The Image Analysis of Eruption Column of Miyake-jima Volcano and the Estimate of the Composition and Temperature of Emitted gas

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Miyake-jima volcano has continuously ejected volcanic gas since September 2000, and the height of the eruption column has fluctuated. The daily mean height of the eruption column was as height as 3000 to 4000 m a.s.l. with the minor wind on September to October 2000, but only 2000 to 2500 m a.s.l. after November 2000. The height reached 3000 to 4000 m a.s.l. on July 2001 and 2000 to 2500 m a.s.l. after October 2001. Furthermore, the height of eruption column usually increases at 10-14 hour. It is expected that these fluctuations may respond to probable variation of the degassing efficiency on the magma, mixing with underground water and various atmospheric conditions.

To estimate the energy and vapor flux of the eruption column, we analyze continuous images of eruption column automatically obtained at Mikura-sima and the data of upper-air conditions provided by JMA. From these images, we determined the final height and the initial width and ascending velocity of the eruption column. The width and velocity were within the accuracy of 15 - 20 m, and 1.5 - 2.0 km/s respectively. To avoid the effect of horizontal wind, we use the images at the condition of weak horizontal wind. The mean diameter of the eruption column is 400m and the mean ascending velocity at is 6 m/s at the height of 700 - 900m a.s.l. Concerning upper-air observations made by JMA, we use the data of temperature, pressure and humidity obtained above the Hachijo-jima meteorological station that is located at the distance of 110km SSE from Miyake-jima. The measurement of the upper-air condition is made at about twenty points under 4000m a.s.l. .

The motion of the ascending gas was analyzed based on the model of a spherical thermal including the effect of latent heat of water condensation. In this analysis we assume that the eruption column consists of vapor and other volcanic gas and entrained ambient air, and that the phase equilibrium is achieved among vapor and water, condensed water in the eruption column. Furthermore we estimate the density of eruption column at a height in the method of Scorer(1957).

According to this analysis, the estimated flux of energy is the same order of magnitude as the values obtained from methods after Morton et al. (1956) and Kagiyama(1980). The amount of released vapor differs significantly from the values estimated from the gas composition in magma (Saito et al., 2001).