Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Toroidal rotation at low torque with NTV[1] TIMOTHY STOLTZFUS-DUECK, Princeton Plasma Physics Laboratory — Future devices such as ITER will only be able to apply relatively weak NBI torque, but must avoid dangerous low-rotation regimes that can lead to locking and disruption. In such parameter regimes, the nondiffusive part of the turbulent momentum flux tends to drive tokamak edge rotation co-current. However, ITER also plans to apply three-dimensional magnetic perturbations (MPs). These MPs tend to apply a net counter-current NTV torque to the plasma, often comparable in magnitude to the effective co-current "intrinsic torque" in present-day devices. It is difficult to predict rotation in this regime, due to the near-cancellation of two complicated torques, with different dependence on plasma parameters. As a first step towards the development of such a predictive capability, we combine the modulated-transport model for intrinsic rotation with a simplified global model for the NTV torque. For the NTV torque, we take account of local resonances that can shift in radial position as plasma parameters change. Due to the non-monotonic nature of the NTV torque, rolling over to become weak for strong-enough co-current rotation, the joint turbulent-NTV momentum balance allows the possibility of an edge rotation bifurcation even without island penetration.

[1]Support from the U.S. Department of Energy, Office of Science, Contract No. DE-AC02-09CH11466 is gratefully acknowledged.

Timothy Stoltzfus-Dueck
Princeton Plasma Physics Laboratory

Date submitted: 02 Jul 2020 Electronic form version 1.4