Abstract Submitted
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Direct measurements and modeling of gradient-aligned cross-field ion flows near an absorbing boundary[1] D.S. THOMPSON, M. UMAIR SIDDIQUI, J.S. MCILVAIN, Z.D. SHORT, E.E. SCIME, E.M. AGUIRRE, M.F. HENRIQUEZ, J.S. MCKEE, West Virginia University, Department of Physics and Astronomy — Direct measurements of cross-field ion transport near boundaries are sought for validating transport models in magnetically confined plasmas. Using laser-induced fluorescence, we measured ion flows normal to an absorbing boundary that was aligned to be parallel to a uniform axial magnetic field in a helicon plasma. We used Langmuir and emissive probes to measure local density, temperature and plasma potential profiles in the same region. We then scanned ion-neutral collisionality by varying the ratio of the ion gyro-radius, ρ_i, and ion-neutral collision length, λ, over the range $0.34 \leq \rho_i/\lambda \leq 1.60$. Classical diffusion along density and potential gradients is sufficient to describe flow profiles for most cases but did not describe measurements well for $0.44 \leq \rho_i/\lambda \leq 0.65$. In these cases, cross-sections $\approx$3 times the classical prediction produced acceptable fits, and flow to the boundary was enhanced significantly. These enhanced flow cases exhibit spectra with low-frequency electrostatic fluctuations (f <10 kHz) that are not observed in data described well by a classical diffusion model.

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