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Landslide-Generated Tsunami model

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The landslide-generated tsunamis are known to have catastrophic potential consequences on the infrastructures and populations on the shore of the water body. One way to assess this risk is by the mean of predictive models.

Such models are often based on shallow water equations as they are fast and relatively easy to implement. Nevertheless, the run-up simulation and the generation of the wave by the penetration of the landslide mass in the water still remains a big concern.

In this study, we focus on the wave generation. In order to investigate this topic, we tried to reproduce numerically physical experiments. These latter were performed on a large flume where granular material is released downslope. The thickness, the velocity of the granular flow and the slide deposit, its position and shape are well detailed. The induced wave amplitude and shape are recorder along its path. The initial material volume and the water depth, including dry case, undergo variations.

The numerical model for the granular flow is based on the shallow water equations and several rheology laws can be chosen (such as Voelmy, Coulomb). The tsunami model is also based on the shallow water equations and uses the Lax-Friedrichs scheme. The wave is not only generated by the topographic change, but also by the transfer of the granular flow momentum.

The numerical simulations are firstly conducted on the propagation of the granular flow (dry case) implementing different initial volumes. The results show good correspondence regarding the velocity and the thickness of the flow. The position and the shape of the deposit also match the observed data. Secondly, the numerical simulation incorporates various still water depths. The results fit well the measured data, in terms of landslide deposit and wave amplitude.