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High-order methods for plastic deformation in multi-material Richtmyer-Meshkov instabilities[1] MICHAEL ADLER, JACOB WEST, SANJIVA LELE, Stanford University — Shock-wave / material-interface interactions are key phenomena in a variety of high-velocity material impact, detonation, and inertial confinement fusion applications. We present recent developments of a high-order method for Eulerian simulation of material undergoing large elasto-plastic deformation that is focused toward simulating these interactions. Particular emphasis is laid on new advancements of the methods for solving the kinematic equations describing plastic deformation and the associated strain hardening of the material. The accuracy and stability of a variety of treatments for these kinematic equations are explored in the context of a test suite of developing Richtmyer-Meshkov instabilities between two materials with finite strength. Superior stability is demonstrated for methods based on the plastic deformation Finger tensor as opposed to methods based on the inverse deformation gradient tensors. The underlying numerical methods utilize a tenth-order compact-difference scheme; in this context, a new application of the Localized Artificial Diffusivity (LAD) method that facilitates capturing of strain discontinuities in the kinematic equations is also discussed.

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