Abstract Submitted
for the DFD15 Meeting of
The American Physical Society

Direct Numerical Simulation of Richtmeyer-Meshkov Instability Using pWAMR[1] TEMISTOCLE GRENGA, SAMUEL PAOLUCCI, University of Notre Dame — The parallel Wavelet Adaptive Multiresolution Representation (pWAMR) method is used to simulate the Richtmyer-Meshkov instability caused by a shock interacting with a density-stratified interface. The physical problem is studied in several configurations. We present results of numerical studies that investigate the influence of initial condition parameters (amplitude and wavelength of perturbations) on mixing and transition. In addition, the evaluation of turbulence statistics provides a measure of the mixing across the scales and the correlation with the initial condition parameters. The problem is modeled using the compressible reactive Navier-Stokes equations for a gas mixture, including multi-component diffusion, Soret and Dufour effects, and state dependent thermodynamic and transport properties. Since the amplitudes of wavelets provide a direct measure of the local error, the method is able to efficiently capture to any desired accuracy a wide range of spatial scales using a relatively small number of degrees of freedom by evolving the dynamically adaptive grid. In an effective fashion, the multilevel structure of the algorithm provides a simple way to adapt computational refinements to local demands of the solution, thus automatically producing verified solutions.

[1]Supported by C-SWARM through the Department of Energy, National Nuclear Security Administration, under Award Number DE-NA0002377.

Samuel Paolucci
University of Notre Dame

Date submitted: 22 Jul 2015 Electronic form version 1.4