

Summit observation at Kuchinoerabu-jima island, Japan, by using an unmanned small helicopter

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Kuchinoerabu-jima is a small volcanic island located in southern Kyushu, Japan. On August 3, 2014, a moderate summit eruption occurred for the first time in 34 years. All the observation stations at the summit area were destroyed by the eruption. In order to reconstruct the seismic observation network at the summit area, we newly developed seismometers suitable for the installation at the summit area by using a small unmanned helicopter (UAV). The light-weight (5kg) and solar-powered seismometers were designed exclusively for helicopter installation. They transmit seismic data every 10 minutes by using mobile data communication network. We could install four stations at the summit area in April 2015. We also conducted aero-magnetic survey and temperature measurement using infrared camera. A summit eruption occurred again on May 29, 2015. It was much larger than the previous one and caused entire evacuation of the island. Four seismometers installed by the UAV was destroyed by the eruption but these seismometers could successfully detect the sudden increase and decrease in shallow earthquakes few days before the eruption. In September 2015, four months after the eruption, we installed five seismometers at the summit area again by using the UAV. We also conducted aero-magnetic survey and temperature measurement. Comparison of the April and September observations, all the data, including seismic, aero-magnetic, and infra-red data, showed clear declining trend of the volcanic activity. Other than the helicopter observation data, there were various types of information. All of them, however, were obtained at least 2 km away from the summit area. Helicopter data clearly compensated for the lack of proximal data that are sensitive to the volcanic activity. Together with other information, the information obtained by the UAV observation contributed to reduce the alert level by the authority, and to the return of the island residence.