

Cross field transport of Solar Energetic Particles

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Solar Energetic Particles (SEPs) are accelerated during flares and coronal mass ejections at the Sun. They can escape from the solar corona, propagate through the interplanetary magnetic field (IMF) and reach Earth and other planets. SEPs can provide an effective test of theories of transport of energetic charged particles in turbulent plasmas. In addition, they are a significant radiation component within the heliosphere. This talk will review our understanding of the origin and propagation of SEPs, which is based on a large body of data gathered by spacecraft detectors and on theoretical models of energetic particle propagation. It will focus in particular on transport across the mean interplanetary magnetic field. The degree to which the latter contributes to the propagation, and therefore to the measured SEP intensities, is currently the focus of many observational and theoretical studies. The presentation will discuss multi-spacecraft observations which suggest that cross-field transport plays an important role. It will review several physical mechanisms that may be responsible for such transport, among which are the random walk of IMF lines and scattering due to turbulence. Recent results of full-orbit test particle modelling of energetic particle propagation will be presented, including studies of transport in structured turbulence [1] and of ion propagation from the Sun to Earth's orbit [2].

References

- [1] T. Laitinen, S. Dalla and J. Kelly, ApJ, **749**, 103 (2012)
- [2] J. Kelly, S. Dalla and T. Laitinen, ApJ, **750**, 47 (2012)