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Numerical modelling of a granular step collapse using the Material Point Method

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Abstract
In the last decade, the Material Point Method (MPM) has been successfully applied to model geotechnical problems. The dual description of the media (lagrangian material points and eulerian numerical mesh) provides the MPM capabilities of handling problems involving large deformation. This paper presents the capability of the method to accurately capture the physics of the dynamic evolution of landslides in a unified mathematical framework. A simplified example is proposed reproducing the initiation-propagation transition of a granular step collapse. Influence of geometry (aspect ratio a), material properties (internal friction angle) and contact properties between the material and the sliding surface (basal friction angle) have been analyzed. Profile runouts have also been compared to previous published simulations [1] and experiments [2], [3] among others.

References
[1] G. B. Crosta, S. Imposimato and D. Roddeman (2009). Numerical modeling of 2-D granular step collapse on erodible and nonerodible surface. Journal Of Geophysical Research, Vol. 114, F03020, DOI:10.1029/2008jf001186.
[2] Lajeunesse, E., J. B. Monnier, and G. M. Homsy (2005), Granular slumping on a horizontal surface, Phys. Fluids, 17, 103302.1 – 103302.15, DOI:10.1063/1.2087687.
[3] Lube, G., H. Huppert, S. Sparks, and A. Freundt (2005), Collapses of two dimensional granular columns, Phys. Rev. E, 72, 041301.1– 041301.10, DOI:10.1103/PhysRevE.72.041301.