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Dependence of Turbulence and Transport on T_e/T_i and Comparison with Transport Models*

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Long-wavelength density fluctuations are found to increase significantly as the electron to ion temperature ratio is increased in H-mode plasmas. L-mode plasmas, however, show little low-k density fluctuation dependence on T_e/T_I, though $\tilde{T}_e/T_e$ fluctuations have been shown to increase in L-modes. Particle, thermal and momentum transport all increase with T_e/T_I in both L and H-mode plasmas. T_e/T_I is varied systematically by applying Electron Cyclotron and Fast Wave Heating, which uniformly increases the T_e profile by about 25% in the H-mode (hybrid) discharges examined. χ_e, χ_I, and χ_{mom} increase by factors of two to three over much of the profile, while energy confinement correspondingly decreases with this 25% increase in T_e/T_I. The turbulence spectra measured with BES in the core of these H-mode plasmas exhibit two distinct bands with different frequency ranges, amplitudes and wavenumber spectra, suggesting different underlying instabilities may be operating. As T_e/T_I is increased, these distinct bands tend to merge, while the integrated fluctuation amplitudes also increase. Initial TGLF calculations show reduced linear growth rates with increasing T_e/T_I at $k_\theta \rho_s < 0.5$, perhaps due to reduced local ion temperature gradients, seemingly in contrast with the higher measured low-k density fluctuations. At higher wavenumber, growth rates increase with T_e/T_I, likely a result of higher local electron temperature gradients. Details of the measured turbulence and transport properties and variation with T_e/T_I will be presented and compared with available simulations of turbulence from TGLF and/or GYRO. The differing behavior of low-k density turbulence in L-mode and H-mode will be further examined.

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