An attempt for magnetometric detection of the hydrothermal reservoir beneath Taal Volcano (Philippines)

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MT and AMT surveys on Volcano Island of Taal revealed a large hydrothermal reservoir beneath the island (Yamaya et al., 2013). The reservoir is located at a shallow depth, of which size is about 3 km in diameter. The average magnetization of the shallower part of the volcano was estimated as 5 A/m (Harada et al., 2005). On the other hand, the temperature of volcanic fluids released from the bottom of the main crater lake is as low as 100℃ (Zlotnicki et al., 2008). The reservoir is assumed as the aggregate of tensile cracks filled with volanic fluids within host rocks, which is partially but not completely demagnetized (Alanis et al., 2013). This area could be identified as a partially demagnetized block in a strongly magnetized volcano edifice by magnetometry. The average magnetization of the block can be an important information on the temperature. The formula for the magnetic fields produced by a triaxial ellipsoid is the basis for the present study (Clark, et al., 1986). We have a number of TMF measurements, which can be used to identify it as a demagnetized body having an ellipsoidal shape. The data sources are magnetic surveys on Volcano Island of Taal volcano conducted in 2005, repeat precise measurements at 28 repeat survey points and continuous magnetometer stations and those to be newly obtained by areal surveys in March this year. First, an approximate position of the center of a spherical source (dipole approximation) and its source depth as well as the magnetic moment is sought by a standard technique of grid search. The terrain correction should be necessary, which will be done using DEM data. The best-fit model for a triaxial ellipsoid will be determined with the aid of genetic algorithm (GA), which has been applied to volcanomagnetic models (Currenti, et al., 2005; Sasai, 2013).

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