Abstract Submitted
for the SHOCK15 Meeting of
The American Physical Society

On mesoscale methods to enhance full-stress continuum modeling of porous compaction[1] ERIC B. HERBOLD, DAMIAN C. SWIFT, RICHARD G. KRAUS, MICHAEL HOMEL, HECTOR E. LORENZANA, Lawrence Livermore National Laboratory — The dynamic compaction of initially porous material is typically treated in continuum dynamics simulations via adjustments to the scalar equation of state (EOS) of the bulk, porous material relative to that of the solid. However, the behavior during compaction is governed by inelastic processes, as the solid material deforms, largely by shearing, to fill the voids. The resulting response depends on the strain path, e.g. isotropic versus uniaxial loading. Adjustments to the EOS are therefore fundamentally unsuited to describing porous compaction, and it is desirable to consider porous effects through the stress and strain tensors. We have investigated porous modifications to continuum strength models, designed to reproduce elastic wave speeds in porous materials and the crush response observed experimentally during compaction. We have performed mesoscale simulations, resolving the microstructure explicitly, to guide the construction of continuum models. These simulations allow us to study the interplay between strength and EOS in the solid, the extent of dissipative flow versus non-dissipative displacement, and the evolution of porosity and micro-morphological features can be captured.

[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.

Damian Swift
Lawrence Livermore National Laboratory

Date submitted: 09 Feb 2015 Electronic form version 1.4