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Role of zonal flows and electromagnetic effects in ITER turbulence simulations near threshold[1] J. CANDY, G. STAEBLER, P. SNYDER, GA, C. HOLLAND, UCSD — Design of accurate transport models requires a database of nonlinear gyrokinetic simulations – a computationally challenging undertaking. As early as 2008, GYRO simulations of TGLF-computed ITER operating scenarios were observed to produce levels of nonlinear zonal-flow (ZF) activity large enough to quench turbulence inside the plasma core, implying that fusion power predictions in ITER were pessimistic because turbulence was overestimated. This was in contrast to GYRO-TGLF comparisons for modern-day tokamaks, where GYRO and TGLF are in good agreement. It was speculated that closeness to threshold, ZF activity, and electromagnetic effects, could all play a key role in this discrepancy. It became clear that TGLF must be improved to include ZF stabilization for more accurate ITER simulations. The workflow for inclusion of ZF effects in TGLF is challenging because of intermittency in near-threshold GYRO simulations. GYRO simulation and subsequent TGLF improvement efforts are summarized, representing a significant undertaking carried out over a period of years.

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