Probing plasma turbulence by modulating the electron temperature gradient

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Abstract. The local value of a/L_{Te}, a turbulence drive term, was modulated with electron cyclotron heating (ECH) in L-mode discharges on DIII-D [J.L. Luxon, Nucl. Fusion **42**, 614 (2002)] and the density and electron temperature fluctuations in low, intermediate and high-k regimes were measured and compared with nonlinear gyrokinetic turbulence simulations using the GYRO code [J. Candy and R.E. Waltz, J. Comput. Phys. **186**, 545 (2003)]. The local drive term at $\rho \sim 0.6$ was reduced by up to 50% which produced comparable reductions in electron temperature fluctuations at low-k. At intermediate-k, $k_\theta \sim 4$ cm^{-1} and $k_\theta \rho_s \sim 0.8$, a very interesting and unexpected result was observed where density fluctuations increased by up to 10% when the local drive term was decreased by 50%. Initial comparisons of simulations from GYRO with the thermal diffusivity from power balance analysis and measured turbulence response are reported. Simulations for the case with the lowest drive term are challenging as they are near the marginal value of a/L_{Te} for TEM activity.