

Spectral Nature of earthquakes beneath the summit caldera of Miyakejima volcano

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Since the caldera forming and the large eruptions in 2000, volcanic earthquakes have been frequently occurring beneath the caldera at Miyakejima. We investigated the spectral nature of these earthquakes using seismological data of the Japan Meteorological Agency (JMA) and the National Research Institute for Earth Science and Disaster Prevention (NIED).

JMA and NIED classify the volcanic earthquakes beneath the caldera into three types as followings.

a) High frequency earthquake (A type)

The waveform is composed of high frequency waves (several Hz to more than 10Hz). The phases of P and S waves are rather clear and the mechanism is considered as similar to tectonic earthquake. The activity was very high during caldera forming in 2000 and gradually declined.

b) Intermediate low frequency earthquake (BH type)

The waveform is composed of waves with the frequency between 3 and 6Hz. It has been observed since early 2001 when huge high level degassing is observed and became very vigorous since late 2002. This type of earthquake happens frequently in short periods.

c) Low frequency earthquake (BL type)

The waveform is composed of low frequency waves (2 to 4Hz). It has been observed since late 2000 when huge high level degassing is observed. This type of earthquake sometimes occurs following BH type earthquake swarms. Large magnitude low frequency earthquakes are accompanied by small infrasonic pulses and sometimes by small ash emissions.

The hypocenters are distributed beneath the caldera at the depth of 2-3 km. The magnitudes of the some of them are more than 2.

JMA and NIED independently classify the earthquakes into the three types, however, the classification is inconsistent to each other for some of the events and, especially, the boundary between high frequency and intermediate low frequency earthquakes differs from each other. In order to discuss the volcanic activity from the seismicity, it is desirable to classify the events with some objective method. Considering the ratios of the spectra components of 1-3.5Hz, 3.5-7Hz and 7-20Hz in the waveforms of earthquakes in some periods, we could roughly classify the earthquakes into high frequency, intermediate low frequency earthquakes and low frequency earthquakes. The inconsistency in the classification by JMA and NIED is considered to depend on difference of viewpoints; which part of the waveform to be noteworthy, how clarity of phases to be identified, or whether shape of the waveform envelope is considered or not.

In our presentation, we discuss not only the classification of the volcanic earthquakes but also the correlation between the activities of each volcanic earthquakes and the sequence of the volcanic activity of Miyakejima.