



Experimental study of bed-load on steep slopes at the grain scale

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In order to better understand bed-load solid transport physical processes on steep slopes, an experimental study at the grain scale of the motion of coarse spherical glass beads entrained by a turbulent and supercritical water flow down a steep channel with a mobile bed was set up. The particle diameter was 6 mm, the channel inclination typically 7.5 to 15% and the ratio of water flow depth to particle diameter 1 to 4. The initial width was 6.5mm slightly larger than the particle diameter to create a two-dimensional particle flow allowing recording from the side all particles with a high speed camera. A doubled width of 13mm was also investigated. Water flow rates and solid discharges were kept constant at the upstream entrance. They were adjusted to obtain bed load equilibrium, that is, neither bed erosion nor deposition over sufficiently long time intervals. First global hydrodynamic and sedimentologic results are given. Secondly the trajectories of all particles are analysed especially the state of movement, rolling or saltation. Finally we will discuss the need to study the processes at the grain scale on the one hand and how to upscale from the grain scale to hazard assessment and mitigation measures on the other hand.