Seismicity of Mt. Ontake volcano in the fall of 2017 inferred from a summit observation test

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Nagoya University has developed, in association with Keisokugiken corporation, a small and low energy consumption telemeter equipment for seismic observations (Horikawa et al., 2017VSJ). We started an operation test for this instrument using 10 sites in the summit region of Mt. Ontake volcano from October 2017. In this examination, the telemeter device at each site is connected to a 1 Hz velocity-type seismometer (mainly LE-3Dlite MkII, Lennartz electronic). This is the first time to have multiple online seismic stations within 1 km of an active crater region of Mt. Ontake. In this presentation, we show the characteristics of the seismicity in the summit region of Mt. Ontake in the fall of 2017 obtained by this operation test.

Although some A-type earthquakes are detectable at relatively distant stations, the summit stations have recorded smaller A-type earthquakes that are visible only near the crater region. In addition, B-type earthquakes characterized by a gradual rise of the amplitude and a relatively low-frequency-rich spectral content, tremors characterized by a long duration, monochromatic oscillations composed of a single frequency, and signals with a temporal modulation of the peak frequencies are observed.

To understand the overall seismicity, we detected shallow volcano-seismic events in November 2017 based on signal-to-noise ratios of multiple frequency bands at near and distant stations. The result was 322 candidate events in the month, including 105 events in the first 10 days of the month which we manually classified based on the waveform characteristics. Although some ambiguity exists in the manual classification, the events were tentatively classified into 25 potential A-type earthquakes (24%), 24 potential B-type earthquakes (23%), 19 potential tremors (18%), 12 potential LP and VLP events or temporal increases of the microseismic noise (11%), and 17 potential misdetections including the coda of a distant earthquake and an artificial noise (16%).

The number of events detected by the summit network is by several times larger than that detected without the summit network even taking into account the potential misdetections and the ambiguity of the classification; only 29 events were detected in November 2017 by a station more than 2 km of the crater (Japan Meteorological Agency, 2017). In addition, the summit network recorded a lot of B-type earthquakes and tremors which had been considered rare at Mt. Ontake. We will try to improve the event detection method, automate the event classification, and locate the events to better understand the seismicity of the volcano.

Keywords: Volcanic earthquakes, Mt. Ontake, Near-field observation

