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Gyrokinetic Particle Simulations of Toroidal Momentum Transport in Plasma with Kinetic Electrons[1] I. HOLOD, Z. LIN, UCI — Large scale gyrokinetic particle simulations find that momentum transport driven by microturbulence in magnetized plasmas includes both diffusive and off-diagonal (pinch and residual stress) components. Primitive separation of these momentum fluxes in toroidal plasma requires running simulations with a zero background rotation, a rigid rotation, and a sheared rotation, which give rise to the residual stress term, the pinch-like flux, and the diffusive flux, respectively. We have performed global gyrokinetic particle simulations using GTC code for the toroidal momentum transport in driftwave turbulence. Both ions and electrons are treated kinetically. We observe significant radial redistribution of toroidal momentum in cases with constant angular velocity (rigid rotation), which is the manifestation of residual stress and pinch fluxes. Momentum pinch is found to be enhanced by kinetic electrons. Using obtained off-diagonal fluxes we were able to subtract them from total flux in the sheared rotation case, getting as the result the diffusive flux. The ratio of momentum to heat diffusivity (Prandtl number) is found to be in good agreement with quasilinear estimates. The origin of off-diagonal fluxes has been studies through symmetry breaking mechanisms associated with zonal flow generation.

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