

A study of the volcanic clouds based on the video records

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[Introduction]

In recent years, we can easily apply a video camera system to the observation of volcanoes with low cost. Using such systems, many images of volcanic eruptions have been obtained. However, only a few quantitative analyses were applied. Here we present the method for observation of volcanic clouds and show some quantitative results obtained for Miyakejima, Usu, Tarumae and Asama volcanoes, Japan.

[Observation]

Using commercial Windows PCs and digital cameras, we have developed an automatic image recording system. The system is flexibility, inexpensive, small and lightweight and so has mobility (Terada et al., 2003). This system automatically records camera images in a digital form and transfer them to a remote server through telephone line. This system can be promptly applied to the observation and monitoring of volcanic clouds even under the severe condition. Using this system, we have recorded images of the volcanic clouds of Miyakejima and Asama volcano every 3-10 seconds at JPEG format.

[A study of kinematics of a volcanic cloud]

Quantitative kinematic analyses of volcanic clouds based on our video records show that in most cases the motion of isolated volcanic clouds is consistent with that of a thermal, which is well established from the preliminary results obtained in dimensional, theoretical and experimental studies. This result may be applied to estimating ejecting mass, water and initial temperature of particles, and make clear the detailed ascent process of volcanic clouds.

We also show a series of photographs of the vortex ring, which were obtained accidentally from the eruption of Usu volcano 2000. Because the vortex rings on volcanoes appear rarely and transiently, these photos are very interesting for inhabitants and also volcanologist.

[Optics on volcano]

Since the CCD sensor can detect the near-infrared ray, thermal radiation of less than temperature of several hundred degree could be detected by digital video cameras. Saito et al. (2005) evaluated the temperature of hot vent rocks at Aso volcano using the video camera of SONY HANDY CAM.

Soon after the Tokachi-Oki earthquake in 2003(M8.0), we detected weak glow witnessed by the high-sensitive camera in the nighttime at Tarumae volcano, Japan. Since the high-sensitive cameras can also detect thermal radiation, and the ash ejection of about 24m³ was found around the glow vent, we interpreted that the observed glow would be evidence for high-temperature of rock surface due to the formation of the new vent (Terada et al. 2004).