

Hypocenter and source mechanism of initial part of eruption earthquakes at Suwanosejima volcano

Takeshi Tameguri[1]; Masato Iguchi[2]; Hiroshi Yakiwara[3]

[1] SVRC,DPRI,Kyoto Univ.; [2] SVO; [3] Nansei-toko Obs. for Earthquakes and Volcanoes,Kagoshima Univ

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. In this study, we reported characteristics of waveform of eruption earthquakes accompanied with small explosive eruption and determined hypocenter and source mechanism of the initial part of waveform.

2. Observation

The active summit crater at 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. characteristics of waveform of eruption earthquakes and hypocenter determination

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.

4. Source mechanism

Moment tensor of seismic sources generating the first dilatational and compressional motions are estimated by waveform inversion analysis. We included near-field term for calculation of synthetic waveform.

Three diagonal components of the estimated moment tensor of the first dilatational motion was negative and had similar value. Moment tensor of the compressional motion was dominated by positive vertical dipole.

From hypocenter determination and source mechanism of eruption earthquakes, it is inferred that the first dilatational and compressional motions are excited by isotropic contraction source at the depth of 200-500m beneath the crater and vertical expansion source at the depth of 400-600m, 0.3s after excitation of isotropic contraction, respectively.