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Particle Dispersal in Rapid Expanding Gas Flow: Importance of Unsteady Force and Heat Transfer YUE LING, ANDREAS HASELBACHER, S. BALACHANDAR, University of Florida — When a highly compressed gas-particle mixture is suddenly released, the particles will be dispersed outward in very high speed driven by the rapid expanding gas. This is a phenomenon which can be observed in nature, such as volcanic eruption, and many industrial applications, such as detonation of multiphase explosives. The unsteady compressible nature of the gas flow coupled with the motion of dispersing particles makes accurate prediction of particle behavior challenging. The unsteady force and heat transfer become very important in the momentum and energy transfer between the gas and particle phases. A multiphase flow model is suggested to simulate this problem by Eulerian-Lagrangian approach. The significance of the unsteady force and heat transfer to the quasi-steady force and heat transfer are first justified by using the presented model to solve the problem of shock-particle interaction. The peak values and the total impulses of different forces and heat transfers show that the unsteady force and heat transfer are important. Then the multiphase model will be used to solve the problem of particle dispersal in rapid expanding flow. This problem can be viewed as an extension of the classic problem considered by Brode H. L. (J. Appl. Phys., Vol. 26, 1955, pp. 766-775). One-way coupled simulations are carried out for several initial conditions and particle properties.

S. Balachandar
University of Florida

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