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Nonlinear ion turbulent heating in electron drift wave turbulence
LEI ZHAO, PATRICK H. DIAMOND[1], CMTFO; CASS and Department of Physics, University of California at San Diego, La Jolla, CA 92093 — The total turbulent heat transfer is composed of quasilinear electron cooling, quasilinear ion heating, nonlinear ion heating and zonal flow frictional heating. In a previous paper [1], we discussed quasilinear turbulent heating and zonal flow frictional heating. Here we apply weak turbulence theory to calculate the nonlinear ion turbulent heating via the beat mode resonance in electron drift wave turbulence [2]. The nonlinear diffusion in velocity space, affected by E x B motion and by the parallel velocity scattering, is further analyzed. This calculation proposes and analyzes a *new* collisionless turbulent energy transfer channel through nonlinear Landau damping. This process enters the electron-ion energy coupling. We estimate it by using the saturation balance. The results show that the collisionless turbulent energy transfer through the nonlinear Landau damping and the zonal flow frictional damping can *both* be important in a low collisionality, electron heated plasma, such as ITER.

[1] L. Zhao and P. H. Diamond, submitted to Phys. Plasma, 2012.
[2] W.M. Manheimer and T.H. Dupree, Phys. Fluid, 11, 2709 (1968).

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