

Volcanic activity of the Nishinoshima volcano detected by ocean bottom seismometers and remote sensing observations

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In order to detect seismic activity of the Nishinoshima Island volcano which continues to eruptions actively, the network of self-popup-type ocean-bottom seismometers (OBS) was deployed around the island by the Meteorological Research Institute. We report the brief summary of the seismic activity of Nishinoshima with reference to other remote sensing observations.

Five observation devices which have one three-component seismometer and one hydrophone were installed 4 - 5 km far from the center of Nishinoshima Island, and recorded seismic activity from June 12 to October 2, 2015. This observation revealed that micro-earthquake activity around Nishinoshima volcano was so active. Many micro earthquakes were estimated to be M -1 - 0. Duration time of waveform is around 30 seconds, and envelope of waveform is spindle shape without clear P and S phases. Initial part of waveform has high-frequency component. In later part, the low-frequency component is dominant. Hourly number of recorded waveform was 50 - 100 during the period of OBS. The number of waveforms was around 100 in June, 2015. But seismicity began to weaken in August, and then the number reached to 40 per hour in October. Amplitude of waveform has reached a large size gradually.

The gradual decrease trend of seismicity was consistent with variance of brightness temperature monitored by JMA's geostationary meteorological satellite Himawari-8 (JMA, 2016). In addition, though SO₂ flux in volcanic plume was measured to be 900 ton per day in May, 2015 by the Differential Optical Absorption Spectroscopy (DOAS), decreased to 400 ton per day in October, 2015. Moreover, heat flux of plume by optical sensor on the artificial satellite has decreased, and also incoherent area of the volcanic island by satellite SAR has decreased. So the gradual decrease trend of seismicity must have been synchronized to thermal and gas-emission activity in Nishinoshima volcano.

Another OBS network had been deployed around Nishinoshima from June 25 to July 5, 2015 by Japan Coast Guard (JCG). OBS station St5, located 8 km south far from Nishinoshima, detected active seismic swarms of monochromatic earthquakes. These waveforms have steep dominant frequency of 9 -10Hz, and decays slowly. All of waveform oscillations have same direction, and b value, estimated from frequency distribution of seismic scale, was calculated to be 1.3. St5, recorded these waveforms, was located near submarine volcano Nishinoshima-Minami Knoll. Around this area, discolored seawater and/or thermal anomaly were observed until now. Therefore this monochromatic-earthquakes swarm may have been recorded as an original volcanic activity different from Nishinoshima volcano.

Acknowledgment

Keifu Maru, the marine weather observation ship managed by Global Environment and Marine Department, JMA, was used for installation and pickup of OBS.

Keywords: Nishinoshima, ocean bottom seismometer, monochromatic earthquake, remote sensing