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Self-regulating Drift wave – Zonal Flow turbulence in a linear plasma device JINLIN XIE, RAN CHEN, GUANGHAI HU, XIAOLI JIN, HONG LI, WANDONG LIU, CHANGXUAN YU, University of Science and Technology of China — Here we report new and interesting results about the DW-ZF system in a linear plasma device with much better control environments to illustrate important Zonal flow physics: (1) The three-dimensional spectral features of the LFZF have been provided. In particular, it is identified that the LFZF damping is dominated by ion-neutral collision in our case. Also experimental evidence of the shearing effect of ZF on DW has been given. (2) A zonal flow dominated state of the DW-ZF system has been achieved. Theoretically, it has been predicted that a significant portion of the turbulence energy can be stored in the Zonal Flows for the case of low collisionality plasmas. In our experiments we achieve a zonal flow dominated state, in which the maximum ratio of the ZF energy to the total turbulence energy is about 80%, which seems to support the hypothesis of zonostropic state in geostrophic turbulence. (3) The self-regulating dynamics in the DW-ZF system is clearly elucidated. The evolution of the energy partition ratio of drift-wave turbulence and zonal flow is investigated with varying magnetic field strength, which is found consistent with the general prey-predator model.

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