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An analysis of shallow landsliding at Shobara 2010 disaster using a rainfall infiltration-slope stability model

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This study examines hydrological processes for shallow landslide initiation at Shobara disaster caused by heavy rainfall on 16 Jul 2010, using a rainfall infiltration coupled slope stability analysis. Hydro-geotechnical properties of soils were measured by in-situ shear testing and laboratory permeability tests for undisturbed samples. Slip depths and slope angles were obtained from airborne laser scanning conducted just after landsliding. We simulated one-dimensional vertical pore-pressure propagation due to infiltration into a soil column resulting in rapid increase in pressure head and hence abrupt decrease in factor of safety at soil base. Records of 10 min-rainfall at both of landsliding and non-landsliding areas were used as input for the simulation. The results imply that short-lasting but high-intensity rainfall peak (44 mm/10 min on the record) at the end of the storm event triggers the shallow landslides. Several verbal evidences from residents and time of emergency call-ins coincide with the simulated timing of the landslide occurrence, which support the validity of our modeling.

Keywords: shallow landslide, rainfall infiltration, slope stability analysis, airborne laser scanning