Abstract Submitted
for the DPP17 Meeting of
The American Physical Society

Application of electron closures in extended MHD[1] ERIC HELD, BRETT ADAIR, TREVOR TAYLOR, Utah State University — Rigorous closure of the extended MHD equations in plasma fluid codes includes the effects of electron heat conduction along perturbed magnetic fields and contributions of the electron collisional friction and stress to the extended Ohms law. In this work we discuss application of a continuum numerical solution to the Chapman-Enskog-like electron drift kinetic equation [2] using the NIMROD code. The implementation is a tightly-coupled fluid/kinetic system that carefully addresses time-centering in the advance of the fluid variables with their kinetically-computed closures. Comparisons of spatial accuracy, computational efficiency and required velocity space resolution are presented for applications involving growing magnetic islands in cylindrical and toroidal geometry. The reduction in parallel heat conduction due to particle trapping in toroidal geometry is emphasized.

[1]Work supported by DOE under grant nos. DE-FC02-08ER54973 and DE-FG02-04ER54746
[2]J. J. Ramos, Phys Plasmas 17, 082502 (2010).

Eric Held
Utah State University

Date submitted: 14 Jul 2017 Electronic form version 1.4