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Physical modelling of instability processes in coarse-grained riverbanks

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Several methods are available to model riverbank stability, accounting for an increasing number of factors. Most of bank stability models are suitable for cohesive sediments, and meandering models are preferably applied to lowland, low gradient meanders typically with cohesive banks and relatively fine bed material. However, riverbanks are often composite, with an important component of relatively coarse sediments. Therefore, a better comprehension of processes occurring along this type of banks is needed to improve bank stability models and to extend meandering models to a wider range of situations.

In order to address the previous limitations, a physical model of a bank composed by granular relatively coarse sediment has been created, with a primary aim to investigate on mass-wasting mechanisms caused by changes in hydrometric and water table stage. The experimental device is carried out to work with two possible modalities:

(1) “tank” modality, by varying the water level in the tank in contact with the bank, in order to investigate on the triggering conditions of mass failure in terms of changes in pore water and confining pressures;

(2) “lysimeter” modality, by applying an hydraulic load beyond the bank and creating a seepage flow, to investigate on the role of seepage erosion in such type of banks.

Fluvial erosion is not accounted in this first phase of experiments, although changes at the bank toe due to this process can be simulated by directly modifying the bank toe

geometry. The setup of the model and first preliminary tests and results are presented.