Turbulent Transport Studies in Alcator C-Mod Ohmic Plasmas.*

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In previous studies of ohmically heated low density C-Mod plasmas where $\tau_E \propto n_e$, the so-called neo-Alcator regime where typically $T_e > T_i$, TRANSP results indicated [1] that $\chi_i < \chi_e$, whereas nonlinear gyrokinetic analysis with GYRO [2] indicated that $\chi_i > \chi_e$ due to the dominance of ITG modes over TEM or ETG. In these early experiments the composition of the impurities and Z_{eff} was not well known. In addition, the ion temperature profiles were determined from TRANSP using a model χ_i profile, calibrated to the temperature from neutron emission. We have repeated these experiments with greatly improved diagnostics, and initial results were presented recently [3]. In the present work the measured ion temperature profiles from x-ray crystal spectroscopy were used, and new values of the measured Z_{eff} were found to be larger than previously assumed. Recently, TGLF [4] has been used to model the turbulent transport as a function of density and Z_{eff} and the results indicate that the second (impurity) ion species reduces the predicted values of χ_i while maintaining the electron diffusivity near the experimental value as Z_{eff} was increased and the density decreased. By varying the impurity Z_i, it was verified that increased collisionality alone was not sufficient to explain these results. New analysis with nonlinear fluxtube GYRO simulations indicate a similar trend. We note that turbulent diffusivities do not offer adequate transport inside r/a < 0.5, and hence the role of ohmic drift driven drift waves [5], and/or sawteeth driven transport cannot be excluded. Further work is in progress to examine the role of toroidal flow and E_r in the turbulent transport. Finally, global GYRO simulations and the synthetic phase contrast imaging (PCI) technique [6] will be used to compare the modeled and measured turbulent density fluctuation spectrum.

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