

Acceleration and diffusion of energetic particles by coherent MHD structures:scattering probability model

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Presence of magnetohydrodynamic (MHD) turbulence is essential in many space and astrophysical phenomena, e.g., diffusive shock acceleration of cosmic rays. Such MHD turbulence is often assumed to be a superposition of MHD waves with random phases, but it is well known that coherent structures are often embedded within the turbulence. As an extreme example of phase correlated turbulence, we consider a one dimensional system in which many finite amplitude solitary Alfvén waves (pulses) propagate, and we consider acceleration and diffusion of energetic particles within this system by performing test particle simulations. Energy and pitch angle diffusion take place due to non-adiabatic interaction between the waves and the pulses. The results can be explained using scattering probabilities of the particles by a single pulse.