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Analysis of feedback loop dynamics in turbulence spreading

KAZUHIRO MIKI, PATRICK H. DIAMOND, Center for Astrophysics and Space Science, UCSD, ZHIHONG LIN, Department of Physics and Astronomy, University of California, Irvine — Turbulence spreading, namely, spatial the spillover of excitation into stable region, is an important mesoscale process and so will naturally couple to zonal flow (ZF) and geodesic acoustic mode (GAM) dynamics. In this work, we examine the feedback loops between the evolving turbulence envelope and ZF/GAMs. One possible mechanism for self-consistent feedback is radial GAM propagation and feedback to turbulence via geodesic-acoustic coupling. Another is the effect of a turbulence potential enstrophy flux on zonal momentum, acting in context with the natural tendency of zonal flows to regulate the enstrophy flux by shearing. These mechanisms are tested using the gyrokinetic PIC simulation code GTC. We compare low and high q evolution cases in order to separate the effect of low frequency zonal flows and higher frequency GAMs. Detailed results will be presented. This material is based upon work supported by the Department of Energy under Award Numbers DE-FG02-04ER54738 and DE-FC02-08ER54959.

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