MWDiEM, a new tool to look inside a gravitational mass flow

Katalin Gillemot (1), Martin Mergili (1,2), and Thomas Glade (1)

(1) ENGAGE - Geomorphological Systems and Risk Research, Department of Geography and Regional Research, University of Vienna, Austria (katalin.gillemot@univie.ac.at), (2) Institute of Applied Geology, BOKU University, Vienna, Austria

MWDiEM is a new open-source, discrete element model based numerical tool, that is able to effectively model the dynamics of cohesionless polyhedral and spherical granular particles. The tool is especially aimed at geological mass-waste applications where the fluid content of the flow is none or negligible, e.g. dry rock avalanches, boulder falls, dry sand, gravel and debris slides, dry debris flows and snow avalanches. The model is designed for GIS implementation. It includes possible entrainment and erosion of the particles. The use of different basal topographies and obstacles in the path of the movement is implemented and different slide initiation/slope failure methods are realized, like vibrations or forced breakup of a block of mass.

In the current presentation we will introduce the MWDiEM code with its algorithms, its GPU implementation, the method of simulation and its possible applications. In discrete element modeling the trajectory of each particle is followed individually, resulting in an extended insight into the physical properties of the flow as we have constant knowledge of particle positions, particle orientations, velocities, forces, and a number of other interesting physical parameters at each step in time. As a result the simulations give us the opportunity to look inside the dynamics of dry or mostly dry gravitational mass-movements, including flow velocities, shear rates, segregation patterns and to explain any unexpected run-out zone geometries, providing a useful tool in the future for both scientist and natural hazard professionals.