Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Drift-kinetic electron description with low-collisionality and slow-dynamics orderings[1] J.J. RAMOS, M.I.T. Plasma Science and Fusion Center, J.D. CALLEN, C.C. HEGNA, University of Wisconsin-Madison — An electron drift-kinetic formalism is developed, with the aim of obtaining a closure of the fluid equations for slow macroscopic instabilities in low-collisionality plasmas, including applied RF wave sources. The analysis follows an expansion in the ratio between the ion sound gyroradius and the macroscopic lengths, under a low-collisionality ordering scheme whereby the ratios between ion collision and cyclotron frequencies and between electron and ion masses are taken as second order. This results in a hierarchy of time scales such that, relative to the ion cyclotron frequency, the electron collision frequency and the MHD frequencies are first order, the ion collision frequency and the diamagnetic drift frequencies are second order, and the transport time scales are third order. Besides, a slow-dynamics ordering is assumed, with the macroscopic flows comparable to the diamagnetic drift velocities and the time derivatives comparable to or smaller than the diamagnetic drift frequencies. A new nontrivial result is obtained in the second or diamagnetic drift order. The analysis is carried through the third order, where the main collisional transport effects take place.

[1]Work supported by the U.S. Department of Energy under grants DEFC02-06ER54855 and DEFG02-86ER53218

J.J. Ramos
M.I.T. Plasma Science and Fusion Center

Date submitted: 08 Jan 2009 Electronic form version 1.4