Sensitivity to the rheology and geometry of granular collapses by using the mu(I) rheology

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Résumé

We introduce a numerical method for the 2D and 3D simulation of dense granular column collapses using the mu(I) inertial rheology. A sensitivity analysis of column deformation to the mu(I) model parameters is performed, showing that the inverse static friction parameter mostly controls the final deformation. Our computations show that the mu(I) inertial rheology is able to predict the different regimes of relative spreading as a function of aspect ratio a previously observed experimentally: aˆ1, aˆ{_˜0.66} and aˆ{_˜0.5} scalings for, respectively, slumping for low aspect ratio, 2D and 3D spreading regimes for high aspect ratio. We show that the sublinear scalings for high aspect ratio spreadings are due to an extra dissipation at the impact of the falling granular column. Finally we introduce the relative grain diameter as an additional dimensionless parameter that, for a fixed aspect ratio, increases the inertial number and then decreases the relative spreading.

Mots-Clés: Rheology, Granular Matter, Dam Break, Numerical Simulation

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