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Suppression of Particle Drift by Turbulence

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Abstract content

Nearly thirty years ago it was shown that large scale drift plays a significant role in cosmic ray modulation in the heliosphere. It was found, however, that the classical values for the drift velocity used in the modulation models lead to too much drift, and required some reduction. The typical argument for this reduction of the drift velocity is that when cosmic rays propagate in a turbulent region, their random diffusive motion (if sufficient) should reduce their coherent drift motion. This reduction of drift has usually been treated in an ad hoc fashion in modulation models, by reducing the drift effects with some model parameter. To date, no complete ab initio theory exists that can describe the reduction of large scale drift in the presence of turbulent diffusion. To this end, we present results from direct numerical simulations of simultaneous particle drift and diffusion in a non-uniform magnetic field. We use the results from these simulations in a two-dimensional steady-state modulation model, which includes large scale gradient and curvature drift. We show what the effects may be from a preliminary ab initio treatment of large scale drift in a cosmic ray modulation model.

If this papers is presented for a collaboration, please specify the collaboration

Summary

Reference

Proceedings of the 30th International Cosmic Ray Conference; Rogelio Caballero, Juan Carlos D'Olivo, Gustavo Medina-Tanco, Lukas Nellen, Federico A. Sánchez, José F. Valdés-Galicia (eds.); Universidad Nacional Autónoma de México, Mexico City, Mexico, 2008; Vol. 1 (SH), pages 433-436

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