Abstract Submitted
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The Role of Cross-Scale Coupling in the Saturation of Turbulence and Transport in ITER-Relevant, ELM-y H-mode Plasmas[1] N.T. HOWARD, MIT-PSFC, C. HOLLAND, UCSD, A.E. WHITE, M. GREENWALD, MIT-PSFC, J. CANDY, General Atomics, A.J. CREELY, MIT-PSFC — New multi-scale gyrokinetic simulations which capture ITG/TEM/ETG turbulence and their interactions have been performed on an ITER-relevant, ELM-y H-mode Alcator C-Mod plasma. Recent multi-scale simulations indicate that ion and electron-scale turbulence strongly couple in the core of L-mode plasmas, driving significant electron heat flux at both turbulent scales. Building off of these results, cutting-edge multi-scale simulations were performed in reactor-relevant conditions (no external momentum input, dominant electron heating, and T_e ˜T_i). These simulations include 3 gyrokinetic species, realistic geometry, collisions, rotation, finite beta, all experimental inputs, and required approximately 60M CPU hours on the NERSC Edison supercomputer. The presence of electron-scale turbulence is found to fundamentally change the saturation of the ion-scale turbulence in H-mode plasma conditions, calling into question reactor scenario predictions which are based on purely long wavelength turbulence models. To validate the gyrokinetic model in this reactor-relevant plasma regime, quantitative comparisons are made between simulated heat fluxes, incremental diffusivities, and density fluctuations with experiment.

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