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Constraints on an empirical flux equation for asymmetry-induced transport[1] D.L. EGGLESTON, Occidental College — Despite a large body of experimental work on asymmetry-induced transport, the correct theory remains elusive. We are currently developing an empirical model of the transport with an eye toward providing guidance for further theoretical development. In previous work[2] we have shown that the flux equation for the transport is empirically constrained to be of the form $\Gamma(\epsilon) = -(B_0/B)^{1.33} D(\epsilon)[\nabla n_0 + f(\epsilon)]$, where $\epsilon = \omega - l\omega_R$, ω is the asymmetry frequency, ω_R the plasma rotation frequency, l the azimuthal mode number, B the magnetic field, n_0 the density, B_0 an empirical constant, and $D(\epsilon)$ and $f(\epsilon)$ are unknown functions. To gain information about $D(\epsilon)$ and $f(\epsilon)$, we have examined data near the $\epsilon = 0$ point and compared it to a first order expansion of $\Gamma(\epsilon)$. This analysis shows that $dD/d\epsilon(0) \neq 0$, in contradiction to resonant particle theory[3]. We also find that $f(\epsilon)$ can only be a fraction of the size predicted by that theory, and that $dD/d\epsilon(0)$ is an increasing function of radius and scales with the inverse of the center wire bias. This last result suggests that ϵ may be scaled by ω_R rather than the axial bounce frequency.

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[2]D. L. Eggleston and J. M. Williams, Phys. Plasmas 15, 032305 (2008).
[3]D. L. Eggleston and T. M. O'Neil, Phys. Plasmas 6, 2699 (1999).

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