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Concepts and parameterisation of Perla and FLM model using Flow-R for debris flow

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The Flow-R software was built to allow regional debris flow susceptibility assessment. It uses propagation algorithms such as the friction model from Perla and friction-limited models (FLM). By using concepts from both models, a methodology is proposed to evaluate the friction angle and mass-to-drag ratio based on the maximum velocity estimation for debris flows, and on the observed runout on the debris fan. The goal is to use the energy line concept, the debris fan slope, and the runout on the latter, to estimate the friction angle, the Mass to Drag ratio and maximum flow velocity for a given debris flow event and specific conditions of a catchment. A relation between those parameters themselves and between them and the observed characteristics of the flow (runout, speed of flow, viscosity, thickness) is established.

The sensitivity of the Flow-R model is tested on two real cases and a theoretical topography for both model types. The importance of the friction angle, relative to M/D, is established. It demonstrates that the FLM model gives results similar to the Perla model, and is useful to determine the friction angle and M/D parameters on debris fan topography, using known events as calibration for each case. Those parameters can then be used as input for local hazard simulation and prediction.

In addition, using a broad set of parameters instead of of an ideal one, inducing different propagation results, is proposed for debris flow hazard mapping and assessment.