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Solving super diffusion problem in stretched isotropic simulation by box length adjustment

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Magnetic field line random walk (FLRW) are a resultant from the turbulence of particle and internal magnetic field lines in the interplanetary medium. When high energy particles passing through the medium, their trajectories will be bended following a magnetic FLRW behavior according to the 2D and slab model. The isotropic turbulence simulation which depends on the stretched parameter α, is used to explain this model. However, the magnetic field lines is changing to super diffusion state at α = 0.025 , 0.05, 0.1, and 0.25. This problem may occur from the magnetic FLRW moving over a simulated condition or known as periodicity. In this study, the isotropic turbulence simulation was improved by adjusting the simulated boundary for observing the magnetic FLRW behavior and also studied with varying mean magnetic field. Then the diffusion coefficients were calculated to compare a result with the accepted theories. The results show that the diffusion coefficients can be calculated to explain the behavior of magnetic FLRW in the isotropic turbulence simulation, excepting for the mean magnetic field of 0.5 and 1 which need to be studied under several different conditions.

Keywords : Random walk behavior, Magnetic field line random walk, Isotropic turbulence, Super diffuse, Periodicity, Diffusion coefficient

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