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Debris flow hazard assessment at a regional scale

P. Horton, E. Bardou and M. Jaboyedoff

Institute of Geomatics and Risk Analysis, University of Lausanne, Switzerland
(pascal.horton@unil.ch)

Debris flow susceptibility mapping at a regional scale has been the subject of various studies. The complexity of the phenomenon and the variability of local controlling factors limit the use of process-based models for a first assessment. GIS-based approaches associating an automatic detection of the source areas and a simple computation of the debris flow spreading may provide a substantial basis for a preliminary susceptibility assessment at the regional scale.

The proposed method merges several existing GIS-based approaches. A new model has been developed for a regional debris flow susceptibility assessment with the objective to allow a transparent algorithms choice and an easy customization of the method.

The use of a DEM for the Canton de Vaud territory (3200 km^2; Switzerland), a lithological map and a topographic map, has allowed automatic identification of the potential source areas. Computation on the DEM provide the slope, which is a determining criteria, the upslope contributing area, as a characteristic of water input, and the plan curvature allowing an identification of the gullies. The lithological map gives information on the sediment availability, and finally the topographic map increases the detection quality.

The debris flow spreading is mathematically estimated by two types of algorithms: the first ones are called flow direction algorithms and rule the path that the debris flow will follow; the second ones are basic energy-based calculations and determine the runout distance. This approach does not aim to represent exact physical processes, but to remain realistic.

The resulting data is the total area exposed to debris flow spreading, with an associ-

ated qualitative probability qualifying the susceptibility potential. The chosen methods show realistic results and allow a first assessment of debris flow susceptibilty over a whole territory, despite a limited knowledge of the local controlling factors.