Abstract Submitted
for the APR09 Meeting of
The American Physical Society

Theory of the residual stress and the origins of intrinsic CHRIS MCDEVITT, PATRICK DIAMOND, U.C.S.D., OZGUR GURCAN, CEA, T.S. HAHM, PPPL — We present recent results in the theory of turbulent momentum transport pertinent to the description of intrinsic rotation. A minimal model of intrinsic rotation is developed for H-mode plasmas based on an extended L-H mode bifurcation model [1]. The primary novel components introduced into this model are a residual stress [2,3] (i.e. the portion of the momentum flux not proportional to v_ϕ or v'_ϕ) and a turbulent equipartition pinch [4]. This reduced model reproduces salient features of the ITPA H-mode database [5]. Furthermore, a quasilinear analysis of a phase space conserving gyrokinetic equation is utilized to identify a novel mechanism by which microturbulence may spin-up a plasma from rest, in addition to the $\mathbf{E}\times\mathbf{B}$ shear driven mechanism discussed in Refs. [2,3]. This mechanism, which appears in the gyrokinetic formulation through the parallel nonlinearity, emerges due to charge separation induced by the polarization drift, and is not tied to $\mathbf{E}\times\mathbf{B}$ shear. Thus, this mechanism is likely relevant in regimes of weak $\mathbf{E}\times\mathbf{B}$ shear. [1] F. L. Hinton, Phys. Fluids B 3, 696 (1991), [2] O. D. Gurcan et al. Phys. Plasmas 14, 042306 (2007), [3] Dominguez et al. Phys. Fluids B 5, 3876 (1993), [4] T.S. Hahm et al. Phys. Plasmas 14, 072302 (2007), [5] J. E. Rice et al. Nucl. Fusion 47, 1618 (2007).

Chris McDevitt
U.C.S.D.

Date submitted: 06 Jan 2009 Electronic form version 1.4