Abstract Submitted
for the DPP12 Meeting of
The American Physical Society

Application/extension of the Landau-fluid approach for energetic particle instabilities in stellarators and tokamaks[1] DON SPONG, Oak Ridge National Laboratory — Reduced dimensionality Landau-fluid models have been useful due to their computational efficiency and ease at evaluating the effects of different physics assumptions. Different challenges are present (global mode structure, finite orbit widths, non-Maxwellian distributions) in applying these methods to EP-driven instabilities than for applications to core micro-turbulence. The TAEFL model has demonstrated that Landau closure methods can be used to introduce the linear resonances that drive Alfvèn (AE) instabilities; this model has recently been extended to include coupling to acoustic waves, and higher order EP moments (providing the flexibility needed for analysis of non-Maxwellian distribution functions). Also, a second-order nonlinear stepper has been implemented (allowing simulation of AE growth/decay cycles) and an eigenvalue solver version for 3D configurations is under development using parallel solvers. Recent applications have included RSAE to TAE frequency sweeps, JET antenna damping measurements, edge and core localized AE's, alpha-driven instabilities in ITER, V&V studies, and EP instabilities in stellarators (HAE, RSAE, TAE) and RFP's. These applications and the ongoing extensions to the model will be discussed.

[1]Research sponsored by the U.S. Department of Energy under Contract DE-AC05-00OR22725 with UT-Battelle, LLC.

Don Spong
Oak Ridge National Laboratory

Date submitted: 13 Jul 2012 Electronic form version 1.4