

Feasibility study of immediate eruption scale estimation by using image analysis

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In order to reduce volcanic disaster, it is necessary to detect eruptions, and it is important to monitor and/or forecast eruption style, eruption scale and volcanic ejecta in real time.

Eruption series of the 2011 Shinmoedake was the volcanic activity with huge quantity of ejecta, including sub-plinian eruption. By using various data observed in this eruption, we made a start on researching feasibility of estimating the eruption scale.

We investigate the eruptive velocity of volcanic plume by applying particle image velocimetry (Takimoto et al., 2011) to video images of the 2011 Shinmoedake eruption taken by monitoring camera of JMA. The eruption on March 13 is analyzed by reason that the analysis condition is good because of the calm wind. By the PIV analysis, the kinetic energy of ejecta of eruption was estimated for 30 minutes when the eruption continued. The time variation of the kinetic energy is highly correlate with the time variation of the squared amplitude of the infrasonic signal of the eruption.

The apparent total amount of ejecta evaluated by the PIV analysis is 70 million cubic meters. This apparent total amount includes the amount of volcanic gas and entrained air besides ejecta. By the field survey (ERI, 2011), the total amount of the ashfall was estimated to 1 million tons. This is equivalent to 0.5 - 1 million cubic meters. In other words, the apparent total amount of ejecta calculated by the PIV analysis is equivalent to 700 - 1400 times the total amount of ashfall surveyed at this eruption case.

The time variation of the kinetic energy is highly correlate with the time variation of the squared amplitude of the infrasonic signal of the eruption. Based on the above results, if the relationships between the kinetic energy and infrasonic signal would be able to determined, we can monitor eruptive rate of ejecta by infrasound monitoring.

Keywords: eruption scale, Shinmoedake, PIV analysis, infrasound