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Current Driven Drift Wave Turbulence and Electron Thermal Transport in Tokamaks C.J. LEE, P.H. DIAMOND, UCSD, M. PORKOLAB, PSFC, MIT — Though tokamak reactor plasmas, such as ITER, are expected to be in electron transport dominated regimes, electron thermal transport in tokamaks has not yet been fully understood. In particular, recent analyses [1, 2] have indicated that current understanding cannot explain results from modest density, $T_e > T_i$ plasmas in either Ohmic or ECH heating regimes. Interestingly, such plasmas exhibit very large toroidal current drift parameters ($v_d/c_s > 1$), which have been correlated with degradation of confinement [3]. These observations suggest revisitation of the electron velocity drift as an instability drive and trigger for heat transport through the electron channel. In this work, we examine the linear and nonlinear theory of current driven drift wave turbulence in tokamaks. Special attention is focused on the eigenfunction structure and spectral centroid shift induced by finite current. Note that the spatial asymmetry is a signature of current drive and has implications for flow generation and intrinsic rotation as well. We further explore nonlinear saturation mechanisms. Attention is focused to the effects of magnetic shear-induced resonance broadening of the electron response.
[1] L. Lin, M. Porkolab et al., PPCF, 2009.
[2] J.C. DeBoo et al., Phys. Plasmas, 2010.
[3] L. Lin, APS-DPP invited talk, 2009.

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