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New advances for modelling the debris avalanches

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Flow-like landslides are a major global hazard and they occur worldwide causing a large number of casualties, significant structural damages to property and infrastructures as well as economic losses. When involving open slopes, these landslides often occur in triangular source areas where initial slides turn into avalanches through further failures and/or eventual soil entrainment.
This paper deals with the numerical modelling of the propagation stage of debris avalanches which provides information such as the propagation pattern of the mobilized material, its velocity, thickness and run-out distance. In the paper, a "depth integrated" model is used which allows: i) adequately taking into account the irregular topography of real slopes which greatly affect the propagation stage and ii) using a less time consuming model than fully 3D approaches. The used model is named "GeoFlow_SPH" and it was formerly applied to theoretical, experimental and real case histories (Pastor et al., 2009; Cascini et al., 2012).
In this work the behavior of debris avalanches is analyzed with special emphasis on the apical angle, one of the main features of this type of landslide, in relation to soil rheology, hillslope geometry and features of triggering area. Furthermore, the role of erosion has been investigated with reference to the uppermost parts of open slopes with a different steepness. These analyses are firstly carried out for simplified benchmark slopes, using both water-like materials (with no shear strength) and debris type materials. Then, three important case studies of Campania region (Cervinara, Nocera Inferiore e Sarno) are analyzed where debris avalanches involved pyroclastic soils originated from the eruptive products of Vesusius volcano.
The results achieved for both benchmark slopes and real case histories outline the key role played by the erosion on the whole propagation stage of debris avalanches. The results are particularly satisfactory since they indicate the "GeoFlow_SPH" model as a suitable tool for the analysis of these phenomena.

References

Pastor, M., Haddad, B., Sorbino, G., Cuomo, S., Drempetic V. (2009). A depth-integrated, coupled SPH model for flow-like landslides and related phenomena. International Journal for Numerical and Analytical Methods in Geomechanics, 33, 143-184.

Cascini L., Cuomo S., Pastor M., Sorbino G., Piciullo L. (2012). Modeling of propagation and entrainment phenomena for landslides of the flow type: the May 1998 case study. Proc. of 11th Int. Symposium on Landslides: Landslides and Engineered Slopes, Banf, Canada June 3-8, 2012, Ed. E. Eberhardt, C. Froese, K. Turner, S. Leroueil, ISBN 978-0-415-62423-6, 1723-1729.