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New results of laboratory experiments on the motion of rock avalanche: influence of the substratum, volume, slope angle and radius of curvature

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Rock avalanches are catastrophic events in which granular rock masses >106 m3 travel at velocities up to ten meters per second. The mobilized rock mass travel long distances, which in exceptional cases can reach up to tens of kilometers. Those highly destructive and uncontrollable events, give important insight to understand the interactions between the displaced masses and landscape conditions. However, as those events are not frequent, analogue modelling plays a fundamental role helping to the comprehension of their behaviour.
The objective of the research is to explore the interaction among the rock mass and substratum conditions, slope angle and radius of curvature for long runout rock avalanches. For this work, an installation comprising three distinct parts was designed: a starting box where material is released (representing the detachment), a path along material spreads and the depositional surface. In order to have the best initial conditions, the starting box is quickly separated from the slope by means of a retractile jack which ensures a fast destabilisation of the mass. All the experiments are recorded with a high speed camera and in order to compare their shape and runout, the deposits are scanned with a mirco-Lidar Minolta. In a general way, the travel distance depends of the substratum. The Fahrböschung varies between 30° for the finer and 40° for the coarser but it can be considerably reduced by decreasing the basal friction. When aluminium is used as substratum, the Fahrböschung varies between 24° and 30°. The runout is greater with coarse material compare to finer one. The Fahrböschung got with finer grainsize is in average 3° higher than the one obtained with coarser grainsize. The travel increases with the volume.