



## Experimental study on granular debris flows

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The present study starts with a review of different rheological models proposed in literature to describe the flow behavior of both viscous and granular debris flows indicating the difference of those models. An experimental part of the study has been conducted in the Fluvial Morphology Laboratory of the hydraulics, Marine and Environmental Engineering Department of the Technical University of Catalonia (GITS-UPC). A mixture of well sorted gravel with a mean grain diameter of 7.9 mm and water is discharged suddenly at the upstream end of the metallic laboratory flume. At a distance of approximately 6 m downstream from the gate, the debris flow is filmed at a frequency of 1000 Hz. From the images, the velocity profiles are obtained by a pixel line correlation technique. The flow surface is detected based on the change of color spectrum of the images corresponding to the change of air to water. The velocity profiles obtained show that the granular debris flow surge may be best described by a Voellmy model with a predominant Coulomb friction term. The onset of turbulence can be observed by increasing the flume inclination from 15° to 20°. A calibration of the Voellmy model parameters is presented.