Abstract Submitted
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Progress towards the determination of an empirical flux equation for asymmetry-induced transport[1] D.L. EGGLESTON, C.T. SMITH, Occidental College — In previous work[2] on asymmetry-induced transport, it was found useful to employ the hypothesis that the asymmetry frequency ω and the plasma rotation frequency ω_R always enter the physics in the combination $\omega - l\omega_R$, where l is the azimuthal mode number of the asymmetry. Flux data points satisfying the condition $\omega - l\omega_R = 0$ were shown to satisfy the equation $\Gamma_{sel} = -(B_0/B)^{1.33} D_0[\nabla n_0 + f_0]$, where B is the magnetic field, ∇n_0 is the radial density gradient, and B_0, D_0, and f_0 are empirical constants. The general flux equation was then constrained to be of the form $\Gamma(\epsilon) = -(B_0/B)^{1.33} D(\epsilon)[\nabla n_0 + f(\epsilon)]$, where $\epsilon = \omega - l\omega_R$ and $D(\epsilon)$ and $f(\epsilon)$ are unknown functions. We now examine data points adjacent to the $\epsilon = 0$ points and compare them to a first order expansion of $\Gamma(\epsilon)$. We find that a plot of $d(\Gamma - \Gamma_{sel})/d\epsilon$ vs r changes sign at about the same radius as $\nabla n_0 + f_0$, and show that this implies that $dD/d\epsilon(0) \neq 0$. This, plus the requirement that $D(\epsilon = 0) = D_0$, restricts the form of $D(\epsilon)$. In particular, it excludes a dependence on ϵ of the form found in resonant particle transport theory[3], i.e., $D(\epsilon) \propto \exp(-C\epsilon^2)$, with C a parameter.

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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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