Uncertainty analysis on the parameters applied to landslides-generated tsunamis

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Abstract

In this talk, we present a PVM-IFCP finite volume scheme for two-layer Savage-Hutter type model to study submarine avalanches (and generated tsunamis) where a layer composed of fluidized granular material is assumed to flow within an upper layer of an inviscid fluid (e.g. water).

A coupled hyperbolic PDE system is considered where the fluid layer is modelled by Shallow-Water equations and the sediment layer is modelled by a Savage-Hutter type model where buoyancy effects has been considered. The system is discretized using a PVM (Polynomial Viscosity Matrix) finite volume scheme. In particular we use a first order PVM scheme called IFCP (Intermediate Field Capturing Parabola) by using a suitable decomposition of a Roe matrix by means of a parabolic viscosity matrix that captures information of the intermediate fields. These methods have the advantage that they only need some information about the eigen- values of the system to be defined, and no spectral decomposition of Roe Matrix is needed.

We introduce uncertainty in the initial data using Multi-Level Monte Carlo (MLMC) algorithms introduced by Mishra-Schwab-Sukys [6, 7]. The key idea behind MLMC methods is to simultaneously draw a large number of samples on a hierarchy of nested grids. We model the uncertainty in terms of random parameters like ratio of densisites, friction between layers and Coulomb friction angle to efficiently compute the uncertainty in the solution.

Referencias

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