

Towards Imaging of the Volcanic Hydrothermal System by Integrated Monitoring of Electromagnetic and Seismic ACROSS

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In order to image and monitor the changes of electromagnetic and seismic structures of the hydrothermal systems in and around the volcanic edifice are one of the most indispensable information for understanding the volcanic activity. Furthermore, the understanding of eruption processes obviously require both changes in elasto-dynamic and electromagnetic properties of the material, fluid movement structures and physical state of the environments in and near the volcanic edifice. For example, the effects of fluid movements in the volcanic area would show very complex behavior due to the changes of fluid phases itself and affect on electromagnetic field.

Among the active volcanoes in the world, Kusatsu-Shirane volcano will be one of the best location for the developmental experiments of the active monitoring instrumentations and the supporting analyses. For example, one of the targets of peculiar phenomena at the Kusatsu-Shirane volcano will be occurrence of the temporal variation of resonance frequency of long-period seismic events associated with a seismically active period between 1989 and 1993 (Kumagai et al, 2002; Nakano & Kumagai, 2005). They proposed a physical model, i.e. a crack filled with hydrothermal fluids and temporal change of the resonance frequency due to the changes of steam-liquid ratio. Such a phenomenon should be associated with the changes of nearby electromagnetic field, so that fluid movements or geothermal structure could also change.

Integrated Monitoring of Electromagnetic and Seismic ACROSS would provide more detailed information for such phenomena when a dense electromagnetic and seismic observation network. It obviously needs to develop more stable observation system, such as utilization of MI sensor magnetometers and loop-antenna for signal generation especially in electromagnetic ACROSS.

Keywords: volcanic hydrothermal system, Integrated ACROSS, dense observation network, continuous monitoring, structure sensitive material