Geophysical Research Abstracts
Vol. 12, EGU2010-6787, 2010
EGU General Assembly 2010

Anisotropic developed MHD turbulence

Roland Grappin (1) and Wolf-Christian Müller (2)

(1) Paris Observatory, Luth, Meudon, France (roland.grappin@obspm.fr), (2) Max-Planck Institut für Plasmaphysik, 85748 Garching, Germany

MHD turbulence with a mean field is of importance to understand the non-adiabatic cooling of the expanding solar wind plasma with heliocentric distance.
The first theory was proposed by Iroshnikov and Kraichnan who proposed that the cascade towards small scales would be slowed down by the decorrelation of oppositely propagating Alfvén wavepackets.
This theory did not put much accent on the anisotropy of the phase velocity of the waves, depending on the angle of the wavevector with mean field.
A completely different picture has been since proposed which on the contrary insisted that a 1D-like fast (Kolmogorov-like) cascade should occur along the direction perpendicular to the mean field, with a very reduced spectral width in the parallel direction, this width being given by the balance between the perpendicular non-linear time and the linear parallel propagation time. The anisotropy predicted by this theory is in a sense maximal.
We give here a different picture, resulting from large Reynolds simulations, in which the anisotropy is more moderate than that predicted by the critical balance theory. In this new picture, the spectral scaling is the same in all directions, only the dissipation wavenumber depends on the angle between the wave vector and the mean field. The resulting anisotropy has a simple dependance on the mean field.