Abstract Submitted
for the DFD19 Meeting of
The American Physical Society

Analysis of Blast Driven Instability and Mixing from the Energetic Dispersal of a Perturbed Particle Bed FREDERICK OUELLET, RAHUL BABU KONERU, JOSHUA GARNO, S. BALACHANDAR, University of Florida, BERTRAND ROLLIN, Embry-Riddle Aeronautical University — The evolution of particle clouds following interactions with a blast wave and contact interface resulting from detonating a high-energy explosive is a difficult problem for both numerical simulations and physical experiments. Experimentally, it is challenging to accurately characterize the initial states of both the explosive and the surrounding particle bed. Limitations also exist in the available diagnostic tools and measurable data which can be extracted from experiments. Thus, simulations can be a cheaper method to analyze the physics governing the interactions between the expanding particle cloud and the highly compressible, post-detonation fluid flow. Using multiphase, compressible flow simulations in an Eulerian-Lagrangian frame, the impact of perturbing a particle bed surrounding an explosive charge is analyzed. The analysis focuses on the multiphase instabilities and late-time behavior displayed by the dispersing particle cloud and discusses the associated underlying physical phenomena. Effects of the instabilities on the mixing behavior of the detonation products with the surrounding air are also discussed. The perturbations are varied to unravel the effects of the initial particle distribution and its persistence in the late time particle cloud and the background fluid flow. Inspired by work on two-fluid interfacial instabilities, this study relates to work in the emerging field of shock-driven multiphase instabilities but at extreme conditions and moderate initial particle loadings.

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Date submitted: 30 Jul 2019 Electronic form version 1.4