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Blast Driven Multiphase Instability 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 a particle cloud following its interaction with a blast wave and contact interface resulting from the detonation of an explosive material is an extremely challenging problem for both numerical simulations and physical experiments. Experimentally, it is difficult to accurately characterize the initial states of both the explosive and a surrounding particle bed. Limitations also exist in the available diagnostic tools and measurable data which can be extracted from experiments. This allows numerical simulations to be a cheaper alternative to analyze mechanisms which govern the interactions between the expanding particle cloud and the highly compressible, post-detonation fluid flow. This work uses multiphase, compressible flow simulations in an Eulerian-Lagrangian frame to analyze the effects of perturbing a uniformly distributed particle bed surrounding an explosive charge. The analysis focuses on the multiphase instabilities and late-time behavior displayed by the particle cloud as it disperses and discusses the underlying physical phenomena associated with the instability. Increasingly complex perturbations are used 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 similar two-fluid interfacial instabilities, this study relates to other, previous work in the emerging field of shock-driven multiphase instabilities but at more extreme conditions and at higher, but still moderate, initial particle loadings.

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