TESTING GYROKINETIC SIMULATIONS OF ELECTRON TURBULENCE

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Abstract. An extensive set of tests comparing gyrokinetic predictions of temperature-gradient driven electron turbulence to power balance transport analyses and fluctuation measurements are presented. These tests use data from an L-mode validation study on the DIII-D tokamak [J.L. Luxon, Nucl. Fusion **42**, 614 (2002)] in which the local value of $a/L_{Te} = -(a/T_e)(dT_e/dr)$ is varied by modulated electron cyclotron heating; the GYRO code [J. Candy and R.E. Waltz, J. Comput. Phys. **186**, 545 (2003)] is used to make the gyrokinetic predictions. Using a variety of novel measures, both local and global nonlinear simulations are shown to predict key characteristics of the electron energy flux Q_e and long-wavelength (low-k) T_e fluctuations, but systematically underpredict (by roughly a factor of two) the ion energy flux Q_i. A new synthetic diagnostic for comparison to intermediate wavelength Doppler back-scattering measurements is presented, and used to compare simulation predictions against experiment. In contrast to the agreement observed in the low-k T_e fluctuation comparisons, little agreement is found between the predicted and measured intermediate-k density fluctuation responses.

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