

Analysis of eruption earthquakes accompanied with small explosive eruption at Suwanosejima volcano in November, 2003

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1. Introduction

Suwanosejima is an andesitic volcano (located at 250 km apart from Kagoshima city) and currently repeats eruption from summit crater every few weeks. Suwanosejima volcano has continued active eruption such as Sakurajima volcano and is possible to seismic observation at near the crater. This volcano is one of the most important to clarify mechanics of explosive eruption. In this study, we determined hypocenter of eruption earthquakes accompanied with small explosive eruption observed at near the crater and reported characteristics of waveform of the first motion.

2. Observation

The active crater at the summit of Suwanosejima volcano was surrounded with 4 seismic stations. Broadband seismometers (STS-2) with flat velocity response of 0.02-120 s were installed. Signals from the seismometers were continuously recorded on data loggers (LS-7000XT) with resolution of 24 bit with a sampling rate of 100 Hz. In this study, 8 events with clear first motion out of 47 eruption earthquakes that occurred in November 2, 2003 were analyzed.

3. Hypocenter determination and characteristics of waveform of eruption earthquakes

The first motion of eruption earthquake is dilatational (down and toward the crater in the vertical and radial components, respectively). Compressional wave dominated by the vertical component in the first dilatational motion appears 0.2-0.3 s after the arrival of the first motion. The characteristics are seen at all stations. Particle motion of the first dilatational motion is linearized in the direction to the crater. The compressional motion comes from beneath the station. Hypocenters of sources of the dilatational and compressional motions were determined from arrival times of each motion at 4 stations, assuming a homogeneous half-space with $V_p=2.1\text{km/s}$. The hypocenters of the dilatational and compressional motions were located at depths from 200 to 500 m around the summit crater and located at depths from 400 to 600 m beneath the summit crater, respectively.

From hypocenter determination and characteristics of waveform of eruption earthquakes, it is inferred that the first dilatational and compressional motions are excited by contraction source at shallow part beneath the crater and expansion source at a little deeper part than contraction source beneath the crater, respectively.