A $\mu(I)$-rheology multilayer model for dry granular flows

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In this work we present a method to approximate the Navier-Stokes equations with free surface, hydrostatic pressure and the $\mu(I)$-rheology. A dimensional analysis is introduced and a first order multilayer model is proposed. The multilayer model can be seen as a discretization of the full model in the normal direction to the slope. Being the main advantages the low computational cost to simulate flows with free surface. A comparison with steady uniform Bagnold flows and laboratory experiments with a non-constant normal profile of the downslope velocity demonstrates the accuracy of the proposed approximation.