

フィリピン・タール火山の火口湖における水深および地磁気全磁力測定

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Magnetic and bathymetric studies in the Main Crater Lake of Taal Volcano, Philippines

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Electromagnetic study on Taal Volcano (120.99E, 14.00N), in Philippines, has been carried out since December 2004 by the cooperative group which is constituted of researchers in Japan, France and Philippines. The authors conducted 11 times of field campaign from January 2005 to March 2008, including the measurements of self potential (SP), total magnetic field (TMF) intensity, ground temperature, and CO₂ soil degassing.

In the first campaign on 9-14 January 2005, the TMF and SP measurements were practiced at every 25 meters on the same lines in the Main Crater, on the Crater Rim, and on the hillside of the Volcano Island. In order to monitor abnormal magnetic field variations due to the change of geothermal distribution, we constructed more than 20 benchmarks for the repeat precise TMF survey inside and outside the geothermal areas. The variation of TMF has been studied for 3 years, and the relation with the volcanic status began to be understood [1]-[2]. Moreover, we established the system for continuous TMF measurement [3] in geothermal areas during the last campaign in December 2007.

We reported the abnormal positive TMF anomaly distributes in the geothermal area, where is placed on the northern flank of Volcano Island [2]. The result of two-dimensional modeling for the Volcano Island and geothermal area show that magnetization of the volcanic body is about 5 A/m, which is typical for basaltic rock. Furthermore, about +500 nT of positive TMF anomaly which cannot be explained by topographic contribution exists in the geothermal area. This anomaly may be explained as the thermal demagnetization. We estimated that demagnetized body (width is about 150m, and intensity is -1.2 A/m) is laying under the geothermal area.

In the last campaign in March 2008, we carried out the TMF and depth soundings on the surface of Main Crater Lake (MCL). The overhauser magnetometer (GSM-19, GEM systems) and depth sounder (GPSmap278, GARMIN) were used for the measurements. These equipments were set on a small banca bort which is made of FRP. The sample intervals were set to 5 seconds for magnetic survey and about 15 meters for the depth sounding. Our measurements covered almost whole area of MCL. We also measured the water temperature to keep away from high temperature zones, however, we did not encounter the area of temperature more than 40 degrees excepting the coast line in the geothermally active zones.

The result of depth sounding generally resembles to the previous study [4] in 1986. However, the depth in the central part seems to be decreased. This may be caused by the inflows from the lake shore. In addition, we found out very clear bathymetric change in the northern part of MCL. The iso-bathymetric line of 40 m warps toward south in the 2008 study. This area is coincident with high temperature zone which has been revealed by ASTER data [2]. This topographic high may be a kind of mound composed of some geochemical materials such as sulfide and/or chloride, which are seen along the shore line of MCL. The magnetic study supports that this mound does not contain magnetized materials.

References:

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