Global electrical conductivity model of Miyake-jima: insights into its hydrothermal and magmatic system

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Measuring the electrical conductivity of rocks is an efficient tool used to investigate volcanoes at depth. Broadband Magnetotellurics is the only technique capable of retrieving electrical conductivity structures from shallow to great depth. Hence, it is a central method in the characterization of volcanic edifices at a global scale.

Here, we present the electrical conductivity model of the Miyake-jima volcano obtained from 13 broadband magnetotelluric stations deployed in 2012. We reveal a sharp contrast between the resistive vadose-zone and its underlying conductive hydrothermal system. By combining the electrical conductivity model with hypocenters distributions, surface temperature and CO_2 surveys, we highlight the shallow plumbing system of the volcano: deep magmatic fluids rise through a narrow path, interact with the hydrothermal system before being finally released in the main fumarolic area inside the caldera.

Keywords: Hydrothermal system, Magnetotellurics, Miyake-jima, Electrical conductivity, Volcano

