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Understanding Grain-Scale Mechanisms in Dynamic Compaction of Granular Materials MICHAEL HOMEL, ERIC HERBOLD, DARREN PAGAN, JONATHAN LIND, RYAN HURLY, RYAN CRUM, MINTA AKIN, Lawrence Livermore National Laboratory, LAWRENCE LIVERMORE NATIONAL LABORATORY TEAM — X-ray analysis of granular materials has produced detailed images of grain-scale deformation and failure during high-rate compaction. These experimental results guide the development of continuum constitutive models for granular materials, providing a connection between micromechanical behavior and bulk material response. To interpret the results it is necessary to distinguish between observed phenomena that are intrinsic physical properties of the granular material, and those that are merely artifacts of the test geometry or loading conditions. We perform detailed mesoscale simulations of the experiments, using our recently developed damage-field gradient partitioning approach for simulating fracture and frictional contact in the material point method (MPM). With this approach we have demonstrated a capability to produce mesh-independent predictions of particle size distributions in simulations of comminution of brittle materials. Implications on continuum constitutive model development are discussed. This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344 and was supported by LLNL Laboratory Directed R&D Program (tracking no. 16-ERD-010).

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