Abstract Submitted
for the DPP10 Meeting of
The American Physical Society

Hybrid equilibrium with an end-loss ion distribution with solutions for an FRC[1] LOREN STEINHAUER, University of Washington — Hybrid equilibria (fully kinetic ions + warm fluid electrons) are found for an end-loss ion distribution. The distribution is expressed in terms of the two constants of motion (Hamiltonian H, and canonical angular momentum P_θ) of an axisymmetric equilibrium, both of which depend on velocity *and* space coordinates. The distribution function is the solution of a simplified Fokker-Planck equation in which ion collisions cause the ions to diffuse toward the unconfined region in $H - P_\theta$ space. Moments of the distribution give the macroscopic parameters of the ion distribution, e.g. local density and flow, all of which are explicit analytic functions of the magnetic flux function ψ, electrostatic potential ϕ, and the radius coordinate. The electron temperature function (of ψ) is prespecified. With these, and Ampere's law a complete system of equations is in hand that can be solved by relaxation methods. Solutions are presented for field-reversed configurations. The pressure and density profiles are not extraordinary, but the ion flow has large flow shear near the separatrix. These results are applied to the FRC data compendium to infer collision frequencies in experiment and compare them with those for common turbulent transport mechanisms. Implications of the large flow shear on global stability will be discussed.

[1]This work supported by the US Department of Energy.

Loren Steinhauer
University of Washington

Date submitted: 20 Jul 2010 Electronic form version 1.4