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Importance of Unsteady Force and Heating to Particle Dispersal by Shock/Detonation Waves YUE LING, ANDREAS HASELBACHER, S. BALACHANDAR, University of Florida, COMPUTATIONAL MULTIPHYSICS GROUP TEAM — Particle dispersal by shock/detonation waves is a challenging problem due to the complex interactions between the particles and the compressible flow features that must be captured rigorously in modeling and simulations. Previous experiments and direct numerical simulations have shown that the particle force and heating can be much larger than those predicted by the standard quasi-steady correlations, but little work has been done to improve the inter-phase interaction models. Based on recent research advances in our understanding of particle force and heating in compressible flows, this work proposes a rigorous inter-phase interaction model for unsteady compressible multiphase flows that includes all the unsteady contributions to the particle force and heating. The model is applied to investigate the particle dispersal in the classical explosion problems considered by Brode (J. Appl. Phys. 1955 and Phys.Fluids 1959) using the Eulerian-Lagrangian approach. The peak values and the overall effects are used to measure the importance of unsteady force and heating contributions. The simulation results show that ignoring compressibility and unsteady force and heating contributions in the inter-phase interaction model introduce significant errors.

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