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Gyrokinetic Studies of Microturbulence in the Madison Symmetric Torus ZACHARY WILLIAMS, JAMES DUFF, M.J. PUESCHEL, PAUL TERRY, University of Wisconsin-Madison — Reversed-field pinches operating with Pulsed Poloidal Current Drive (PPCD) exhibit microturbulence that contributes to heat and particle transport. This work focuses on the analysis of high-frequency fluctuations in a recent 200 kA PPCD discharge in the Madison Symmetric Torus, for which strong experimental evidence of microturbulence exists. Local gyrokinetic simulations were performed at multiple radial positions outside the reversal surface using the Gene code. Linear analysis identifies the dominant instability at all positions to be a density-gradient-driven trapped electron mode. An accurate description of turbulence requires the inclusion of residual tearing mode fluctuations: though reduced in PPCD, large-scale tearing modes introduce non-negligible levels of magnetic perturbations. In simulations, they can be seen to weaken zonal flows and degrade confinement, increasing transport to experimentally observed levels. Importantly, imposed fluctuations appear to be self-consistently reinforced, contrary to the usual island-healing picture in tokamaks. Simulations also include $B_{\|}$ fluctuations, which provide finite contributions to transport, particularly when artificially zeroing out tearing modes entirely.

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