

Two types of rainfalls for predicting shallow landslide initiation as revealed by Normalized Soil Water Index

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Two types of rainfall conditions associated with shallow landslide initiation are identified objectively in Japan. We examined rainfall intensity-duration conditions of 1,174 shallow landslides that occurred during 2006-2008 using the Normalized Soil Water Index (NSWI), which represents conceptual soil water contents. We classified rainfalls into two types using principal component analysis: short-duration -- high-intensity (SH) type (557 events), and long-duration -- low-intensity (LL) type (617 events). Based on this classification, we proposed a new method herein for predicting shallow landslides resulting from the rapid increase of NSWI in the SH type, and from the gentle rise of NSWI followed by intense rainfall in the LL type. Figure 1

shows two curves, SH and LL-curves, which were obtained from non-parametric median regressions of each rainfall type. Using these curves, we verified the predictability by analyzing the rainfall-induced shallow landslide disasters in 2009 (Fig. 1, gray lines), for which we succeeded in predicting a landslide at an earlier stage of the rainfall event. These results will be useful for quasi-real time monitoring and prediction of shallow landslide initiation, which should be verified using more cases of shallow landslide events.

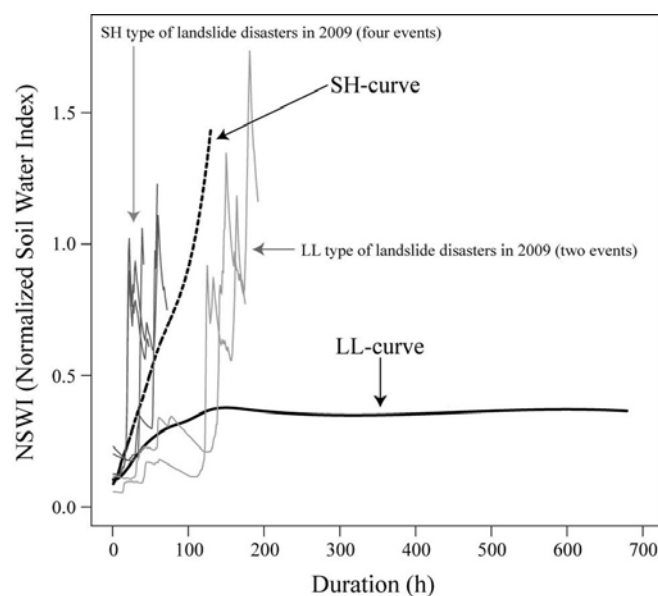


Fig. 1 Temporal changes of NSWI for predicting shallow landslide caused by SH type (SH-curve) and LL type (LL-curve), along with the verification using shallow landslide disasters in 2009 (gray lines).

Keywords: Shallow landslide initiation, Soil Water Index, Rainfall intensity-duration, short-duration -- high-intensity type, long-duration -- low-intensity type