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Coherent nonlinear structures in ITG-Zonal flow system

RAMESWAR SINGH, RAGHVENDRA SINGH, PREDHIMAN KAW, Institute For Plasma Research, Bhat, India, PATRICK H. DIAMOND, Department of Physics, UCSD, USA — Nonlinear stationary structure formation in the coupled ion temperature gradient (ITG) - Zonal flow system is investigated. The ITG turbulence is described by a wave-kinetic equation for the action density of ITG mode and the longer scale zonal mode is described by a dynamical equation for the $m = n = 0$ component of the potential. In a moving frame, two populations of trapped and untrapped drift wave trajectories are shown to exist. This novel effect leads to formation of nonlinear stationary structures. It is shown that the ITG turbulence can self-consistently sustain coherent, radially propagating modulation envelope structures such as solitons, shocks, nonlinear wave trains, etc.

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