Initial Phase of Vulcanian Eruptions at the Showa Crater, Sakurajima Volcano, Japan: Insight from Visual Movies and Infrasound Data

*Dan Muramatsu¹, Koki Aizawa², Akihiko Yokoo³, Masato Iguchi⁴, Takeshi Tameguri⁴

1. DEPS, GSS, Kyushu Univ., 2. SEVO, Kyushu Univ., 3. AVL, Kyoto Univ., 4. DPRI, Kyoto Univ.

To investigate mechanism of Vulcanian eruptions, we analyzed infrasound data and eruption movies (30 frames/s) of the Showa crater, Sakurajima volcano, Japan. 153 eruptions during December 2011 to August 2015, which accompanied variable infrasound waves and visible ash clouds, were selected for an analysis. In this study, we focus on the infrasound initial compression phase (i.e., initial pulse). First, we estimated volume flow rate (dV/dt) of the initial compression phase using the simple acoustic source model (Lighthill, 1978; Johnson and Miller, 2014). Furthermore, based on the relation dV/dt and ejection velocity u from the eruption movie; $dV/dt = \pi R^2 u$, the vent radius (R) was calculated on each eruption. The estimated vent radius R shows the time change, which may be an indicator reflecting the activity of the Showa crater. Second, we investigated variations of duration (τ_+) and its relationship to peak amplitude (Δp) of the infrasound initial compression phase. Enigmatically, τ_+ shows bimodal distributions. The relationship between τ_+ and Δp shows characteristic distributions and it may be explained by rupture of the pressure source under the crater bottom (e.g., gas chamber).

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Keywords: Vulcanian Eruptions, Infrasound, Sakurajima Volcano