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Theory of Turbulent Impurity Transport in ITER based Experiments in Alcator C-Mod XIANGRONG FU, W. HORTON, University of Texas at Austin, S. BENKADDA, International Institute for Fusion Science, I.O. BESPAMYATNOV, University of Texas at Austin, C.L. FIORE, MIT Plasma Science and Fusion Center, W.L. ROWAN, University of Texas at Austin — Impurity transport is modeled for C-Mod's I-mode discharges using quasilinear theory. I-mode is one of the new high confinement modes produced on Alcator C-Mod. It is characterized by L-mode like density profile but strong temperature peaking. For typical discharges, we calculate the dimensionless parameters required to obtain the eigenvalues and eigenvectors for several sets of gyro-fluid equations which model ordinary drift waves, impurity drift waves and trapped electron modes. Based on analysis of eigenvalues and eigenvectors, the relative phase shift of the density fluctuation-to-electric potential fluctuation is obtained for each k-vector. The fluctuation spectrum is determined by a combination of nonlinear simulations, empirical formulas and experimental results. Impurity transport coefficients for the particle diffusivity D_z and pinch velocity v_z are computed and compared with the experiments. We identify several sources for pinch velocity: the curvature effect, the temperature gradient, and the viscosity. The degree to which the results do and do not agree with the experiments is quantified. Based on these results, we extrapolate the analysis to predict impurity transport in ITER.

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