Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Higher-Order Advection-Based Remap of Magnetic Fields in an Arbitrary Lagrangian-Eulerian Code[1] BRIAN CORNILLE, University of Wisconsin-Madison, DAN WHITE, Lawrence Livermore National Laboratory — We will present methods formulated for the Eulerian advection stage of an arbitrary Lagrangian-Eulerian code for the new addition of magnetohydrodynamic (MHD) effects. The various physical fields are advanced in time using a Lagrangian formulation of the system. When this Lagrangian motion produces substantial distortion of the mesh, it can be difficult or impossible to progress the simulation forward. This is overcome by relaxation of the mesh while the physical fields are frozen. The code has already successfully been extended to include evolution of magnetic field diffusion during the Lagrangian motion stage. This magnetic field is discretized using an H(div) compatible finite element basis. The advantage of this basis is that the divergence-free constraint of magnetic fields is maintained exactly during the Lagrangian motion evolution. Our goal is to preserve this property during Eulerian advection as well. We will demonstrate this property and the importance of MHD effects in several numerical experiments. In pulsed-power experiments magnetic fields may be imposed or spontaneously generated. When these magnetic fields are present, the evolution of the experiment may differ from a comparable configuration without magnetic fields.

[1]Prepared by LLNL under Contract DE-AC52-07NA27344. Supported by DOE CSGF under grant number DE-FG02-97ER25308.

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Date submitted: 11 Jul 2017 Electronic form version 1.4