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Early motion in a rapidly decompressed particle bed HEATHER ZUNINO, RONALD ADRIAN, AMANDA CLARKE, Arizona State University — Rapid expansion of dense, pressurized beds of fine particles subjected to rapid reduction of the external pressure is studied in a vertical shock tube. Located at bottom of a high pressure chamber below the shock tube diaphragm, a particle bed expands when the diaphragm bursts, releasing a near-sonic expansion wave that impinges on the particle bed-gas interface. The expansion wave presents a very rapid unloading to the particle bed. A high-speed video camera and pressure sensors capture events occurring during bed expansion. Interesting structures during the first few milliseconds include two-dimensional instabilities of the particle bed's surface and roughly spatially periodic regions void of particles within the bed. One-dimensional and two-dimensional Fourier analyses are used to measure their frequencies in space-time. It is found that the frequencies and patterns exhibit a clear dependence on particle diameter in which cell frequency decreases and cell size increases with increasing particle size. This work is supported by the U.S. Department of Energy, National Nuclear Security Administration, Advanced Simulation and Computing Program, as a Cooperative Agreement under the Predictive Science and Academic Alliance Program, under Contract No. DE-NA0002378.

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