

## Characteristics of seismic waveforms excited by slope failures

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Recent development of advanced seismograph networks enables us to capture high-frequency seismic waves excited by landslides. However, it is still challenging to recognize landslide occurrence solely from seismic records, without knowing the detailed characteristics of the seismic waves excited by landslides. In this study, we investigated two cases where seismic signals accompanied with landslides were clearly detected at several seismic stations in 2017: landslides in northern Nagano region in May and in Oita region in July.

Firstly, we consulted the record-section of the seismic records and confirmed that the wave packets propagated from the landslide areas. We also obtained such parameters as dominant frequency and duration for better understanding their characteristics. Then, we also estimated hypocentral locations using spectral amplitudes in the dominant frequency of the seismic signals, based on the method of Kumagai et al. (2010).

In the case of Nagano landslide, we recognized wave packets propagating with the group velocity of 3 km/s from the landslide area at 6:37 on May 19, 2017. On the other hand, in the case of Oita landslide, two wave packets separating one minute were propagating with the group velocity of 3 km/s from the landslide area at 9:45 and 9:46 on Jul 6, 2017. In both cases, hypocentral determination using the amplitude information showed that landslide areas were included in the regions with small errors in estimation, regardless of the assumed types of seismic waves or assumed values of velocities and attenuation parameters. It is considered that high frequency seismic wavefield can be effective to monitor landslide occurrence.

The dominant frequencies of the seismic waves were 0.5-3 Hz in both cases, though there were slight differences between two events in Oita case. We will use this information together with the results of the field investigation to grasp the relationship between what was going in the field and what seismic waves were excited.

Acknowledgement: We used seismic waveform data from Hi-net and JMA. This study was supported by the collaborative program between DPRI, Kyoto Univ. and ERI, Univ. of Tokyo (2017-K-04).