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Exascale Simulations For Exploring The Physics of Expanding Bed of Particles[1] S BALACHANDAR, University of Florida, DAVID ZWICK, Sandia National Laboratories — In this work we present simulations of the rapid depressurization of a particle bed in a gas shock tube. Historically, experiments of this nature have been used as a laboratory surrogate for volcanic eruptions. The present simulations use a state-of-the-art Euler-Lagrange (EL) approach to discretize the governing equations through the coupling of the discontinuous Galerkin (DG) and discrete element methods (DEM). Appropriate numerical parameters for the EL equations were selected through numerous low-fidelity simulations and used in three high-fidelity simulations. The results are compared and contrasted with experimental observations to explain various physical phenomena. The DG and DEM codes are open-source and highly-scalable, with proven scalability to more than one hundred thousand processors. Exascale trends also suggest exceptional scalings on future architectures

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