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Comparison of an Extended Rotation Theory with Experiment[1]

C. BAE, W.M. STACEY, Georgia Institute of Technology, W.M. SOLOMON, Princeton Plasma Physics Laboratory — An extended neoclassical rotation theory (poloidal and toroidal) is developed from the fluid moment equations, using the Braginskii decomposition of the viscosity tensor extended to generalized curvilinear geometry and a neoclassical calculation of the parallel viscosity coefficient interpolated over collision regimes. Important poloidal dependences are calculated using the Miller equilibrium flux surface geometry representation, which takes into account elongation, triangularity, the Shafranov shift and flux surface compression/expansion. The resulting set of eight (for a two-ion-species plasma model) coupled nonlinear equations for the flux surface averaged poloidal and toroidal rotation velocities and for the up-down and in-out density asymmetries for both ion species are solved numerically. Comparison of prediction with measured carbon poloidal and toroidal rotation velocities in co-injected and counter-injected H-mode discharges in DIII-D indicates agreement to within <10% except in the very edge ($\rho > 0.95$).

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