Geophysical Research Abstracts, Vol. 8, 03967, 2006
SRef-ID: 1607-7962/gra/EGU06-A-03967

Flow experiments with particles in a viscous fluid in a vertically rotating drum

R. Kaitna, D. Rickenmann

Institute of Mountain Risk Engineering, BOKU University, Austria (roland.kaitna@boku.ac.at / Phone: +43 1 47654 4372)

Debris flows endanger resources, infrastructure and human life. Strong efforts have been made to model and predict movement and runout of debris flow events to be able to implement adequate mitigation measures. In debris flow simulations for hazard assessment often rheologic approaches are used. However it is difficult to determine rheologic model parameters for natural debris flow mixtures.

In order to gain insight into the role of particle-interactions in a viscous fluid, flow experiments with a viscoplastic fluid and PVC grains have been conducted in a large scale vertically rotating drum.

The drum has a diameter of 2.5 m, the rectangular flow cross-section has a width of 0.45 m, and rotation velocities up to 20 rpm have been obtained. Parameters like flow geometry, total shear stress of the mixture, bed normal- and bed shear stress along the centreline of the flow, and pore fluid pressure have been measured. The tested material consisted of synthetic polymer Carbopol Ultrez 10® - mimicking flow behaviour of viscous slurries - and PVC cylinder-shaped grains.

We present results from experiments including different particle concentrations and fluid viscosities. Using dimensionless numbers based on scaling analysis, we compare values characterising different flow regimes observed in the drum with threshold values proposed in other studies.