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Flow driven inward particle flux and enstrophy production constraint on relaxation in Hasegawa-Wakatani turbulence[1] ARASH ASHOURVAN, Center for Energy Research (CER), UCSD, P.H. DIAMOND, CER, CASS & Department of Physics, UCSD, Ö.D. GÜRCAN, LPP, Ecole Polytechnique, Palaiseau, France — The relation between the physics of turbulent transport of particles and momentum is investigated, using the Hasegawa-Wakatani model, with both a density gradient and a quasi-equilibrium shear (zonal) flow. For axisymmetric ($k_\parallel = 0$) fluctuations, pure KH instabilities, energized by the flow shear, relax the flow and drive an outward (down the density gradient) flux of particles ($\Gamma = \langle \tilde{n}\tilde{v}_x \rangle > 0$, where Γ is the non-dimensional turbulent particle flux). However, for drift-KH instabilities of finite $k_\parallel$, flow enhanced pumping can locally drive an inward particle flux. Moreover, we use the positivity of the production of the fluctuation potential enstrophy to obtain a constraining relation between the momentum and particle transport. This constraint relation asserts that the turbulent vorticity flux Π_ω of a system which has a local inward particle flux ($\Gamma < 0$) must locally satisfy $\Pi_\omega < \Gamma < 0$. This can lead to the change in the sign of the Reynolds work and relaxation of the flow shear at the radial location of the occurrence of the inward flux. Ongoing work focuses on determining the dependencies of the turbulent viscosity.

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