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Transport of parallel momentum by drift-Alfven turbulence

CHRIS MCDEVITT, PAT DIAMOND, U.C.S.D. — An electromagnetic gyrokinetic formulation is utilized to calculate the turbulent radial flux of parallel momentum for a strongly magnetized plasma in the large aspect ratio limit. For low beta plasmas, away from transport barriers, the level of momentum transport induced by microturbulence is found to be well described within the electrostatic approximation. However, near regions of steep equilibrium profile gradients, strong electromagnetic contributions to the momentum flux are uncovered. In particular, the magnitude of transport induced by the off-diagonal residual stress component of the momentum flux induced by drift wave turbulence can be quenched for sufficiently steep pressure gradients. This quenching mechanism is distinct from ExB shear decorrelation, since it allows for the level of off-diagonal turbulent transport to be strongly mitigated, without extinguishing the underlying microturbulence. In contrast, the level of transport induced by a given Alfvenic branch of the drift-Alfven dispersion relationship typically increases as the pressure gradient steepens, allowing for an alternate avenue of momentum transport. A homogeneous calculation of momentum transport induced by Alfvenic turbulence suggests that an imbalance in the Elsasser populations is required in order to introduce a finite level of off-diagonal momentum transport for the simplified geometry utilized.

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