

Magnetotelluric images of Kusatsu-Shirane volcano, revisited by 3-D modeling with tetrahedral elements considered topography effect

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Mount Kusatsu-Shirane, Japan, is an active volcano with temporary phreatic eruptions. The distribution of subsurface conductor was previously inferred with 2-D inversion of magnetotelluric data which considered the topography effect. We combine the magnetotelluric data from 94 stations which were investigated in 2001-2002 and 8 stations which were investigated in 2017-2018 for inverse modeling. The stations were located on the volcano, mostly around Yugama crater. We selected the data by 15 frequencies for the 3-D inverse modeling. The model was calculated by FEMTIC (Usui, 2015; Usui et al., 2017), considering the topographic effect.

The final model presents two major electric conductive structures. A 0.5-3 ohm-m conductive structure with 500-1000 meters thickness is located at 300 meters depth, beneath Yugama crater and extend to the east slope of Kusatsu-Shirane volcano until Sesshogahara fumarole field. Another conductor at the west of Yugama crater has 600-1000 meters thickness at 1500-2000 meters depth.

Comparing the final model with microseismic data, most of the hypocenters are under a low conductive (<2 ohm-m) structure beneath Yugama crater. This conductive structure infers a hydrothermal deposit of volcano, which cut-off the seismicity as a cap rock. At the north of Mizugama crater, a high resistivity structure at the edge of conductor infers the path of fumarole. The deep conductor between Kusatsu-Shirane volcano and Manza geothermal field infers the geothermal source of Kusatsu-Shirane volcano system.

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