Abstract Submitted
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Density-Gradient-Driven trapped-electron-modes in improved-confinement RFP plasmas[1] JAMES DUFF, JOHN SARFF, University of Wisconsin - Madison, WEIXING DING, DAVID BROWER, ELI PARKE, UCLA, BRETT CHAPMAN, PAUL TERRY, M.J. PUESCHEL, ZACH WILLIAMS, University of Wisconsin - Madison — Short wavelength density fluctuations in improved-confinement MST plasmas exhibit multiple features characteristic of the trapped-electron-mode (TEM). Core transport in the RFP is normally governed by magnetic stochasticity stemming from long wavelength tearing modes that arise from current profile peaking, which are suppressed via inductive control for this work. The improved confinement is associated with an increase in the pressure gradient that can destabilize drift waves. The measured density fluctuations have $f \sim 50$ kHz, $k_\phi \, \rho_s < 0.14$, and propagate in the electron drift direction. Their spectral emergence coincides with a sharp decrease in global tearing mode associated fluctuations, their amplitude increases with local density gradient, and they exhibit a density-gradient threshold at $R/L_n \sim 15$. The GENE code, modified for the RFP, predicts the onset of density-gradient-driven TEM for these strong-gradient plasma conditions. While nonlinear analysis shows a large Dimits shift associated with predicted strong zonal flows, the inclusion of residual magnetic fluctuations, comparable to experimental magnetic fluctuations, causes a collapse of the zonal flows and an increase in the predicted transport to a level close to the experimentally measured heat flux.

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