Abstract Submitted
for the DPP11 Meeting of
The American Physical Society

The Linear Stability of the ITG Mode using the NIMROD Code[1]

DALTON SCHNACK, PING ZHU, CARL SOVINEC, CHRIS HEGNA, University of Wisconsin - Madison — We demonstrate that the linear instability of the Ion Temperature Gradient (ITG) mode can be computed with the extended MHD code NIMROD. The ITG is related to a parallel sound wave that is destabilized by two-fluid and FLR effects in the presence of an ion temperature gradient. It can be unstable in configurations that are otherwise ideal and resistive MHD stable. We show analytically that the ITG can be described in slab geometry using both two-fluid (separate electron and ion equations) and the equivalent single fluid (center of mass) form that is solved in NIMROD. These analytic calculations use the local approximation and the ballooning ordering. They include the Braginskii ion gyro-viscous stress tensor that encapsulates the lowest order ion FLR effects. Linear two fluid/FLR numerical calculations with the NIMROD code, which does not employ either the local approximation or the ballooning ordering, are in reasonable agreement with the predicted growth rates and marginal points. Therefore, the extended MHD model used in NIMROD is capable of capturing the effects of this instability within the context of global fluid simulations.

[1]Work supported by U. S. D. O. E.

Dalton Schnack
University of Wisconsin - Madison

Date submitted: 14 Jul 2011 Electronic form version 1.4