First Transport Code Simulations using the TGLF Model *

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The first transport code simulations using the newly developed TGLF theory-based transport model [1,2] are presented. TGLF has comprehensive physics to approximate the turbulent transport due to drift-ballooning modes in tokamaks. The TGLF model is a next generation gyro-Landau-fluid model that includes several recent advances that remove the limitations of its predecessor, GLF23. The model solves for the linear eigenmodes of trapped ion and electron modes (TIM, TEM), ion and electron temperature gradient (ITG, ETG) modes and finite beta kinetic ballooning (KB) modes in either shifted circle or shaped geometry [1]. A database of over 400 nonlinear GYRO gyrokinetic simulations has been created [3]. A subset of 140 simulations including Miller shaped geometry has been used to find a model for the saturation levels. Using a simple quasilinear (QL) saturation rule, we find remarkable agreement with the energy and particle fluxes from a wide variety of GYRO simulations for both shaped or circular geometry and also for low aspect ratio. Using this new QL saturation rule along with a new ExB shear quench rule for shaped geometry, we predict the density, temperature, and toroidal rotation profiles in a transport code and compare the results against experimental data in the ITPA Profile Database. We examine the impact of the improved electron physics in the model and the role of elongation and triangularity on the predicted profiles and compare to the results previously obtained using the GLF23 model.

[1] G.M. Staebler, J.E. Kinsey, and R.E. Waltz, Phys. Plasmas **12**, 102508 (2005).

[2] G.M. Staebler, J.E. Kinsey, and R.E. Waltz, to appear in Phys. Plasmas, May(2007).

[3] The GYRO database is documented at fusion.gat.com/theory/gyro.

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