A microphysical model for turbulent Fermi acceleration

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Abstract: Particle acceleration in magnetized turbulence represents a fundamental process for particle energization in a wide variety of astrophysical sources. This contribution presents a generalization of the original Fermi scenario of discrete, point-like interactions with fast-moving MHD structures to the more realistic case of a (continuous) turbulent flow. In this description, turbulence intermittency plays a central role in shaping the physics of particle acceleration. The microphysical model describes turbulent Fermi acceleration as a continuous-time random walk, drawing on a multi-fractal description of turbulence intermittency. A kinetic equation that simulates this process can then be derived. It will be shown that this model can reproduce the time evolution of particle energy distributions that are collected by particle tracking in the forced MHD turbulence of the Johns Hopkins University database.