Abstract Submitted
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Verification Test Problems BILL MORAN, Lawrence Livermore National Laboratory — We present analytic solutions to two test problems that can be used to check the hydrodynamic implementation in computer codes designed to calculate the propagation of shocks in spherically convergent geometry. Our analysis is restricted to fluid materials with constant bulk modulus. In the first problem we present the exact initial acceleration and pressure gradient at the outer surface of a sphere subjected to an exponentially decaying pressure of the form $P(t) = P_0 e^{-\alpha t}$. We show that very-finely-zoned hydro-code simulations are in excellent agreement with our analytic solution. In the second problem we discuss the implosions of incompressible and compressible spherical shells. For the incompressible case, we present the velocity time-history at the inner and outer surfaces of the shell and the radial pressure profile across the shell thickness. We also present a semi-analytic solution to the time-evolution of a nearly spherical shell with arbitrary but small initial 3-dimensional (3-D) perturbations on its inner and outer surfaces. We show that 3-D hydro-code calculations converge to the semi-analytic solution as the resolution increases in the hydro-code. For the compressible case we present the initial conditions that lead to a shock-less acceleration and a time evolution very similar to the incompressible case.

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