Abstract Submitted
for the DFD11 Meeting of
The American Physical Society

Numerical modeling of the early interaction of a planar shock with a dense particle field JONATHAN REGELE, GUILLAUME BLANQUART, California Institute of Technology — Dense compressible multiphase flows are of interest for multiphase turbomachinary and energetic material detonations. Still, there is little understanding of the detailed interaction mechanisms between shock waves and dense (particle volume fraction $\alpha_d > 0.001$) particle fields. A recent experimental study [Wagner et al, AIAA Aero. Sci., Orlando, 2011-188] has focused on the impingement of a planar shock wave on a dense particle curtain. In the present work, numerical solutions of the Euler equations in one and two dimensions are performed for a planar shock wave impinging on a fixed particle curtain and are compared to the experimental data for early times. Comparison of the one- and two-dimensional results demonstrate that the one-dimensional description captures the large scale flow behavior, but is inadequate to capture all the details observed in the experiments. The two-dimensional solutions are shown to reproduce the experimentally observed flow structures and provide insight into how these details originate.

Jonathan Regele
California Institute of Technology

Date submitted: 29 Jul 2011 Electronic form version 1.4