Abstract Submitted
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Shock Interacting with Isolated and Random Distribution of Particles in Water[1] JACOB BEHRENDT, S. BALACHANDAR, University of Florida, T. MCGRATH, NSWC Indian Head EODTD, UNIVERSITY OF FLORIDA TEAM, NSWC INDIAN HEAD EODTD COLLABORATION — In this work, particle resolved 3-D inviscid simulations of an underwater planar shock interacting with an isolated particle and a random distribution of stationary particles are considered. The purpose of this study will help evaluate the accuracy of the current point-particle drag models used for predicting force on a particle subjected to a planar shock in water using non-ideal stiffened gas equation of state. We assume that the flow is inviscid in nature and governed by the Euler equations of gas dynamics. The simulations were performed for a range of incident shock Mach number. The early-time forces are of interest in this project allowing the particles to be fixed in space. We show that the standard quasi-steady models do not fully capture the non-monotonic forces acting on the particle. With an improved theory that accounts for unsteady force contributions, we can accurately predict the forces for a single particle. Based on the findings, the simulations have been extended to shock propagation in water over a random array of particles distributed at varying volume fraction, and the isolated particle can be considered as the zero volume fraction limit.

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