Geophysical Research Abstracts
Vol. 18, EGU2016-4413, 2016
EGU General Assembly 2016

Analogue and numerical models coupled with structural analysis to investigate the runout of dry granular flows.

Longchamp Céline (1), Manzella Irène (2), Antonio Abellan (1), Olivier Caspar (1), Yury Podladchikov (1), and Michel Jaboyedoff (1)

(1) Lausanne, UNIL, Switzerland , (2) Geneva, UNIGE, Switzerland

The objective of this research is to better understand the propagation of dry granular flows by coupling analogue modelling, structural analysis of deposit and numerical modelling, as follows:
(a) The analogue modelling use laboratory experiments to investigate both the fluid-like flow of a granular mass falling down a slope and the influence of certain parameters such as the basal roughness, mobilized volume and slope angle. The experimental setup allows unconfined flow which spreads freely on a horizontal surface. Different grainsizes (115, 545 and 2605 μm) and substratum roughness (simulates by aluminium and sandpapers with grainsize from 16 to 425 μm) were used in order to understand their influence on the motion of a granular mass. During our experiments, the runout varied between 4.5cm and 11cm, with an increase of the basal roughness. When the volume varied between 300 and 600cm3 the runout was comprised between 9.2cm and 11.7cm. Finally when the slope angle was increased from 35° to 60°, the observed runout was between 5.3cm and 20cm.
(b) Rock avalanche dynamic is analysed by means of a detailed structural analysis of the analogue modelling deposits. A series of 3D measurements were carried out on the deposit and a median filter and a gradient operator along the direction of propagation were applied to the 3D datasets. Treatment yield a more precise mapping of the longitudinal and transversal displacement features observed at the surface of the deposits.
(c) The numerical modelling performed during this research is based both on continuum mechanics approach and on solving the shallow water equations. The avalanche was described from an Eulerian point of view within a continuum framework as single phase of incompressible granular material following Mohr-Coulomb friction law. The results obtained with the numerical model resemble those observed with the analogue modelling mentioned above.
By coupling these three approaches, we obtained a complete scheme for the propagation of unconstrained dry granular flows, allowing for a more detailed understanding of their mechanisms.