Abstract Submitted
for the DPP20 Meeting of
The American Physical Society

Gyrokinetic Dimits-Shift Analysis and Quasilinear Model Building PING-YU LI, PAUL TERRY, University of Wisconsin - Madison, M.J. PUESCHEL, University of Texas - Austin — The quasilinear heat flux estimate is widely in used reduced models because its need for nonlinear inputs is minimal. However, standard quasilinear models fail to predict certain features of turbulence scalings, including the Dimits shift, in which the onset of finite heat flux is shifted to a higher critical gradient relative to the linear growth rate. Gyrokinetic simulations for the Madison Symmetric Torus reversed field pinch and the Cyclone Base Case, which demonstrate Dimits shifts in plasmas unstable to trapped electron and ion temperature gradient instabilities respectively, are obtained and used to produce a quasilinear estimate that incorporates more complete saturation physics. In particular, the triplet correlation time, which is shown to be important in saturation for fluid and kinetic models, is introduced into quasilinear estimates near the critical gradient threshold. It additionally shows that strong resonance between modes can lead to suppression of the turbulence. Therefore the coherency of modes within and above the threshold is investigated. Also, wavenumber dependencies within the saturation theory for zonal-flow-catalyzed energy transfer to stable modes are investigated to inform how to handle wavenumber summations in flux calculations.

Ping-Yu Li
University of Wisconsin - Madison

Date submitted: 02 Jul 2020

Electronic form version 1.4