Abstract Submitted
for the SHOCK17 Meeting of
The American Physical Society

Simulations and Experiments of Dynamic Granular Compaction in Non-ideal Geometries[1] MICHAEL HOMEL, ERIC HERBOLD, JOHN LIND, RYAN CRUM, RYAN HURLEY, MINTA AKIN, Lawrence Livermore National Laboratory, DARREN PAGAN, Cornell University, LLNL TEAM — Accurately describing the dynamic compaction of granular materials is a persistent challenge in computational mechanics. Using a synchrotron x-ray source we have obtained detailed imaging of the evolving compaction front in synthetic olivine powder impacted at $300 - 600 m/s$. To facilitate imaging, a non-traditional sample geometry is used, producing multiple load paths within the sample. We demonstrate that (i) commonly used models for porous compaction may produce inaccurate results for complex loading, even if the $1 - D$, uniaxial-strain compaction response is reasonable, and (ii) the experimental results can be used along with simulations to determine parameters for sophisticated constitutive models that more accurately describe the strength, softening, bulking, and poroelastic response. Effects of experimental geometry and alternative configurations are discussed. Our understanding of the material response is further enhanced using mesoscale simulations that allow us to relate the mechanisms of grain fracture, contact, and comminution to the macroscale continuum response. Numerical considerations in both continuum and mesoscale simulations are described.

[1]This work was performed under the auspices of the U.S. Department of Energy by Lawrence Livermore National Laboratory under Contract DE-AC52-07NA27344. LDRD#16-ERD-010. LLNL-ABS-725113.

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Date submitted: 24 Feb 2017 Electronic form version 1.4