

## 活動的火山のイメージングとモニタリング：草津白根火山への適用の提案

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### Electromagnetic Imaging and Monitoring of Active Volcanoes: Proposal for Kusatsu-Shirane Volcano

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Diagnostic understanding of active volcanoes is one of the targets of strong social demands, as indicated by the recent phreatic eruption of Ontake volcano on 27 September 2014 and also by many other volcanic activities in Japanese Islands. Kusatsu-Shirane Volcano, in particular, is the most important target for the volcanologists at Tokyo Institute of Technology.

In the last decade, we have had successfully imaged the edifice of the volcano in three dimensions with 200m horizontal resolutions to a depth of 2km by measuring impedances using natural electromagnetic fields in the frequency range between 0.1Hz and 10kHz (Nurhasan 2006). We have found that the peak of the volcano has a bell-shaped electrical conductor, consisting of clay minerals (smectite), which works as an impermeable cap to trap underlying vapor and fluids. The micro-seismic hypocenters of the volcano are consistently located under the bell-shape conductor. The pressure source location for the recent expansion of the volcanic edifice since March 2014, is also located inside the bell-shaped conductor. We think that the increase in the resistivity under the clay cap and the breakdown of the bell-shaped cap itself will lead to a phreatic eruption.

The continuous imaging of the cap structure by the electromagnetic method will thus be a key to successfully monitor the potential phreatic eruption. We now propose a controlled source electromagnetic imaging and monitoring system, consisting of multiple current loops sources and magnetic impedance (MI) sensor receiver arrays to be installed around the peak of Kusatsu-Shirane volcano. Following the concept of ACROSS (Accurately Controlled Routinely Operated Signal System) (Ogawa and Kumazawa 1996), transmitting signals consist of frequency combs and receiving the signal by a large number of stacking will enable detections of small magnetic signals and their temporal changes originating from the deep geothermal system prior to future phreatic eruptions.

#### References:

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