MAR06-2005-005260

Abstract for an Invited Paper
for the MAR06 Meeting of
the American Physical Society

From solitons to shocks: entropy generation and quasi-isentropic compression

ROGER MINICH, LLNL

Recently a number of experimental platforms have demonstrated the ability to produce stress waves that have thermodynamic paths intermediate between an ideal isentrope and the Hugoniot. It is of interest to quantify the entropy generated for a given path in order to accurately determine the equation of state. Stationary propagating structures known as solitons have recently been observed in particle velocity time histories and provide insight as to how entropy is generated in quasi-isentropic flows. The origin of the structures is discussed in terms of dispersion and dissipation and a metric for quantifying the entropy generated is derived. A generalization of Lagrangian analysis is presented that allows an experimental determination of the relative contributions of nonlinear steepening, dispersion and dissipation. Finally, wavelet analysis is introduced as a powerful tool for the quantification of nonlinear wave dispersion and energy dissipation.