

Project Details

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Program Element: Focused Science Topic

Topic: Prediction of the Interplanetary Magnetic Field Vector Bz at 1AU

Project Title:

Trapping, Transport and Dynamic Behavior of Magnetic Connectivity and Energetic Particles in the Inner Heliosphere: Implications for Solar Probe, Solar Orbiter and Heliospheric Prediction

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Summary:

Several challenging problems of great current interest in heliospheric physics and LWS science relate to magnetic field line connectivity and solar energetic particle (SEP) transport. Rapid transport of SEPs in latitude (e.g., seen by Ulysses) and in longitude (seen by STEREO) challenge both theory and prediction. A second (and we argue, related) problem is the broadening of boundaries between fast and slow solar wind due to stochastic interchange of connectivity, allowing energetic particles and plasma of different composition to transport and mix across boundaries. Both cases will be better understood by improved quantitative description of interconnection and exchange of magnetic flux between nearby topological families (flux tubes) due to topological effects in field line transport in space (Seripienlert et al., ApJ 711, 980, 2010), and exchange of field line connectivity in time (Rappazzo et al., ApJ 758, L14, 2012). These processes can have significant consequences considering the complex magnetic environment inferred from observations.

We propose several tasks to further develop these ideas, with the goal of incorporating these anomalous transport effects with focused SEP transport models. We aim to thereby explain existing puzzles in longitudinal transport, and to provide better quantitative description of dropouts. We will determine the variability of the measured SEP flux depending on the observer's location with respect to the turbulence topology (e.g., Ruffolo et al., ApJ 779, 74, 2013). It is intended that improvements in prediction of SEP fluxes will emerge as both intermediate and final products.

Publication References:

no references