

Long period pulses preceding the explosive eruption of Aso Volcano in October, 2016 part2

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At 01:46 on October 8, 2016, an explosive eruption occurred at the Nakadake first crater of Aso Volcano. The type is considered as a phreatomagmatic eruption(JMA,2016).

Two seismic pulses called long period pulses(LPPs) were observed 6 and 2 minutes before the eruption, which we hereinafter call LPP1 and LPP2, respectively.

In this work, by mainly analyzing the broadband seismograms, we examined the source mechanism of the LPPs, which can provide information on the preparatory process of the explosive eruption.

We used broadband seismic data at eight stations around the Nakadake first crater. The distances from the crater range between 0.3 and 2.3km. We also used tilt data at a station.

By using the particle motions recorded at the seismic stations, we estimated the sources of the two LPPs to be located about 100m from the LPP source determined by Kawakatsu et al. (2000). Within the error ranges, the source regions are considered to be the same. Compared with the location of the crack-like conduit beneath the crater (Yamamoto et al.,1999), the LPP sources are located in or close to the crack.

In the Fourier spectra from the two LPPs, we observed some peaks corresponding to the crack resonance.

The spatial variation in observed LPP amplitude is very similar to that of long period tremor(LPT) which was shown by Yamamoto et al. (1999). Thus, a resonance of the crack-like conduit is likely to cause the LPPs in a similar manner to LPT. Moreover, Legrand et al. (2000) showed that the moment tensors of LPT and LPPs are similar.

At the times of LPP1 and LPP2, static tilt changes were also observed at Hondo, which is located 800m southwest of the crater). The changes associated with LPP1 and LPP2 were $0.012 \mu\text{rad}$ upward to the $N15^\circ\text{W}$ direction and $0.026 \mu\text{rad}$ upward to $N49^\circ\text{W}$ direction, respectively. The directions are not toward the crater. The tilt changes can not be explained solely by a spherical pressure source beneath the crater. For an open crack of Yamamoto et al. (1999) beneath the crater, the displacements calculated on the formulation of Okada et al. (1992), indicate that the tilt at Hondo is to the $W10^\circ\text{S}$ direction, which does not agree with the observations. However, we found that the observations appear to be explained by summing the tilt changes predicted from the open crack and spherical source. Both may have occurred.

Keywords: Aso volcano, phreatic eruption, long period pulse