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Breakup of Zonal Flows Driven by Turbulence in Tokamaks[1] F.L. HINTON, M.N. ROSENBLUTH, General Atomics — Zonal flows driven by turbulence are linearly undamped,[2] in the absence of collisions. We investigate the breakup of these flows by the tertiary instability mechanism suggested by Dorland.[3] The primary instability is assumed to be the ITG modes which develop into turbulence and cause plasma transport. The secondary instability, in this nomenclature, is the nonlinear generation of the axisymmetric radially sheared poloidal flows, or zonal flows, which strongly regulate the turbulence and transport. The tertiary instability of these sheared flows, which is the subject of this paper, would limit their amplitudes, and allow larger ITG turbulence levels and transport. Starting with the gyrokinetic equation, we analyse the stability of perturbations on the kinetic zonal flow equilibria which we obtained previously.[2] The potential perturbation is the solution of an integral equation; we use a variational principle to solve it and determine the growth rate in various limits.

[1]Work supported by U.S. DOE Grant DE-FG03-95ER54309.
[2]M.N. Rosenbluth and F.L. Hinton, Phys. Rev. Lett. **80**, 724 (1998).
[3]http://kendall.umd.edu/~bdorland.

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