Abstract Submitted
for the DFD07 Meeting of
The American Physical Society

**Numerical Modeling of Detonation Initiation Using Acoustic Time Scale Heat Deposition** JONATHAN REGELE, OLEG VASILYEV, DAVID KASSOY, University of Colorado at Boulder — Localized thermal power deposition of limited duration into a reactive gas is the initiator for deflagration to detonation transition (DDT) on the microsecond time scale. Numerous spatial and temporal scales are involved in these problems making them computationally challenging. These scenarios are modeled with a newly developed shock capturing scheme that utilizes the computational efficiency of the Adaptive Wavelet-Collocation Method (AWCM). With this technique it possible to perform simulations with over 100 grid points per steady-state half-reaction length, ensuring the transient dynamics leading to detonation initiation are well resolved. Previous one-dimensional studies have demonstrated the basic sequence of events that are needed in order for a DDT process to occur. Instead of starting with a strong shock-coupled reaction zone, the initial pulse is weak enough to allow the shock and the reaction zone to decouple. Reflected compression waves generated by the inertially confined reaction zone lead to localized reaction centers, which eventually explode and further accelerate the process. Eventually a shock-coupled reaction zone forms an initially overdriven detonation, which relaxes to a steady CJ wave. New two-dimensional results using a cylindrical heat deposition in a channel demonstrate the same sequence of events, verifying the concepts of the one-dimensional work.

Jonathan Regele
University of Colorado, Boulder

Date submitted: 03 Aug 2007 Electronic form version 1.4