CoV5
13-P-08

22 November 2007

Measures Taken by Local Officials against Sulfur Dioxide Emissions from Miyakejima Volcano

Yasuhiro Ishimine (ishimine@bosai.go.jp)
National Research Institute for Earth Science and Disaster Prevention,
With the information provided by Miyake Village Office

1. Outline

This poster presents the measures taken by the local officials in Miyakejima Island to protect the general public against the toxic sulfur dioxide (SO_2) emitted from Miyakejima Volcano. All the information is provided by the Miyake Village Office.

Miyakejima is a volcanic island with a diameter of approx. 8 km located 180 km south of Tokyo (Fig. 1). Miyakejima Volcano erupted in 2000, and since then, it has continued emitting volcanic gases including SO_2 from the summit caldera (Fig. 2). It forced all the 3800 residents to keep evacuating from the island from September 2000 to February 2005. Even now high concentration SO_2 is often measured in the island, making it difficult for the residents to live safely without any restrictions. Miyake Village Office and several relevant agencies adopt various measures to allow the residents to live in the island. The measures include:

1. To observe SO_2 concentration.
2. To issue alerts when SO_2 concentration exceeds exposure limits.
3. To prepare evacuation facilities and provide information for evacuation when alerts are issued.
4. To install desulfurization equipments in evacuation facilities and advise residents to always carry gas masks with them.
5. To implement access restrictions to high-risk areas.
6. To provide residents with information of the risk of SO_2 emissions and countermeasures by using pamphlets and some other media (e.g. Internet).

Although the volcanic gas greatly damaged vegetation (Fig. 3) and corroded metals used as exterior parts of buildings, no significant health hazard has been reported because the above measures and the SO_2 observation information provided by Miyakejima Weather Station of Japan Meteorology Agency work well.

2. Emission and Concentration of Sulfur Dioxide

Since mid-August of 2000, a large amount of volcanic gas including SO_2 has been emitted from a summit caldera of 1.6 km in diameter, which was formed during Miyakejima 2000 eruptions. Although the total volume of SO_2 was several thousand tons a day in the beginnings, it increased to several tens thousand tons a day in mid-September and reached a peak value of 80,000 tons/day in November (Fig. 4). Then it gradually decreased to 3,000-10,000 tons/day after the fall of 2002, 2,000-5,000 tons/day after the fall of 2004, and 1,000-3,000 tons/day after 2006.

The concentration of SO_2 in residential areas in the island exceeded the exposure limits recommended by Japanese Ministry of Environment (< 0.04ppm one-day average and <0.1ppm one-hour average). In particular, the five-minute average of SO_2 concentration often exceeded 5ppm in the eastern and southwestern areas of the island, which are leeward side of the prevailing winds (Fig.5). The high SO_2 concentration posed potential health hazard and forced the residents to leave from the island for four and a half years. At present, SO_2 concentration seldom reaches 5ppm and many people live in the island, although SO_2 sometimes exceeds 2ppm (Fig. 6).

3. Alert and Access Restriction

The village officials measure SO_2 concentration around the clock at the 14 sites on the island to provide real-time information.The alerts of four levels are issued when the SO_2 concentration exceeds the recommended limits (Table 1). The information is rapidly spread through 44 outdoor loudspeakers, 14 warning lights (Fig. 7), home receivers, and mobile receivers for the people sensitive to SO_2. The village officials advise the residents to take suitable responses, such as to wear a gas mask (Fig. 8) and to evacuate into a facility with a desulfurization equipment (Fig. 9) according to alert levels.

Also, the village officials restrict the access to high-risk areas (Fig. 10). There are a Number of notice boards displaying the restricted areas in the island (Fig. 11).

Reference

Miyake Village Office (2007) Guide for Disaster Prevention in Miyake Village, 32p. (in Japanese).

Nakada, S., Nagai, M., Kaneko, T., Nozawa, A., and Suzuki-Kamata, K. (2005) Chronology and products of the 2000 eruption of Miyakejima Volcano, Japan, Bull. Volcanol., 67, 205-218.

Kazahaya, K., Shinohara, H., Uto, K., Odai, M., Nakahori, Y., Mori, H., Iino, H., Miyashita, M., Hirabayashi, J. (2004) Gigantic SO2 emission from Miyakejima volcano, Japan, caused by caldera collapse, Geology, 32, 425-428.

Table 1. Alert Level and Response

Level	5-min average	Color Code	Response
1	0.2ppm	Blue	Advisory Information for Sensitive Group
2	0.6ppm	Yellow	Warning for Sensitive Group
3	2.0ppm	Green	Advisory Information
4	5.0ppm	Red	Warning

Fig. 1. Map of Miyakejima

Fig. 2. Miyakejima volcano emitting volcanic gas (Photo by Prof. M. Tsukui, 26 September 2000)

Fig. 3. Trees with leaves fallen due to SO_2 gas and a building buried by the deposits of mudflows.

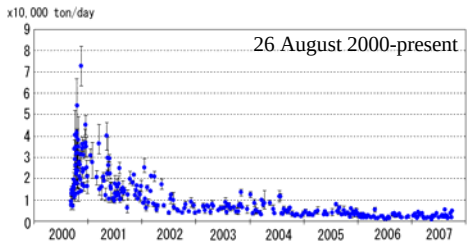

Fig. 4. Time variation of the total volume of SO_2 emissions from Miyakejima Volcano measured by Japan Meteorological Agency.

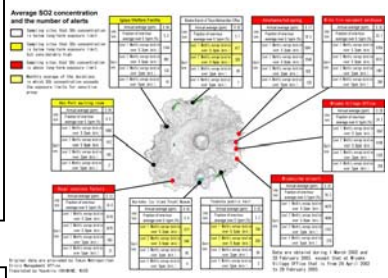

Fig. 5. SO_2 concentration at an early stage (Mar. 2002-Feb. 2003).

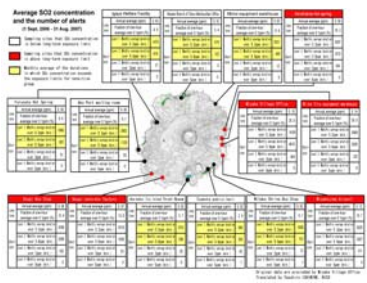

Fig. 6. Recent SO_2 concentration (Sept. 2006-Aug. 2007).

Fig. 7. Warning lights and speakers.

Fig. 8. Gas mask used in Miyakejima

Fig. 9. Desulfurization equipment in a hotel.

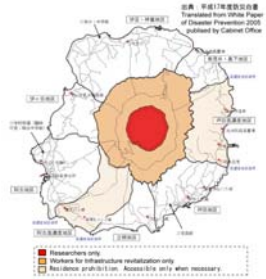

Fig. 10. Distribution of restricted areas

Fig. 11. Notice displaying a restricted area.