Geophysical Research Abstracts
Vol. 19, EGU2017-17557, 2017
EGU General Assembly 2017

A generic Froude scale model study of massive bedload deposition in a debris basin

Guillaume Piton and Alain Recking

Univ. Grenoble Alpes - Irstea, centre de Grenoble, UR ETGR, St Martin d'Hères, France (guillaume.piton@irstea.fr)

Sediment trapping structures, such as gravel deposition basins, are regularly implemented in mountainous context for flood hazard mitigation. These structures should ultimately trap gravels when their excess may aggravate the downstream flood hazard, while, the remaining time, allowing a suitable background sediment continuity. Such optimized designs require a sufficient knowledge of the flow features and geomorphic processes implied in gravel trapping. A generic Froude scale model of a 10%-steep, bedload deposition basin, with a slit dam and without outlet structure, is presented in this work.

Accurate photogrammetry and large scale particle image velocimetry (LS-PIV) were combined to study the geomorphic patterns and to reconstruct the flows. The emergence of self induced cycles of braided and channelized flows, with intense grain size sorting, is described. It sheds light on the similarity of bedload trapping with alluvial fan formation or fluvial delta development.

The deposition slope, a key parameter in the structure design, is more precisely studied. The measurements are correctly estimated by a new simple equation, which is developed from prior works dedicated to steep slope stream hydraulics and bedload transport.

The analysis demonstrates additionally that, despite the steepness of the studied conditions, most flows are subcritical due to roughness adjustment. We finally highlight that morphologically-active flows, *i.e.*, with dimensionless shear stress higher than the threshold for motion, have Froude number ≈ 1; *i.e.*, that a critical flow hypothesis seems reasonable, as a first approximation, to describe flows over massive bedload depositions.

This new dataset, with complete geomorphic and flow measurements, in diverse conditions, may be used as reference to try and test numerical approaches of the phenomena.