Hydrothermal system around the Iwo-yama fumarolic field in Kuju volcano (Japan) inferred from a 3-D resistivity structure model

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This paper presents an electrical resistivity structure inferred from audio-frequency magnetotelluric (AMT) surveys carried out in the central part of Kuju volcano. Kuju volcano is a composite volcano, consisting of more than 20 lava domes or cones, located in the central part of Kyushu Island, SW Japan. In Oct. 1995, a phreatic explosion occurred after a few hundred years of dormancy with opening of several new vents at the eastern flank of Mt. Hossho, one of the domes of the Kuju complex. The new vents were located about 300m south of an intense fumarolic field called Iwo-yama. After the eruptive activity continued to middle of 1996, a rapid cooling of the volcanic edifice beneath around Iwo-yama was inferred from several geophysical observations. The objective of our AMT surveys is to reveal the shallow electrical structure of the cooling zone relating to the phreatic explosion.

The AMT data were successfully collected at 25 locations around Iwo-yama from 2005 to 2008 and recently interpreted by a 3-D inversion (Usui, 2015). A thin conductive layer less than 100 m thick near the surface and an underlying resistive zone were found beneath Iwo-yama area, which is interpreted as a permeable zone saturated with vapor-rich fluids. The center of cooling zone inferred is located around the lower part of this less conductive zone, where the accumulation of groundwater and the vaporization of hydrothermal fluids are supposed to occur.

Keywords: Resistivity structure, Hydorthermal system, Phreatic eruption

