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On the Role of Microtearing Turbulence in DIII-D High Bootstrap Current Fraction Plasmas[1] XIANG JIAN, CHRIS HOLLAND, University of California, San Diego, JEFF CANDY, EMILY BELLI, ANDREA GAROFALO, General Atomics, SIYE DING, ORNL, DIII-D TEAM — We report the first direct comparisons of microtearing turbulence simulations to experimental measurements in the DIII-D tokamak. Previous studies of high bootstrap fraction plasmas carried out in DIII-D with large radius internal transport barriers (ITBs) have found that while the ion energy transport is neoclassical, the electron transport remains anomalous, and not well-described by existing quasilinear transport models. The large value of normalized pressure gradient in these plasmas is shown to stabilize drift-wave and kinetic ballooning mode instabilities in the ITB, but destabilize the microtearing mode (MTM). Nonlinear gyrokinetic simulations of the ITB region performed with CGYRO demonstrate that the MTM are robustly unstable, and capable of reproducing the inferred electron energy transport within experimental uncertainties. The predicted transport levels are found to be most sensitive to the magnetic shear rather than the temperature gradients. Extrapolation to an ITER steady-state scenario suggests that whether MTMs or drift-wave transport dominates will depend sensitively on the balance between lower collisionality and high safety factor expected in these scenarios.

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