Abstract Submitted
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Global Gyrokinetic Electron Temperature Gradient Turbulence and Associated Electron Heat Transport in NSTX Plasmas W.X. WANG, S. ETHIER, S.M. KAYE, E. MAZZUCATO, D. SMITH, W.W. LEE, T.S. HAHM, G. REWOLDT, J. MANICKAM, W.M. TANG, PPPL, M. ADAMS, Columbia Univ. — Global, nonlinear simulations of electron temperature gradient (ETG) turbulence for experimental discharges have been carried out for the first time for direct validation against high-k measurements of electron gyroradius scale fluctuations in NSTX. Qualitative agreement in the density fluctuation spectrum between the experiment and the simulation is obtained with exponential power -2.6 in k_r and -5.3 in k_θ in the simulation, compared to -4.5 in k_{perp} in the experiments. The nonlinear generation of zonal flows with fine radial scale is observed during ETG turbulence development. However, zonal flows are too weak to break up radially elongated streamers in the nonlinear phase of ETG turbulence. The identification of streamers will be a good opportunity for future high-k diagnosis to validate nonlinear ETG simulation models. The ETG turbulence spreading is found to be small (a few tens electron gyroradii). Comparison of density fluctuation amplitudes based on synthetic diagnosis between simulations and measurements, will be discussed. Also presented is the phase space structure of the electron heat flux to elucidate the roles of resonant and nonresonant electrons. Work supported by U.S. DOE Contract DE-AC02-76-CH03073 and SciDAC GPS–TTBP.

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