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A Robust Numerical Method for Compressible Dense Granular Flows RYAN HOUIM, ELAINE ORAN, Department of Aerospace Engineering, University of Maryland — Dense granular flows are important for problems such as coal mine explosions or interior ballistics in which flow compressibility and the presence of shocks are important. Numerical solutions of such flows has been plagued with difficulties arising from non-conservative nozzling terms, which are often neglected for numerical convenience. The "cure" has been to use highly dissipative numerical methods to avoid instability when the non-conservative terms physically must be included. Second-order methods or even refining the grid can reintroduce these numerical instabilities. We developed a robust and high-order numerical method for solving dense granular flows in highly compressible situations that circumvents these problems. The technique has been verified on a number of test problems including advection of a granular material interface, granular shocks, and transmission angles of oblique compaction waves. The method has been demonstrated in challenging situations where a shock impacts a dense layer of dust on very fine meshes approaching the continuum limit of the granular phase.

Ryan Houim
Department of Aerospace Engineering, University of Maryland

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