Abstract Submitted
for the DPP07 Meeting of
The American Physical Society

Numerical modeling of anisotropic 3D Drift-Alfven turbulence

J.C. PEREZ, STANISLAV BOLDYREV, University of Wisconsin-Madison — We present results from extensive numerical simulations of steady state Drift-Alfven turbulence in the presence of a strong guide field. We use a turbulence model based on equations originally derived by Hazeltine as an extension of the Reduced MHD model (RMHD). The model includes three dynamical fields, potential, magnetic flux, density and allows for the existence of a background density gradient that drives large scale electromagnetic drift-wave instabilities. Previous numerical simulations of this type of models have been mostly restricted to 2D or pseudo 2D simulations in the limit of vanishing $k_{\|}$, which restrict the turbulence cascade to the field-perpendicular plane. However, recent work in MHD turbulence have shown that the parallel dynamics can play a key role in anisotropic turbulent cascades. In this work we present fully 3D simulations of strong Drift-Alfven turbulence in a rectangular box that reflects the anisotropy of the turbulence imposed by the guide field. Simulations are benchmarked against state-of-the-art simulations of MHD turbulence at large scales and are used to investigate the energy spectrum as the turbulence reaches the ion sound radius, where the Shear Alfven makes the transition to a Kinetic Alfven wave.

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Date submitted: 20 Jul 2007

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