Magma/gas intrusion process of Shinmoedake Eruption in 2017 suggested by volcanic tremors location with ASL method

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Kirishima volcanoes, which located on border Miyazaki and Kagoshima prefecture in Kyushu, is still active after the large scale eruption in 2011. In this study, by using volcanic tremor/events distribution, we would like to discuss magma/gas intrusion process around magma chamber.

Recentlly, source location of volcanic tremors is usually determined by ASL (Amplitude Source Location) method (*c.f.* Nakamichi *et.al.*, 2017). ASL method is based on the idea that seismic (S) waves at higher frequency range (> 5 Hz) will propagate isotropically, an its amplitude will be simply attenuate with distance. If we can use dense seismic observation records around volcano, we can calculate the volcanic tremor location in automatically every time window. Thus, using with ASL we can easily discuss volcanic tremor/events distribution and its time variation.

According to Kirishima volcanoes activities reported by JMA (Oct, 2017), numbers of volcanic earthquakes/tremors located at southwestward of the Shinmoedake have been rapidly increased from Oct. 2017, and erupsed on 11th until 16th. Therefore, In this study we analyzed three stages, **(1)** stable condition on 9th, **(2)** earthquake/tremor activation on 10th, and **(3)** continuous eruption on 16th.

In this study, we choiced and used 10 stations, which were operated by JMA, NIED and ERI, established around Shinmoedake. For analysis, we assumed V_S = 2.2 km/s, Q_f = 175 @10Hz for volcanic events, and Q_f = 300 for volcanic tremors beneath Shinmoedake and used 5 - 10 Hz band-passed envelope amplitude for ASL. Thus, we obtained three stages time-spatial volcanic tremor/events distribution.

According to Volcanic tremor/events distribution, these were located at southward of magma source at ~ 4 km depth estimated with GPS observations (Nakao et al., 2013); stage (1). After 18 o'clock, volcanic tremor/events were activated with numbers and magnitudes around magma source, and these location were move to shallower until -1 km; stage (2). Small magnitude and shallower tremors occurred continuously at Oct. 10th.
On 16th, tremor activity became in quiet, and just only located around southward of magma source; stage (3).

These results imply that magma/gas intrusion was occurred at stage (2), might have been occurred after magma vaporization in chamber. And we can considered that at stage(2), magma vent was already constructed, magma/gas was continuously supplyed from chamber at stage (3).

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