L-mode Validation Studies of Gyrokinetic Turbulence Simulations via Multiscale and Multifield Turbulence Measurements on the DIII-D Tokamak

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Abstract. A series of carefully designed experiments on DIII-D have taken advantage of a broad set of turbulence and profile diagnostics to rigorously test gyrokinetic turbulence simulations. In this paper the goals, tools, and experiments performed in these validation studies are reviewed and specific examples presented. It is found that predictions of transport and fluctuation levels in the mid-core region ($0.4 < \rho < 0.75$) are in better agreement with experiment than those in the outer region ($\rho \geq 0.75$) where edge coupling effects may become increasingly important and multiscale simulations may also be necessary. Validation studies such as these are crucial in developing confidence in a first-principles based predictive capability for ITER.

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