Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Nonlocal Neoclassical Calculation of Toroidal Momentum Transport[1] G. REWOLDT, W.X. WANG, M. BELL, S. KAYE, W. SOLOMON, R. NAZIKIAN, Princeton Plasma Physics Lab — Motivated by experimental observations, neoclassical equilibrium and transport have been studied using global particle simulations by the GTC-Neo code. First, the toroidal angular momentum transport due to collisional dissipation has been calculated to understand whether the spontaneous toroidal rotation observed in plasmas without external momentum sources implies any anomalous momentum transport and torque. In some cases, GTC-Neo calculates that the toroidal momentum diffusivity is 5-6 times larger than previous predictions. Second, simulations of low aspect-ratio plasmas in NSTX show that there is considerable variation of T_i on a magnetic surface, with up to a 20% difference in T_i between the outer and inner sides on the mid-plane. As a consequence, plasma temperature iso-surfaces are shifted from magnetic surfaces. This finite-orbit-width toroidal effect is enhanced as the ratio of ion orbit width to temperature gradient scale length is increased, but is insensitive to the density gradient. The dependence on machine parameters, plasma rotation and collisionality have also been studied. Third, simulations have been made of the poloidal momentum transport to help understand the origin of the "anomalous" poloidal flow observed in DIII-D.

[1]This work supported by U.S. DOE Contract # DE-AC02-76CH03073.

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Date submitted: 19 Jul 2007 Electronic form version 1.4