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Three dimensional resistivity structure of Kirishima volcanoes inferred from anomalous magnetotelluric data

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Broad-band magnetotelluric (MT) measurements were conducted on 2010?2011 around Shinmoe-dake volcano in the Kirishima volcanic group, Japan, where sub-Plinian eruptions took place three times on 26?27 January 2011. Combining with the previous MT data, it is found that the anomalous phase in excess of 90 degree is commonly observed at the northern part of the Kirishima volcanic group. Because the anomalous phase is not explained by 1-D or 2-D structure with isotropic resistivity blocks, 3-D inversions were conducted. By applying the small error bars on anomalous phase, we successfully estimated a 3-D resistivity structure that explains not only the usual data but also the anomalous phase data. The final model shows a eastward inclined and clockwise twisted pillar-like conductor that connects a deep-seated conductive body (at a depth greater than 10 km) to a shallow conductive layer at the central part of Kirishima volcanoes. By using the geophysical and petrological studies of the 2011 sub-Plinian eruptions, we infer that the pillar-like conductor represent the zone of hydrothermal aqueous fluids over 400 C, in which a magma pathway (interconnected melt) is partly and occasionally formed before magmatic eruptions. To the north of the deep conductor, earthquake swarms occurred on 1968?69, suggesting that these earthquakes were caused by volcanic fluids.