Radial spreading of electron temperature gradient driven turbulence

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Abstract

Particle and heat transport for the ion and electron temperature gradient driven modes have certain properties which can not be explained from simple linear analysis. One such important phenomenon is the existence of turbulence in regions where the local linear growth rate vanishes. One attempt at explaining this is the idea of turbulence propagation, or spreading. Driven in regions for which $\gamma > 0$, turbulence may in fact propagate into regions for which $\gamma = 0$. In this work we use reductive perturbation methods, to derive one such model for the intensity of ETG turbulence. The derived model has all the physically expected terms, hence it fits into the framework of previous scaling analysis but puts this on a firm theoretical foundation. In addition, the model takes into account spreading of turbulence due to linear dispersion, which may be effective, especially during the initial phase before nonlinear saturation.

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