluid and heat can generate a surrounding conductor.