Abstract Submitted
for the DPP05 Meeting of
The American Physical Society

Numerical Simulation of Two-Fluid Dynamo Effects Driven by Tearing Instabilities HAO TIAN, CARL SOVINEC, University of Wisconsin-Madison — Simulations of the nonlinear evolution of current-driven tearing instabilities in slab geometry are run to investigate the two-fluid dynamo effects. The study is conducted with the NIMROD code [1] applied in the large guide-field limit. In the $\beta = 0$ cold plasma case, the reported simulations used an unphysically small equilibrium scale length L that is much smaller than the ion skin depth c/ω_{pi} to emphasize two-fluid effects. The hot plasma case with finite β values and ion sound gyroradius larger than the resistive skin depth is also considered. We verify the role of dispersive whistler and kinetic Alfven dynamics in decoupling the ion and electron flow at small scales, which allows the fast connection in the two-fluid plasmas. Linear simulation results are compared with two-fluid quasilinear calculations [2], which show that the dynamo effect driven by the $< \vec{J} \times \vec{B} >$ Hall term is greater than the contribution from the MHD dynamo term, $< \vec{V} \times \vec{B} >$, in the narrow electron layer. We also present two-fluid dynamo effects through the nonlinear saturation stage where the Hall contribution broadens to the ion spatial scale.

[1] C.R.Sovinec *et al.*, J.Comput.Phys, 355 (2004)
[2] V.V.Mirnov *et al.*, Phys.Plasmas 11, 4468 (2004)

Hao Tian
UW-Madison

Date submitted: 22 Jul 2005 Electronic form version 1.4