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Extended generalized Lagrangian multipliers for magnetohydrodynamics using adaptive multiresolution methods[1] MARGARETE O. DOMINGUES, ANNA KARINA F. GOMES, Laboratorio Associado de Computacao e Matematica Aplicada, Instituto Nacional de Pesquisas Espaciais (INPE), Sao Jose dos Campos, Sao Paulo, Brazil, ODIM MENDES, Instituto Nacional de Pesquisas Espaciais (INPE), Av. dos Astronautas 1758, 12227-010 Sao Jose dos Campos, Sao Paulo, Brazil, KAI SCHNEIDER, M2P2-CNRS & CMI, Aix-Marseille Universite, Marseille, France — We present a new adaptive multiresoltion method for the numerical simulation of ideal magnetohydrodynamics. The governing equations, i.e., the compressible Euler equations coupled with the Maxwell equations are discretized using a finite volume scheme on a two-dimensional Cartesian mesh. Adaptivity in space is obtained via multiresolution analysis, which allows the reliable introduction of a locally refined mesh while controlling the error. The explicit time discretization uses a compact Runge-Kutta method for local time stepping and an embedded Runge-Kutta scheme for automatic time step control. An extended generalized Lagrangian multiplier approach with the mixed hyperbolic-parabolic correction type is used to control the incompressibility of the magnetic field. Applications to a two-dimensional problem illustrate the properties of the method. Memory savings and numerical divergences of the magnetic field are reported and the accuracy of the adaptive computations is assessed by comparing with the available exact solution.

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