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Optimizing the choice, parameterization and combination of landslide models for fall and flow processes

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Landslides can lead to loss of life as well as damages to public infrastructure and private property. Particularly processes with high velocities and energies, such as falls and flows (according to Cruden and Varnes), are highly dangerous. Therefore, adequate risk management strategies are necessary to reduce negative consequences of such processes. These strategies are often based on hazard information obtained from modelling. These can be implemented in early warning systems, land use planning, and technical protection measures.
Computer simulations are based on knowledge of the initial conditions, the physical characteristics of the movement, and information on previous events. Calculation approaches are often tailored to landslides of a specific type. Many landslides, however, display characteristics of more than one type of movement in space and time. In the case of landslides runouts, it is not always a priori clear which type of computer models better describes the process of a complex movement since there are, among others, computer models for (i) fall or (ii) flow processes. A rock avalanche, for example, would better be represented by (ii) as most models of class (i) do not consider interactions between the individual blocks.
In an attempt to face this challenge, we first investigate which sets of criteria are decisive whether fall or flow models serve the best. Selected, well-documented case studies are back-calculated comparatively and/or sequentially with models designed for flows and falls (WURF, Rockyfor3d and r.avaflow), and the plausibility and empirical adequacy of the model outcomes are evaluated. We also present the prototype of a concept to sequentially combine fall and flow models for cascading landslide processes.