



Contribution ID: 67

Type: **Poster contribution**

Diffusion of Cosmic Rays in Turbulent Plasmas: Analytical Theory and Simulations

Saturday 1 August 2015 15:30 (1 hour)

A fundamental problem in Space Science and Astrophysics is the interaction between energetic particles and a turbulent plasma. We have developed a test-particle code to simulate the interaction of charged particles with turbulent magnetic fields. Diffusion coefficients along and across the mean magnetic field are calculated and compared to different analytical theories. Different turbulence models were considered such as slab, 2D, composite, and isotropic geometries. We have also included wave propagation effects via the interaction with shear Alfvén waves. We explored the transport regimes in which the Bohm limit and the quasi-linear limit are valid. We have also shown that the so-called Unified Non-linear Transport Theory (UNLT) is indeed a strong tool for calculating perpendicular transport upon agreement with numerical simulations.

Collaboration

– not specified –

Registration number following "ICRC2015-I"

1067

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