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SIMULATIONS OF ENERGETIC PARTICLES INTERACTING WITH DYNAMICAL MAGNETIC TURBULENCE

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We explore the transport of energetic particles in interplanetary space by using test-particle simulations. In previous work such simulations have been performed by using either magneto-static turbulence or undamped propagating plasma waves. In the current work we simulate for the first time particle transport in dynamical turbulence. To do so we employ three models, namely the damping model of dynamical turbulence, the random sweeping model, and the nonlinear anisotropic dynamical turbulence. We also added dissipation effects to the power spectrum, an effect which is usually neglected. We compute parallel and perpendicular diffusion coefficients and compare our numerical findings with solar wind observations. We show that good agreement can be found between simulations and the Palmer consensus range for all dynamical turbulence models if using appropriate values for different parameters in consistent with interplanetary space at 1 AU heliocentric distance. In particular we show that best fit between simulations and observation occurs when the ratio of turbulent magnetic field and mean field is $\delta B/B0 = 0.75$.

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