Stabilization of Electron-Scale Turbulence by Electron Density Gradient in NSTX

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Electron scale (high-k) ETG-turbulence is diagnosed in NSTX using a high-k microwave scattering system. We report on the stabilization effects of electron density gradient on electron-scale density fluctuations in a set of neutral beam injection (NBI) heated H-mode plasmas. High-k density fluctuations are absent with high density gradient, consistent with linear stabilization of ETG instability due to density gradient using the ETG linear threshold and linear gyrokinetic simulation with GS2. During ETG unstable periods, the observed scattered power is anti-correlated with equilibrium density gradient. Nonlinear electron-scale gyrokinetic simulations with GYRO show high electron density gradient increases the ETG nonlinear threshold, and reduces electron density fluctuations, heat flux and stiffness. Negligible electron heat flux is predicted at high density gradient, suggesting experimentally relevant ion-scale turbulence contributions to electron heat flux. Preliminary nonlinear ion scale gyrokinetic simulations will be presented, as well as development progress in the design of a synthetic diagnostic for the high-k scattering system.

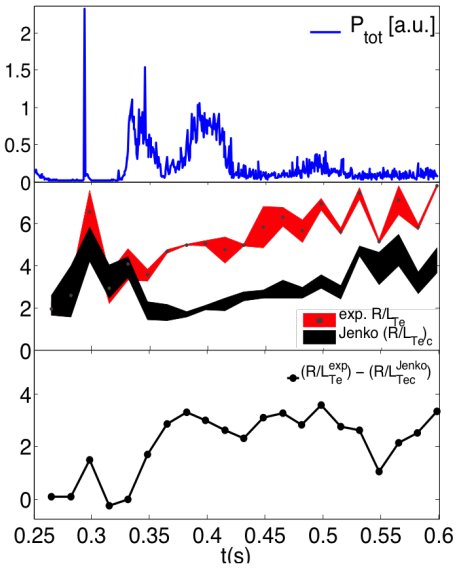

Figure 1: ***a)*** **Scattered power** $\sim (\delta n/n)^2$ ***b)*** **Experimental and critical temperature gradient.** ***c)*** **Difference between exp. and critical T gradient.**

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