Abstract Submitted
for the DPP06 Meeting of
The American Physical Society

**Two-fluid modeling with the NIMROD code**[1] C.R. SOVINEC, D.D. SCHNACK, University of Wisconsin, D.C. BARNES, University of Colorado, D.P. BRENNAN, University of Tulsa, NIMROD TEAM — Many applications of macroscopic simulation are incomplete without two-fluid effects, the most important of which are magnetization flows and fast reconnection. Nonetheless, they have rarely been included in global simulations, primarily due to temporal stiffness. Here, we briefly review an implicit leapfrog algorithm that has been developed for the NIMROD code and describe benchmarks and initial applications. The model includes the magnetization flows found in the Braginskii equations, and it has a two-fluid Ohm's law that reproduces dispersive waves and fast reconnection. Nonlinear computation is applied to modeling dynamo in sheared-slab and cylindrical configurations, where the former focuses on single-helicity dynamics, and the latter shows multi-helicity coupling. Open-field configurations relevant for spheromaks are also considered. Finally, we describe two-fluid modeling of edge-localized modes in the DIII-D tokamak at General Atomics.

[1]Work supported by the U.S. Dept. of Energy.

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Date submitted: 21 Jul 2006 Electronic form version 1.4