Project Details

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Topic: Shock acceleration of solar energetic particles by interplanetary CMEs

Project Title:
MHD Modeling of Coronal and Heliospheric Magnetic Field Evolution

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Summary:
The "open" magnetic field is the portion of the Sun's magnetic field that stretches out into the heliosphere to become the interplanetary magnetic field (IMF). It plays a key role in the Sun-Earth connection. It defines the structure of the heliosphere, including the position of the heliospheric current sheet and the regions of fast and slow solar wind.

Understanding of the topology and dynamics of the Sun's open magnetic field requires time-dependent modeling of the field response to changes in the photospheric magnetic flux. We propose a three-year program to investigate coronal and heliospheric magnetic field evolution with time-dependent MHD simulations. Specifically, we will:

- Incorporate magnetic flux evolution into the SAIC/NOAA SEC coupled MHD model of the solar corona and inner heliosphere;

- Study how the topological properties of the magnetic field evolve in response to different components of flux evolution, such as differential rotation;

- Model the time-dependent response of the coronal and heliospheric field to the flux evolution specified by the Schrijver and DeRosa (2003) evolutionary model for several months of real time;

- Use particle tracing techniques to investigate the contributions of initially closed field regions to the slow solar wind;

- Compare the magnetic field topologies of the resulting solutions (expanding loops, disconnection and interchange reconnection events) with measurements from spacecraft to determine whether the simulated evolution is compatible with heliospheric observations.

Results from our simulations will be provided to the space science community through journal publications and our web

site (http://iMHD.net/mhdweb).

Publication References:

no references