



Debris flow experiments in a vertically rotating drum

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Natural debris flows can be regarded as flows of extremely heterogeneous mixtures of solids and water in a complex, locally variable environment. Since these flows represent a serious hazard in mountainous regions, great efforts are made to predict flow parameters using various kind of models including simple rheologic approaches.

A vertically rotating drum is used to study the flow behaviour of debris-flow like materials. The facility allows to establish quasi-stationary conditions and to measure both the range of fluctuations and mean values characterising the flow behaviour of the mixture. The diameter of the rotating flume is 2.5 m, channel width is 0.45 m, and the maximum rotational speed is around 30 revolutions per minute. Measured parameters include flow geometry, mean and surface velocity, total boundary shear stress, normal stress and shear stress along the bottom close to the centreline of the flow. The objectives of the study include to

- determine rheologic parameters of simple models for quasi-homogeneous fluids,
- describe the change of flow behaviour of mixtures ranging from dry, granular solids in motion to viscous fluids, and
- determine criteria (e.g. dimensionless parameters) separating different flow “regimes”.

The facility has been tested with an artificial, viscoplastic material (Carbopol Ultrez 10[®]) and with a homogeneous loamy mixture.

First results from experiments are presented and different approaches of analysing the data especially with reference to simple flow models are discussed. The rheologic parameters derived from the rotating flume experiments are compared with independent estimates using a conventional rheometer (Bohlin Visco 88).