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A New Shallow Landslide Model for Predicting the Location, Timing, Size and Landslide Runout

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This study proposes a new shallow landslide model, integrating a size-explicit landslide prediction model, an event-based transient soil moisture model, and a debris flow model. The model is expected to predict the location, timing, size, and landslide runout for a rainfall-induced landslide. In the study, we first examined a coupled model to simulate, at watershed level, landslides and debris flows induced by Typhoon Morakot (August, 2009) in southern Taiwan. Although the coupled model performed reasonably well in model test and validation, it overestimated unstable areas (cells) and underestimated debris fluxes downslope. The problems are most likely due to the landslide model, SHALSTAB, used in the coupled model, which is hydrologically steady-state and size-inexplicit. To solve the problems, we will implement a new landslide model, capable of predicting the hydrology dynamics and landslide size. The new integrated model will be tested with past event data in the Baichi catchment in northern Taiwan and the Coos Bay watershed in northwestern United States. The landslide triggers are different in these two study areas: mid-latitude cyclones that affect Coos Bay are much milder rainfall events than typhoons that affect Baichi. A comparative analysis between these two study areas will also offer an opportunity to examine the controls of rainfall pattern, topography, land cover, and soil physics on landsliding and landslide size.
Keywords: shallow landslide, soil moisture, debris flow, landslide size, typhoon