

A SPLITTING HIGH ORDER/MULTILAYER APPROACH FOR DRY GRANULAR FLOWS

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ABSTRACT. In this work we present a splitting method to approximate the vertical velocity profile of shallow avalanches. A combination of high order finite volume methods with a multilayer approach is considered. First, a multilayer shallow model is proposed (see [1], [3]) to approximate the Navier-Stokes equation with hydrostatic pressure and the $\mu(I)$ -rheology (see [2], [4], [5], [7]). As a result we obtain a model where the number of unknowns and equations depend on the number of layers of the vertical partition of the domain. The advantage is that the unknowns of the deduced multilayer model only depend on the horizontal coordinates. The resulting multilayer model is a parabolic system where the hyperbolic component contains nonconservative products (see [6]). These terms come from the mass and momentum transference terms between the layers of the vertical partition. Secondly, a high order finite volume method is applied to approach this new model. Finally, several numerical tests will be presented, by comparing with analytical solutions and with experimental data.

Keywords: Multilayer approach, high order finite volume method, splitting techniques, dry granular flows

Mathematics Subject Classifications (2010): 65M08, 65N08, 74S10, 76M12, 76T25.

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