COSMIC RAY TRANSPORT IN ANISOTROPIC MAGNETOHYDRODYNAMIC TURBULENCE

R. Schlickeiser (1) and I. Lerche (2)
(1) Institut für Theoretische Physik, Lehrstuhl IV: Weltraum- und Astrophysik, Ruhr-Universität Bochum, D-44780 Bochum, Germany, (2) Department of Geological Sciences, University of South Carolina, Columbia, SC 29208, USA.
rsch@tp4.ruhr-uni-bochum.de

Observations of interstellar scintillations, general theoretical considerations and comparison of interstellar radiative cooling in HII-regions and in the diffuse interstellar medium with linear Landau damping estimates for fast-mode decay, all strongly imply that the power spectrum of fast-mode wave turbulence in the interstellar medium must be highly anisotropic. It is not clear from the observations whether the turbulence spectrum is oriented mainly parallel or mainly perpendicular to the ambient magnetic field, either will satisfy the needs of balancing wave damping energy input against radiative cooling. This anisotropy must be included when transport of high energy cosmic rays in the Galaxy is discussed. Here we evaluate the relevant cosmic ray transport parameters in the presence of anisotropic wave turbulence. Using the estimates of the anisotropy parameter in the strongly parallel and perpendicular regimes, based on linear Landau damping balancing radiative loss in the diffuse interstellar medium, we show that in nearly all situations the pitch-angle scattering of relativistic cosmic rays by fast magnetosonic waves at pitch-angle cosines $|\mu| \geq V_A/c$ is dominated by the transit-time damping interaction.