

## Hydrothermal reservoir beneath Taal Volcano (Philippines): Implications to volcanic activity

# Paul Alanis[1]; Yusuke Yamaya[2]; Akihiro Takeuchi[3]; Juan Jr Cordon[1]; Maria Bornas[1]; Jesus Puertollano[1]; Christian Clarito[1]; Takeshi Hashimoto[4]; Toru Mogi[5]; Yoichi Sasai[3]; Toshiyasu Nagao[3]

[1] PHIVOLCS; [2] ERI, Univ. Tokyo; [3] EPRC, IORD, Tokai Univ.; [4] ISV, Hokkaido Univ.; [5] ISV, Hokkaido Univ.

[www.phivolcs.dost.gov.ph](http://www.phivolcs.dost.gov.ph)

Taal Volcano is one of the most active volcanoes in the Philippines. The first recorded eruption was in 1573. Since then it has erupted 33 times resulting in thousands of casualties and large damages to property. In 1995, it was declared as one of the 15 Decade Volcanoes. Beginning in the early 1990s it has experienced several phases of abnormal activity, including seismic swarms, episodes of ground deformation, ground fissuring and hydrothermal activities, which continues up to the present. However, it has been noted that past historical eruptions of Taal Volcano may be divided into 2 distinct cycles, depending on the location of the eruption center, either at Main Crater or at the flanks. Between 1572-1645, eruptions occurred at the Main Crater, while in 1707 to 1731, they occurred at the flanks. In 1749, eruptions moved back to the Main Crater until 1911. During the 1965 and until the end of the 1977 eruptions, eruptive activity once again shifted to the flanks.

As part of the PHIVOLCS-JICA-SATREPS Project magnetotelluric and audio-magnetotelluric surveys were conducted on Volcano Island in March 2011 and March 2012. Two-dimensional (2-D) inversion modeling reveals a prominent and large zone of relatively high resistivity between 1 to 4 kilometers beneath the volcano almost directly beneath the Main Crater, surrounded by zones of relatively low resistivity. This anomalous zone of high resistivity is hypothesized to be a large hydrothermal reservoir filled with volcanic fluids. According to a 3-D forward modeling, the size of the reservoir is as large as 3 km in diameter and its location between 1 to 4 km at depth. The presence of this large hydrothermal reservoir could be related to past activities of Taal Volcano. During the cycle of Main Crater eruptions, this hydrothermal reservoir is depleted, while during a cycle of flank eruptions this reservoir is replenished with hydrothermal fluids. In particular, the 1911 January 30 eruption showed an anomalous feature similar to a gas explosion.