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MULTISCALE MODELLING OF LANDSLIDES AND DEBRIS FLOWS

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ABSTRACT

Landslides and debris flows are serious geo-hazards common to countries with mountainous terrains. The high speed and the enormity of debris mass make debris flows one of the most dangerous natural hazards. Debris flows are often triggered by landslides partially or completely mobilizing into debris flows. Globally, landslides cause billions of dollars in damage and thousands of deaths and injuries each year.

The numerous devastating events worldwide have made us aware of the complexity of landslides and debris flows and our insufficient knowledge to make reliable predictions. Traditional tools for prediction and design are based on limit equilibrium analysis for landslides and shallow water model with a Finite Difference solver.

Usually soil and debris are modelled as single phase materials with constant material properties. That the simple models are unable to account for the complex behaviour of landslides and debris flows, which can be best described as multiphase and multiscale, is well known to researchers and stakeholders. There is an urgent need for better understanding of the triggering mechanisms, for reliable prediction of runout dynamics, deposition pattern, impact forces, and for rational design of stabilization and protection measures.

The last decade saw rapid developments in advanced constitutive models, experimental techniques in laboratory and in-situ, mechanics of multiphase media, localized deformation analysis, Discrete Element Method (DEM), advanced Finite Element Method (FEM), Computational Fluid Dynamics (CFD), and meshless methods. This mini-symposium intends to bring together different approaches in modelling the complex behaviour of landslides and debris flows in one place.