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Converging Shock Flows in a Mie-Gruneisen Material SCOTT RAMSEY, EMMA SCHMIDT, ZACHARY BOYD, JENNIFER LILIEHOLM, ROY BATY, Los Alamos National Laboratory — Previous work has shown that the one-dimensional (1D) inviscid Euler equations admit a variety of scale-invariant solutions when the included equation of state (EOS) closure model assumes a certain scale-invariant form. However, this scale-invariant EOS class does not include even simple models used for shock compression of crystalline solids, including many broadly applicable representations of Mie-Gruneisen EOS. This incompatibility naturally arises from the presence of multiple dimensional scales in the Mie-Gruneisen EOS. The current work uses a scale-invariant EOS model to approximate a Mie-Gruneisen EOS form. To this end, the adiabatic bulk modulus for the Mie-Gruneisen EOS is constructed, and its key features are used to motivate the selection of a scale-invariant approximation form. The approximate adiabatic bulk modulus is used in conjunction with the 1D inviscid Euler equations to calculate a semi-analytical, Guderley-like imploding shock solution in a metal sphere, and to determine if and when the solution may be valid for the underlying Mie-Gruneisen EOS.

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