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Assessing rainfall triggered landslide hazards through physically based models under uncertainty

D. Balin (1), R. Metzger (2), J.M. Fallot (1), and E. Reynard (1)
(1) IGUL,University of Lausanne, Switzerland (daniela.balin@unil.ch), (2) IGAR,University of Lausanne, Switzerland

Hazard and risk assessment require, besides good data, good simulation capabilities to allow prediction of events and their consequences. The present study introduces a landslide hazards assessment strategy based on the coupling of hydrological physically based models with slope stability models that should be able to cope with uncertainty of input data and model parameters.
The hydrological model used is based on the Water balance Simulation Model, WASIM-ETH (Schulla et al., 1997), a fully distributed hydrological model that has been successfully used previously in the alpine regions to simulate runoff, snowmelt, glacier melt, and soil erosion and impact of climate change on these.
The study region is the Vallon de Nant catchment (10km2) in the Swiss Alps. A sound sensitivity analysis will be conducted in order to choose the discretization threshold derived from a Laser DEM model, to which the hydrological model yields the best compromise between performance and time computation. The hydrological model will be further coupled with slope stability methods (that use the topographic index and the soil moisture such as derived from the hydrological model) to simulate the spatial distribution of the initiation areas of different geomorphic processes such as debris flows and rainfall triggered landslides. To calibrate the WASIM-ETH model, the Monte Carlo Markov Chain Bayesian approach is privileged (Balin, 2004, Schaefli et al., 2006). The model is used in a single and a multi-objective frame to simulate discharge and soil moisture with uncertainty at representative locations. This information is further used to assess the potential initial areas for rainfall triggered landslides and to study the impact of uncertain input data, model parameters and simulated responses (discharge and soil moisture) on the modelling of geomorphological processes.