

Electromagnetic images of Kusatsu-Shirane Volcano with emphasis on the hydrothermal system under Mizugama crater

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Kusatsu-Shirane is one of the active Quaternary volcanoes in NE-Japan arc. Since 1805, there were 17 phreatic eruptions and they created many crater pits on the summit area. The volcano activity and the geothermal system have been investigated mainly by geochemistry. The spatial extent of the geothermal system have remained unknown.

In 2003 and 2004, we carried out audio-magnetotelluric measurements to image geothermal system by resistivity. We had (i) a 15km long regional profile, running across the summit area, and (ii) detailed mappings around the summit crater lake.

From the regional profiling, we found the followings from the two-dimensional inversion. Two conductive zones (less than 3ohmm) are found to the east and to the west of the summit crater lake (Yugama). The eastern one is located at 200-500m depth from the surface and shows sub-vertical structures near the geothermal manifestations. The western one is located at deeper level, at 500-1000m from surface. These two conductors are not connected at the summit, where resistivity is significantly higher. These two conductors imply clay alteration zones, which seal the volcanic fluid underneath. The summit resistive gap coincides with high seismicity zone and an equivalent point source of volcano contraction(Murakami et al., 2004).

Detailed mapping around the summit detected a conductive anomaly under Mizugama crater. It is clearly seen by the induction vectors at around 10Hz. This also coincides with the gravity low anomaly. The area also coincides with the demagnetization zone in 1990-1992 and source location of N-type earthquakes. We propose a model where conductive and impermeable clay caps the geothermal system and also supply horizontal crack path for the fluid to generate N-type earthquake.