Abstract Submitted
for the DFD17 Meeting of
The American Physical Society

Fully resolved simulations of expansion waves propagating into particle beds[1] GORAN MARJANOVIC, JASON HACKL, SUBRAMANIAN ANNAMALAI, THOMAS JACKSON, S. BALACHANDAR, University of Florida — There is a tremendous amount of research that has been done on compression waves and shock waves moving over particles but very little concerning expansion waves. Using 3-D direct numerical simulations, this study will explore expansion waves propagating into fully resolved particle beds of varying volume fractions and geometric arrangements. The objectives of these simulations are as follows: 1) To fully resolve all (1-way coupled) forces on the particles in a time varying flow and 2) to verify state-of-the-art drag models for such complex flows. We will explore a range of volume fractions, from very low ones that are similar to single particle flows, to higher ones where nozzling effects are observed between neighboring particles. Further, we will explore two geometric arrangements: body centered cubic and face centered cubic. We will quantify the effects that volume fraction and geometric arrangement plays on the drag forces and flow fields experienced by the particles. These results will then be compared to theoretical predictions from a model based on the generalized Faxen's theorem.

[1]This work was supported in part by the U.S. Department of Energy under the Predictive Science Academic Alliance Program, under contract no. DE-NA0002378

Goran Marjanovic
University of Florida

Date submitted: 01 Aug 2017 Electronic form version 1.4