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Multiscale MT-ETG Turbulence in the Pedestal[1] M.J. PUESCHEL, D.R. HATCH, M. KOTSCHENREUTHER, S. MAHAJAN, University of Texas at Austin — Turbulence and transport in H-mode pedestals tend to be of a different nature and harder to evaluate and understand than in the core. In particular, microtearing (MT) turbulence is a key mechanism in explaining pedestal evolution. For a pedestal scenario based on a DIII-D discharge, it is shown through nonlinear gyrokinetic simulations that MT saturates via zonal fields – in a process analogous to zonal-flow-catalyzed energy transfer – while simultaneously generating strong zonal flows. Coexisting with the ion-scale MT are multiple branches of electron-temperature-gradient (ETG) modes. When resolving only electron scales, intermediate-scale streamers produce significant heat flux. However, when both ion and electron scales are included, the zonal flows driven by MT partially suppress the electrostatic ETG transport. The rule that a constant ratio of growth rate and wavenumber across scales leads to an equal balance of large- and small-scale transport is confirmed. Resonant magnetic perturbations – important in the suppression of edge-localized modes – disrupt zonal flows through the breaking of flux surfaces, enabling a radial electron current channel. In the present scenario, this leads to an increase in electron-scale transport while leaving ion-scale fluxes unaffected.

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