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Coupling of rainfall-induced landslide triggering model with predictions of debris flow runout distances

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Rapid debris flows initiated by rainfall induced shallow landslides present a highly destructive natural hazard in steep terrain. The impact and run-out paths of debris flows depend on the volume, composition and initiation zone of released material and are requirements to make accurate debris flow predictions and hazard maps. For that purpose we couple the mechanistic 'Catchment-scale Hydro-mechanical Landslide Triggering (CHLT)' model to compute timing, location, and landslide volume with simple approaches to estimate debris flow runout distances. The runout models were tested using two landslide inventories obtained in the Swiss Alps following prolonged rainfall events. The predicted runout distances were in good agreement with observations, confirming the utility of such simple models for landscape scale estimates. In a next step debris flow paths were computed for landslides predicted with the CHLT model for a certain range of soil properties to explore its effect on runout distances. This combined approach offers a more complete spatial picture of shallow landslide and subsequent debris flow hazards. The additional information provided by CHLT model concerning location, shape, soil type and water content of the released mass may also be incorporated into more advanced models of runout to improve predictability and impact of such abruptly-released mass.