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**Eigenmode Tests of Improved Basis Functions for NIMROD**[1] C.R. SOVINEC, University of Wisconsin-Madison — The spectral-element basis functions used in the standard NIMROD implementation are appropriate for fluid-based models with dissipation in each equation [JCP 195, p 355]. However, realistic levels of dissipation can be negligible at computationally practical spatial resolution. One- and two-dimensional ideal-MHD eigenmode computations with the CYL_SPEC and NIMEIG codes demonstrate the effectiveness of different numerical representations for extended-MHD. Keeping all variables that are required for a dissipative, first-order in time system constrains the possible formulations. The eigenmode computations produce favorable results for a vector representation that responds to divergence at all scales. A numerical penalty term that is sensitive to parallel vorticity is adapted from the penalty method described in [Degtyarev and Medvedev, CPC 43, p 29]. The new method retains the first-order in time formulation, responds only to scales near the limit of the spatial representation, and yields convergence on localized interchange from the stable side.

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