Poloidal momentum transport due to drift-waves in toroidal geometry

G.M. Staebler

General Atomics, P.O. Box 85608, San Diego, California 92186-4508

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Abstract. The aim of this paper is to provide the theoretical framework for a quasi-linear drift-wave model of poloidal and toroidal momentum transport in magnetically confined plasmas in toroidal geometry. Axisymmetry is not required. The new feature is the inclusion of poloidal flow in the coupled equations for linear drift-wave stability and quasilinear mean field transport. It is shown how both toroidal and poloidal rotations can be included in a distribution function which is an equilibrium of the Vlasov equation in a rotating reference frame. The equations for the fluctuation driven toroidal and poloidal viscous stresses are determined and the toroidal form of the $E \times B$ and parallel velocity shear terms are found. In order to be able to follow the electric field evolution during a transport bifurcation, the neoclassical constraint on the poloidal rotation is not imposed. Instead, the common poloidal flow is evolved as part of the system of transport equations.

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