Abstract Submitted
for the SES10 Meeting of
The American Physical Society

Formulation of Macroscale Compaction Dynamics based on Mesoscale Simulations of Uniaxial Waves in Granular Explosive[1] SUNADA CHAKRAVARTHY, KEITH A. GONTHIER, Louisiana State University, Baton Rouge, LA 70803 — A macroscale continuum theory for Deflagration-to-Detonation Transition (DDT) in granular explosive is generalized to account for the simultaneous existence of an arbitrary number of condensed phases. The theory assumes phase separation, and allows for flexible partitioning of dissipation between phases in a thermodynamically consistent manner. The constitutive theory is complex and requires descriptions for dissipation partition functions, relaxation rate functions, and phase-specific parameters that are not well-characterized, particularly for dynamic loading. A key focus of this study is to formulate expressions for phase-specific intergranular stresses and compaction potential energies based on mesoscale simulations of uniaxial compaction waves because of their importance to compaction induced heating and combustion. Predictions will be compared to quasi-static compaction data for granular HMX.

[1]This work was supported in part by the Defense Threat Reduction Agency, Basic Research Award # HDTRA1-10-1-0018, to Louisiana State University, and the Air Force Research Laboratory, AFRL/RWK, Research Award # FA8651-09-1-0021, Eglin AFB, Florida.

Sunada Chakravarthy
Louisiana State University, Baton Rouge, LA 70803

Date submitted: 24 Aug 2010 Electronic form version 1.4