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Anisotropic MHD Turbulence in the Interstellar Medium and Solar Wind

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A theoretical model is given of anisotropic magnetohydrodynamic turbulence in the interstellar medium and the solar wind. The model is motivated by observations that show significant deviations from the Kolmogorov power-law. Dimensional and heuristic arguments are given and critically assessed. On the basis of the weak turbulence approximation in which three-wave interactions dominate, analytical and numerical results are obtained for the anisotropic energy spectrum produced by the random scattering of shear Alfvén waves propagating parallel to a large-scale magnetic field. The energy spectrum is shown to be proportional to $k_{\perp}^{-2}$, qualitatively consistent with some observations and wave kinetic theory. ©2003 American Institute of Physics

doi:10.1063/1.1618628
PACS: 96.60.Vg, 96.50.Ci Additional Information

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