

Project Details

ROSES ID: NNH05ZDA001N

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Program Element: NSF Partnership

Project Title:

The Comprehensive Corona and Heliosphere Model (CCHM)

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Summary:

A primary goal of the NSWP and the LWS program is the development of first- principles-based models for the coupled Sun-Earth system by the early 2010s. We propose to develop and maintain a first-principles based comprehensive numerical model of the 3D time-dependent structure and dynamics of the slowly varying corona and the ambient solar wind. The model will be based on the Space Weather Modeling Framework, a high-performance, flexible, easy-to-use computational tool developed at the University of Michigan. The proposed CCHM will be developed on the timeline described in the NSWP Implementation Plan. We will deliver all expected and desired features of the time-dependent corona and heliosphere model described in Section 1.2.2 of the Strategic Capabilities NRA. We will work with CCMC, NOAA SEC, and the solar-heliospheric community to expand the available physics models, assist the community in usage of the new capability, validate the individual models and calculate skill scores. The main features of the model will be: (i) a 3D quantitative description of the large scale structure and properties of the corona and the heliosphere at any given instant in time; (ii) the incorporation presently available and forthcoming line-of-sight photospheric magnetic field data, as well as vector magnetic field observations as input; (iii) the ability to initiate simple transients, as well as sophisticated magnetically driven solar eruptions; (iv) predictions of time dependent solar wind parameters at a point or an object (Earth, Mars, spacecraft) in space including the energetic particle environment; (v) sufficient modularity to incorporate routines containing new or more sophisticated physics; (vi) a user-friendly web portal to create, submit, monitor and analyze runs (including graphics) by the general research community; (vii) faster than real-time capability on reasonable computational resources, yielding the flexibility for quick-turn- around runs; (viii) the ability to run continuously in a pipeline mode and describe the continuous topological changes of the solar magnetic field (this requires that continuous data streams from SoHO/MDI, SOLIS, and later on from SDO/HMI, be available). We will deliver a working version to the CCMC and/or other centers in the first half of the funding period. We will apply rigorous evaluation and validation procedures throughout the project.

Publication References:

no references