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Modulational Instability Effects on the Transition to Collisionless ITG Turbulence ROMAN KOLESNIKOV, JOHN KROMMES, Princeton University — Transition to collisionless curvature-driven ITG turbulence has been discussed via the application of systematic dynamical systems analysis[1] to a low-dimensional truncated model [including a drift wave (DW), a zonal flow (ZF), and a DW sideband]. This method allows one to calculate the Dimits shift of ∇T due to ZF generation. However, although the center-manifold dynamics demonstrate the basic physics of the Dimits shift, the lowest-order truncation does not saturate above the point of ZF destabilization. In this work we study the effects of long-wavelength envelope modulations[2] on saturation. We show that the system can undergo the transition to turbulence via the Benjamin–Feir mechanism. Collisional and collisionless scenarios are contrasted, and a collisionless version of the Ginzburg–Landau equation is derived. While a collisional system becomes modulationally unstable at linear marginality, collisionless systems exhibit that behaviour at the point of the Dimits-shift destabilization, the regime of suppressed turbulence being stable to long-wavelength modulations.

[1]R. Kolesnikov and J. Krommes, Phys. Rev. Lett. **94**, 235002/1 (2005).
[2]R. Kolesnikov and J. Krommes, Phys. Plasmas (submitted).

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