

Enhancement of volcanic observation system of JMA near the volcanic crater

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1. Introduction

Based on lessons learnt from the eruption of Ontake Volcano on 27 September 2016, the Coordinating Committee for Prediction of Volcanic Eruptions discussed enhanced monitoring systems for active volcanoes and proposed urgent recommendations on November 2014; a final report from the Committee was also published on 26 March 2015. Responding to these recommendations and report, Japan Meteorological Agency (JMA) decided to install various instruments near volcanic craters and increase the number of observation facilities to continuously monitor more volcanoes. Furthermore, JMA started to develop methods for earlier detection of precursory phenomena of phreatic eruption. In this report, we will show the outline of our efforts to enhance the monitoring systems and some observational results.

2. Enhancement of observation systems near volcanic craters

In general, intensities of preceding activities of phreatic eruptions are weak and appear only in the vicinity of the crater. In order to monitor and detect small precursors, JMA decided to install following instruments near the craters of 48 active volcanoes in Japan: (i) infrared and visible light cameras to monitor thermal activities and change of fumaroles, (ii) broad-band seismometers and tiltmeters to detect low-Frequency seismic signals caused by the movements of volcanic gas or hydrothermal activities. Since such instruments are installed in high places around craters, they are often exposed to severe weather conditions, such as strong winds, heavy snow and lightning. In order to keep stable operations, we took care of the robustness of the systems.

3. Development of methods for earlier detection of precursory signature of phreatic eruptions

Changes of volcanic gas composition and geomagnetic total intensity were often observed prior to past phreatic eruptions. JMA, therefore, decided to observe components of volcanic gas (4 volcanoes) and geomagnetic total intensities (6 volcanoes, including scheduled) near the craters of volcanoes and start to develop methods for earlier detection of precursory signature of phreatic eruptions. Since JMA does not have any experience to conduct continuous volcanic gas observations, we installed instruments with the cooperation of Meteorological Research Institute (MRI) and National Institute of Advanced Industrial Science and Technology (AIST).

4. Examples of observed data

We observed a volcanic tremor accompanied by a long-period seismic signal and small tilt change around Ontake Volcano on 27 September 2016. We also recorded the thermal image at the moment of the eruption of Aso Volcano on 8 October 2016. JMA is going to investigate techniques for accurate evaluation of volcanic activities by using data observed by these newly installed instruments. The observation data will become available for research institutes; it aims to encourage effective data utilizations and extensive developments in volcanological studies. It is expected that such developments will give positive feedback to JMA's volcanic activity evaluation process.

Keywords: phreatic eruption, tiltmeter, broadband seismometer, infrared and visible light cameras

