Pitch angle diffusion of charged particles by MHD waves

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We discuss some fundamental properties of pitch angle diffusion of charged particles by MHD waves by performing test particle simulations. When the turbulence energy is small, the particles stay within the hemisphere they belonged to initially. However, as the turbulence energy level is increased, substantial portion of particles start to traverse 90 degrees pitch angle. We propose a model to describe the pitch angle diffusion in a presence of finite amplitude MHD waves, which incorporates both mirror reflection and anomalous diffusion at 90 degrees pitch angle.

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We discuss some fundamental properties of pitch angle diffusion of charged particles by MHD waves by performing test particle simulations. The static magnetic field turbulence is given as superposition of Alfven waves with equal propagation speeds. Although each wave mode is non-compressional, superposition of the waves yields ponderomotive compressional fields, which may mirror-reflect the particles. The wave phases are assumed to be random. When the turbulence energy is small, the particles stay within the hemisphere they belonged to initially. However, as the turbulence energy level is increased, substantial portion of particles start to traverse 90 degrees pitch angle. We propose a model to describe the pitch angle diffusion in a presence of finite amplitude MHD waves, which incorporates both mirror reflection and anomalous diffusion at 90 degrees pitch angle.