Sources and Sinks in the Zonal Flow Energy Balance in Tokamak Microturbulence

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Abstract

The relative contributions of various terms to the driving and damping of the zonal flows in toroidal ion temperature gradient turbulence have been investigated using nonlinear gyrokinetic simulations. The simulation diagnostic was discussed and its correctness, in that the implemented terms numerically recover the net rate of change of the zonal flows, was demonstrated previously (A.M. Dimits *et al*. APS-DPP02 meeting). We have applied the diagnostic to cases in the turbulent finite-transport regime. It is found that (1) the zonal flow energy fluctuates about a steady mean level and (2) zonal flow energy is generated primarily through the Reynolds' stress term and dissipated by the transit time damping terms. The source/sink rates of other terms, such as the diamagnetic Reynolds stress, are finite but lower. Issues of the applicability of an analogous diagnostic to experiments are discussed.

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