

Volcanic tremor recorded on two seismic arrays at Kirishima volcano, Japan

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The Kirishima volcano complex is a group of more than 20 volcanoes in southern Kyushu Island, Japan. The 2011 eruption of Shinmoedake, one of them, was preceded by phreatic events on August 22, 2008 and continued until September 7, 2011. After that we found no remarkable volcanic activity at the volcano. Recently, however, it is observed that fumarolic gas is rising at Ioyama and crustal deformation studies point out ground uplift around the area. Because volcanic earthquakes and tremors also occurred, it is necessary to pay attention to change on the activity. Volcanic tremors are considered to be oscillations that occur in the magma supply system. Therefore, it is important to investigate location of their source and characteristics for understanding the conditions and processes of volcanic activity. We carried out two seismic array observations at Kirishima volcano to reveal source location of volcanic tremor.

It is difficult to locate tremor sources by conventional methods using travel times because we cannot pick the arrival time correctly. One useful method of estimating the source locations is array analysis, which uses data from a dense seismic network in small area. Generally, a seismic array can decompose waves approaching from many directions and determine the slowness of each wave. Although location of the source cannot be uniquely determined by only one seismic array, multiple array enable us to estimate the source location. We deployed two seismic array on August 30, 2014. One consisted of 7 seismometers located near Ohata pond 5 km away from Shinmoedake crater, and the other consisted 7 seismometers located at Shinyu hot springs 3km away from the crater. They were installed with a sensor interval of 200-350 m, and signals from the seismometers were recorded by a data logger with 250 Hz sampling frequency. We use the combination of two array to determine the tremor sources. Moreover, we can also detect temporal change by array analysis.

From August 30, 2014 to October 5, 2015, two volcanic tremor were recorded at our site. We analyzed the tremor which occurred on July 26 at 9:23, 2015 and its duration was about 150 seconds. Peak frequency of the tremor was about 2-3 Hz. As the result of semblance analysis with 2-4 Hz band-pass filter, we found that the tremor was radiated from WSW direction to Ohata array and from north direction to Shinyu array, corresponding to Ioyama area.

Keywords: Kirishima volcano, volcanic tremor, seismic array