

Temporary seismic observation at Kusatsu-Shirane volcano, Japan

*Mare Yamamoto¹, Hiroshi Aoyama², Tomoki Tsutsui³, Akihiko Terada⁴, Wataru Kanda⁴, Yasuo Ogawa⁴

1. Research Center for Prediction of Earthquakes and Volcanic Eruptions, Graduate School of Science, Tohoku University, 2. Institute of Seismology and Volcanology, Hokkaido University, 3. Graduate School of International Resource Sciences, Akita University, 4. Volcanic Fluid Research Center, Tokyo Institute of Technology

Kusatsu-Shirane volcano is located near the border of Gunma and Nagano prefectures, and its central part consists of the Shirane pyroclastic cone group (northern part) and the Motoshirane pyroclastic cone group (southern part). All of the historical eruptions have been took place at the Shirane pyroclastic cones, especially around the crater lake named Yugama, and the phreatic eruption on 23 January 2018 was the first eruption that occurred at the Motoshirane pyroclastic cone group since the beginning of recorded history. For this reason, the permanent seismic stations at Kusatsu-Shirane volcano were located mainly around Yugama, and few permanent seismic stations exist in the southern part of Kusatsu-Shirane volcano, although some recent researches suggest the existence of pressure source around the northern part of the Motoshirane pyroclastic cones. In this presentation, we report a summary of a temporary seismic observation which we started just after the occurrence of 23 January eruption, and discuss about the spatio-temporal characteristics of seismic activities at the volcano.

In the temporary seismic observation, to improve azimuthal coverage of the observation network, we deployed three stations mainly in the southern part of Kusatsu-Shirane volcano. We installed a Nanometrics Trillium Compact miniature broadband seismometer (eigen period of 120 s) at each station, and record the data at a sampling rate of 100 Hz using Keisokugiken HKS-9700 data logger which equipped with a telemetry module. The observed data at each station are also sent to a single-board computer Raspberry Pi and are continuously transmitted to Tohoku University through VPN connection on a mobile phone network. Then, the data are transmitted to the Volcanic Fluid Research Center, Tokyo Institute of Technology in Kusatsu, and the data of the temporary stations, together with those of the permanent stations, are processed and stored in the processing system at the research center. The data of the temporary stations are also transmitted to JMA in a real-time, and used for the monitoring of the volcanic activities.

The data of the temporary observation enables us to study the volcano seismic activities around Kusatsu-Shirane volcano in more detail. In contrast to the relatively low seismicity before the eruption on 23 January 2018 which is characterized with small number of A-type earthquakes, our data shows much intense seismicity and wide variety of volcanic earthquakes including B-type and Hybrid-type events. As previously pointed out by Mori et al. (2006), the epicenters of these earthquakes are concentrated in two regions: one is around Yugama and the other is the northern part of Motoshirane. In addition to the events with clear onset and good S/N ratio, we also detected a lot of small earthquakes in observed data. Further analysis using correlation-based methods like the Matched Filter method may reveal the detail of seismic activities around the Kusatsu-Shirane volcano, and provide a key to understand the volcanic activities beneath Motoshirane pyroclastic cones.

Keywords: Phreatic eruption, Kusatsu-Shirane volcano, Eruption on 23 January 2018