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Quasi-Similar Converging Shock Flows for a Mie-Gruneisen Equation of State EMMA SCHMIDT, SCOTT RAMSEY, ROY BATY, Los Alamos National Laboratory — The Guderley hydrodynamic test problem is an example of a self-similar, scale-invariant solution of the inviscid Euler equations. It consists of an infinitely strong shock wave converging to an axis or point of symmetry, where the defined flow has the notable property of being independent of a system of units. A key piece of the self-similar analysis is selecting a material that exhibits scale invariant behavior. The symmetry properties of the Euler equations have been used by several authors to determine the general form of an equation of state (EOS) that permits the existence of scale-invariant solutions. However many widely used EOSs, such as the Mie-Gruneisen EOS for crystalline solids, are not of the required form. We propose a joint similarity-perturbative analysis that modifies the classical self-similar solutions of the Euler equations to represent non-ideal material behavior, and perform the quasi-similar analysis of the Guderley problem in a non-ideal material defined by the Mie-Gruneisen EOS. LA-UR-19-27159.

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