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Numerical simulations of Rock Avalanches with DAN-3D: from real case to analogue models

Céline Longchamp (1), Ivanna Penna (1), Claire Sauthier (2), and Michel Jaboyedoff (1)

(1) Center of Research on Terrestrial Environment, University of Lausanne, Switzerland (celine.longchamp@unil.ch), (2) Laboratory for Rock Mechanics, Ecole Polytechnique Fédérale de Lausanne, Switzerland

Rock avalanches are rapid events with capacity to develop long and unexpected runouts, which can evolve into catastrophic events difficult to predict. In order to better understand unusual travel distances, analogue and numerical modeling are often used. The comparison between real case, and analogue and dynamics models is key to constrain and understand parameters governing rock avalanches run outs.
In the Pampeanas range (Argentina), the Potrero de Leyes rock avalanche involved 0.23 km3 of highly fractured metamorphic rocks that spread in the piedmont area without any topographical constrain, resulting in a runout of 4.8 km. In this study we first attempt to apply analogue models to replicate the rock avalanche deposit. The analogue modeling consists into the release of a granular material (calibrated and angular carborundum sand) along a slope, creating similar landscape conditions that the real case. The material is not constrained laterally and spread freely on a flat deposition surface. For a volume of 50 cm3, the runout is 50 cm, the deposit has as length of 10 cm and a width of 19 cm. For a volume of 100 cm3, the runout is 65 cm, the deposit has as length of 25 cm and a width of 30 cm.
In a further step we model both the real case and the result of the analogue models. Dynamics models are carried out with DAN-3D, a dynamic model for the prediction of the run out of rapid landslide (O. Hungr, 1995; O. Hugr & S.G. Evans, 1996). The result of the simulations for both volumes tested with the analogue model give satisfactory results. In fact, for the volume of 50 cm3, the deposit has as length of 10 cm and a width of 20 cm and for the volume of 100 cm3, the deposit has as length of 25 cm and a width of 50 cm. The shape and the thickness of the deposit obtained with DAN-3D are also similar with those got with the analogue models.