

Topic: Prediction of the Interplanetary Magnetic Field Vector Bz at L1

Project Title:

Stepping Stones Toward CME Prediction: Characterizing the IMF at L1

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Project Information:

The heliospheric community is about to benefit from a significant increase in both the types and the amounts of solar observations. As a result, NASA in the 2007 LWS TR&T AO challenges the research community to work towards the long-term (12--24 hours) prediction of the IMF inside CME events prior to their passing of the L1 point. Particular focus is given to the prediction of IMF B_z, as B_z is (usually) a main driver for storm strength and allows to predict storm duration reasonably well.

In order to make progress towards predicting the IMF B-field vector, we propose a project focused on the characterization of the solar wind IMF at the L1 point. We propose to pursue the following objectives:

- (1) Develop Self-Organizing Maps that can characterize the solar wind IMF at L1. A Self-Organizing Map (SOM) is a neural network algorithm that excels in pattern recognition as well as classification and clustering of complex, high-dimensional input data. SOMs are also used in time series prediction.
- (2) Discover patterns in the temporal development of the solar wind IMF at relevant time scales. Temporal developments at the Sun will have to be related to temporal developments at L1 for reliable long-term forecasts. We propose to use a modification of SOM to uncover patterns in the time developments of the IMF inside CMEs.
- (3) Relate L1 observations to and expand them with modeling results and solar remote observations in the focus topic working group. We plan to collaborate with other teams to interconnect our IMF investigation with remote solar observations and modeling efforts within the focus team working group, leading the way to uncover pattern correlations between developments at the source (during CME creation) and in the upstream solar wind at L1 once the CME passes.

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