

Dynamic Movement History of the 2017 Iiyama Landslide Revealed from Drone Image and Seismic Data

ドローン撮影と地震波形記録から解明された飯山の地すべりの運動履歴

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The Iiyama landslide occurred on May 19, early morning. A nearby resident found the downstream of the Idegawa river became muddy at 6AM on the day. The local government confirmed a large-scale hillside failure on the upstream of the river. The debris of the landslide run along the Idegawa river about 3 km and merged with Chikuma river.

We performed the field survey with a drone and analysis of seismic signal. The aerial photos taken by the drone enable us to create three dimensional digital elevation model (3D DEM) with a modeling software (Pix4Dmapper). The 3D DEM revealed that there were two significant collapses in the landslide. The one was about 100m width and 300m length, and run from North to South direction. The horizontal displacement was about 100m, and the movement was terminated when the toe of the landslide reached the bottom of the valley. The other was about 100m width and 800m length, and run from West to East direction. The debris of this collapse run along the Idegawa river by a few kilometers.

In order to estimate the timing and dynamic movement history of the landslide, we analyzed the seismic waveforms provided by the NIED. The closest station (MAKH, about 7km north from the landslide) shows the long-period signal (0.1-0.01 Hz) preceding to the short-period signal (1-8 Hz) by about 40 seconds (at 6:37:35). The largest direction of the long-period signal is North-South component. This

suggests the North-South collapse occurs prior to the East-West collapse. The seismic signal combining with drone aerial photos help us to understand the dynamic movement history of landslides.



Fig.1 Ortho image of the landslide made by drone photos.

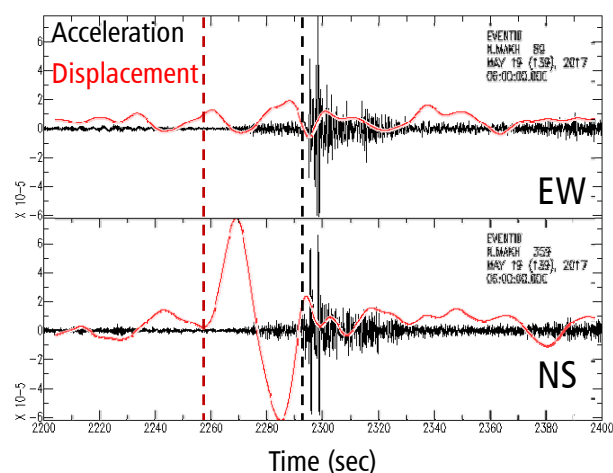


Fig.2 Seismic signals at the closest station (N.MAKH). The peak displacement was recorded earlier than the peak acceleration.