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**Kinetic Theory of Tokamak Zonal Flow Dynamics**[1] F.L. HINTON, M.N. ROSENBLUTH, General Atomics, P.H. DIAMOND, University of California, San Diego — We consider electrostatic turbulence in a tokamak as described by the gyrokinetic equation. The fluctuating potential is the sum of an axisymmetric (zonal flow) component and nonaxisymmetric (drift wave) components. We calculate the nonlinear coupling between these components by using a simple fluid model for the drift waves but retaining the kinetic description for the zonal flows. We thus retain the effect on the zonal flows of the neoclassical polarization and the trapped particle enhancement of the collisional damping. The kinetic linear response function for the zonal flows is used in the calculation of the nonlinear mode coupling coefficients in the equation for the zonal flow intensity. These mode coupling coefficients modify the zonal flow response to drift wave turbulence when the latter is modeled as a noise source, as in previous work (M.N. Rosenbluth and F.L. Hinton, PRL 1998; F.L. Hinton and M.N. Rosenbluth, presented at 1998 EPS meeting in Prague).

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