Project Details

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Project Title:
A Next-Generation Model of the Corona and Solar Wind

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Summary:
The ambient structure of the solar corona and inner heliosphere plays a crucial role in the goals of Sun-Earth Connection science, yet both remote solar and in situ observations severely under-sample this region. Three-dimensional, time-dependent models have recently advanced sufficiently to provide a meaningful context for interpreting and connecting these disparate observations. We propose a strategic capability to combine the most sophisticated of these models with the latest techniques for deriving time-dependent photospheric magnetic field data and deliver a GUI-driven model that will be of broad appeal to the solar and heliospheric scientific community. This model will encapsulate both our current technical capabilities as well as a number of important improvements that will be developed and incorporated during the course of this work. The observed photospheric magnetic field acts as the primary boundary condition to the models and we have found that the solar wind solution is strongly dependent on it. Thus our proposed work includes detailed studies to improve the quality of this input. Moreover, we will drive the model with time-dependent output from flux transport codes, allowing us to produce a real-time model of the solar wind, which would be delivered to the CCMC. Ultimately, it might replace the current WSA model at the National Weather Service's Space Environment Center. Global MHD models are, by necessity, complex. In the past, typically only code developers were able to successfully run their code. We propose to abstract away the unnecessary complexities by providing a uniform GUI interface with which to initiate runs. We will also provide a set of GUI tools for post-processing, analysis, and visualization. Much of this work has already been done as part of previous and ongoing programs. Our team includes experts in the range of disciplines required to successfully carry out this project, including solar magnetometry, surface flux evolution modeling, coronal and solar wind modeling, and computational physics.

Publication References:

no references