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Numerical simulation of two-dimensional shallow submarine avalanches and generated tsunami

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Abstract

In this work we present a 2D two-layer Savage-Hutter type model, with application to aerial or submarine avalanches over variable topography and generated tsunami. It is an extention of the model presented in [2]. The first layer is filled with a homogeneous inviscid fluid with constant density and the second layer is made of a fluidized granular mass. The two fluids (i.e. water and fluidized debris) are assumed to be immiscible. The definition of the model contains a Coulomb friction law that takes into account the buoyancy effects over the sand grains.

To discretize the model, we study different 2D high order well-balanced finite volume methods (see [1]), with a special treatment of the Coulomb friction term. Its discretization is important, to properly simulate the landslides and to preserve the stationary solutions corresponding to water at rest and no movement of the sediment layer.

Finally, we present some numerical tests, by simulating submarine and sub-aerial avalanches and the generated tsunami, as well as problems with real bathymetry.

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