斜面崩壊によって励起された地震波動の解析 －2013年伊豆大島崩壊を例として－
Analysis of seismic waves excited by landslides - a case for Izu-Oshima Island on Oct. 16, 2013 -

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Records of ground motions due to landslides had been observed frequently thanks to the enhancement of the recent seismic network (e. g. Yamada et al., 2012; Ogiso and Yomogida, 2015). These records may enble us to estimate locations and timing of landslides which are especially important to understand the mechanism of landslides in association with geology, hydrological environment and precipitation distribution.
On Oct. 16, 2013, large-scale landslides took place due to extreme rainfall in Izu-Oshima Island in Japan. Accompanied with the Izu-oshima landslide disasters, seismic waveform records which recorded landslide signals were obtained at more than ten stations operated by Oshima Volcano Observatory of ERI, U. Tokyo. Using these waveform records, this study shows the effectiveness and limits to estimate the spatio-temporal distribution of the shallow landslides.
We detected at least 95 landslide events in the seismograms. Particle motions obtained with narrow (2-3 Hz) bandpass-filtered seismic waveforms showed that the Rayleigh waves were dominant at a certain time window. Therefore, assuming the observed waves as surface waves, the movement of the source regions was estimated using spectral amplitude ratios among stations. It was found that the source regions were determined with a small error radius at the earlier stage of one event, though the source regions at the latter stage were limited only in the slope-strike direction. This fact was considered to be due to the spreading of the regions where seismic energies were radiated.
The locations in the slope-strike direction for the detected landslide events were firstly situated mainly in the northern regions of the failure region at 2:00, then moved to the south with increasing frequency around 3:00-4:00, and then terminated past 5:00. The first large-amplitude event occurred only after one event, which suggested that large-scale failures suddenly might have occurred without small failures.
Geological map (Kawanabe, 1998) shows that the orthopyroxene-augite basalt scoria and spatter involved in the eruption in the 14th century cover the top side of the northern failure slope, within which the slip surface was observed (Terajima et al., 2014). On the other hand, the southern failure slope is also covered by basalt scoria but scoria involved in 14th century eruption did not reach there. Therefore, we suggested that one reason for the occurrence time difference in landslide events in the northern and southern slopes was geology difference.
Acknowledgments: We used the meteorological data recorded by JMA.

