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Understanding the Role of Electron-Scale Turbulence in the Core of Alcator C-Mod Using Multi-Scale Gyrokinetic Simulation[1] N.T. HOWARD, ORISE, C. HOLLAND, UCSD, A.E. WHITE, M. GREENWALD, MIT-PSFC, J. CANDY, General Atomics — First-of-a-kind, nonlinear gyrokinetic simulations that capture both the ion and electron spatio-temporal scales were performed in the core (r/a = 0.6) of Alcator C-Mod, ITG and TEM dominated, L-mode discharges. These multi-scale gyrokinetic simulations demonstrate the coexistence of ion and electron turbulence, an enhancement of ion-scale transport by the electron-scale turbulence, and the resolution of a previously documented discrepancy between ion-scale simulation and experimental electron heat flux. These simulations, performed using the GYRO code, capture ion and electron-scale turbulence up to $k\theta\rho_s = 48.0$ with realistic electron mass ($(m_D/m_e)^{.5} = 60.0$), allowing for the first quantitative comparison of multi-scale simulation with experiment. Electron-scale turbulence plays a significant, even dominant, role in the core of a standard ITG and TEM dominated L-mode discharges, driving experimentally-relevant levels of electron heat flux in the form of radially elongated ETG "streamers" that coexist, ion-scale turbulent eddies. The implications of these results for transport model validation are discussed.

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