

Hypocenter relocation of microearthquakes of Kusatsu-Shirane volcano

KUWAHARA, Tomoyoshi^{1*} ; TERADA, Akihiko¹ ; KANDA, Wataru¹ ; OGAWA, Yasuo¹

¹Tokyo Institute of Technology

Kusatsu-Shirane volcano is one of the most active volcano in terms of persistent release of volatiles. Mt. Shirane is a pyroclastic cone which contains a hot crater lake, called Yugama, with a diameter of 300 m. In addition to Yugama crater lake, vigorous fumaroles occur on the northern slope of Shirane pyroclastic cone that was formed by phreatic eruptions 70 years ago.

Earthquake swarms have been enhanced since March 2014 around the hot crater lake. The seismic activity was followed by an inflation at shallow depth beneath hot crater lake, changes in geomagnetic field and chemical compositions of volcanic gas emitted around crater lake. These unusual activities are thought to be caused by migration of hydrothermal hot water at shallow part beneath crater lake. To discuss where the hydrothermal water is supplied from, precise hypocenter gives valuable clue.

The objectives of this study are to reveal a shallow P-wave velocity structure of summit area of Kusatsu-Shirane volcano and to determine values of delay in travel time. Volcanic Fluid Research Center, Tokyo Institute of Technology deploys six seismic stations including three bore-hole types within 1km distance from Yugama crater lake. We pick arrival times of P and S-wave manually from 48 earthquakes of fine S/N signals.

Averaged residuals of P-wave travel times give optimal seismic structure showing slightly larger values than that of previous study (Mori et al., 2006). Travel times are systematically delayed at seismic stations which located on ground surface, corresponding to an existence of soft pyroclastic materials produced by recent phreatic eruptions.

Hypocenters are relocated using the optimal velocity structure with station corrections obtained in this study. Relocated hypocenters are significantly concentrated on the southern part of Yugama crater lake that is far from the fumarole area. Microearthquakes rarely occur near the pressure source, suggesting the inflation is caused by ductile deformation.

Acknowledgement: We are grateful to Dr. Shin'ya Onizawa, Dr. Tomoki Tsutsui and Mr. Rintaro Miyamachi for the field work. We also thank to Mr. Shin'ichiro Matsuda who helped us to pick arrival times.

Keywords: Kusatsu-Shirane Volcano, structure of seismic velocity, microearthquakes