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Multi-dimensional Shock Fluidization of Particle Assemblies SVETLANA SUSHCHIKH, VLADIMIR MITKIN, CHIH-HAO CHANG, THEO THEOFANOUS, UCSB — We present new kinds of experiments that resolve the transient dynamics of shock-fluidized particle (glass, lead) assemblies in 1D and 2D geometries, covering both subsonic and supersonic after-shock flows (shock Mach numbers 1.5 to 2.5). From high speed video records time-wise evolutions of particle number densities could be recovered, as on this basis complete clouds (with spatially-distributed particle number densities) could be reconstructed at various positions along the flow channel, up to 1.3 m away from the point of initial interaction. We also discuss numerical simulations, based on a two-fluid model made consistently hyperbolic over the complete range of Mach numbers, thus allowing the grid-refinements needed to capture sharp density gradients at such intense flow conditions. These simulations are a priory in that the only constitutive law is for the drag coefficient; it is obtained from single- particle tests and direct numerical simulations, augmented with standard approaches to account for particle proximity effects. These simulations are in excellent agreement with the experiments, and so are shown to be sample, initial results of overall cloud dynamics in explosive dissemination of bulk liquids (10's of kilogram quantities, km/s speeds).

Svetlana Sushchikh UCSB

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