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Analysis of Saturation and Predator-Prey Behavior in ITG Turbulence PING-YU LI, PAUL TERRY, University of Wisconsin - Madison — Two requirements for realistic modeling of limit cycle oscillations involving ITG turbulence and zonal flows are the inclusion of large-scale stable modes, which are critical for saturation and its scalings, and the energy conserving coupling that links the instability with stable modes through the zonal flow. Models that satisfy these criteria involve wavenumber truncations in the eigenmode decomposition, the simplest of which is a three-wavenumber truncation. We examine truncations that preserve coupling topology between the turbulence and zonal flows, which respectively occupy 2D and 1D spectral domains, showing that this consideration affects the amplitude ratio of turbulence and zonal flows. Truncated models with time dependence are shown to naturally produce predator-prey oscillations. The relation between characteristic oscillation times, phasing and the parameters including the wavenumbers are investigated. Furthermore, the dependence on the zonal flow strength of the characteristic oscillation times and the energy transfer before and after saturation are tested. Dissipation, which breaks the conjugate symmetry of unstable and stable modes, is also examined to further probe saturation physics. Supported by USDOE.

Ping-Yu Li
University of Wisconsin - Madison

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