Abstract Submitted
for the DPP09 Meeting of
The American Physical Society

Neoclassical parallel closures for toroidal plasmas MUKTA SHARMA, E.D. HELD, J.Y. JI, Utah State University — Closures for the parallel conductive heat fluxes and stresses are derived. A Chapman-Enskog-like approach is adopted and time-dependent effects are ordered small compared to parallel free streaming, collisional effects and particle trapping in magnetic wells. The distribution function is written as the sum of a dynamic Maxwellian and a kinetic distortion, F, expanded in Legendre polynomials. To lowest order, the magnetic moment and total energy of the particles are conserved. For an accurate treatment of collisional effects, a moment approach is applied to the full, albeit linearized, Coulomb collision operator. In contrast to previous derivations[1], this work does not bounce-average when solving the lowest-order drift kinetic equation. In contrast, a Fast Fourier Transform algorithm is used to treat the one-dimensional spatial domain along the magnetic field and the drift kinetic equation is solved on a grid in the speed variable, $s = v/v_T$. This approach allows for parallel acceleration as well as examination of the closures in all collisionality regimes, i.e., Pfirsch-Schlueter, plateau and banana. The application of these closures in the NIMROD code is also discussed.

[1]E.D. Held, *et al.*, Phys. Plasmas **10**, 3933 (2003).

Mukta Sharma
Utah State University

Date submitted: 21 Jul 2009 Electronic form version 1.4