Long period pulse preceding the explosive eruption of Aso volcano, October, 2016

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At 01:40, October 8, 2016, an explosive eruption occurred at the Nakadake first crater of Aso volcano. Type of the eruption is regarded as phreatomagmatic eruption because glassy particles are included in the ejecta (JMA,2016). Two long period pulses(LPP) were observed 6 minutes and 2 minutes before the eruption, which we called LPP1, LPP2, respectively.
In this work, we analyzed the broadband seismograms in order to unveil the source mechanism of the LPPs since it is thought that the mechanism contains the information of the preparatory process of the explosive eruption.
We used the broadband seismic data at 8 stations around the Nakadake first crater. The distances from the crater to each station are 0.3~2.3km.
Based on the particle motions at each station, we estimated the source location of LPPs by waveform semblance method (Kawakatsu et al. 2000). It was estimated that the source of LPP1 is located at 270m south-west of the crater (32.88237N, 131.08416E), 0m above sea level, and the source of LPP2 is located at 300m south-southwest of the crater (32.88237N, 131.08416E), 120m above sea level. They are about 100m apart from the LPP source location estimated in Kawakatsu et al.(2000). In addition, compared with the location of the crack-like conduit under the crater(Yamamoto et al. 1999), LPP sources are in or close to the crack. Moreover, we calculated RMS amplitude of 10~30s band-pass filtered vertical seismogram. As a result, the amplitude distribution is very similar to long period tremor(LPT) that was observed in Yamamoto et al.(1999). Thus, it is inferred that same conduit behavior, a resonance of the crack-like conduit, can be a source model of LPP. Furthermore, our result shows that the source moved upward between two events, however, it is under investigation whether this move is significant or not.
Then, we calculated Fourier spectrum of LPPs with time width of 150 seconds. Spectrum peaks of LPP1 are 12~20s(unclear), 7.5s, 5s, and those of LPP2 are 17s, 10s, 6s. Period of LPP2 is longer than LPP1. It is thought that LPP period depends on the conduit length, or sound velocity of the fluid in the conduit because LPP is interpreted as resonance of the conduit(Kawakatsu et al. 2000). Thus, the conduit condition likely changed between two events, which occurred within 4 minutes just 2 minutes before the explosion.

Keywords: Aso volcano, explosive eruption, long period pulse

