Project Details

ROSES ID: NRA-00-OSS-01
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Program Element: Independent Investigation: LWS

Project Title:
Prediction of the Three Dimensional Structure of the Solar Wind at the Earth from L1 Orbit

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Summary:
We propose a two-year project to investigate how accurately observations from one or more spacecraft at the L1-halo orbit can predict the solar wind plasma and magnetic field just upstream of earth. By focusing on events in which solar wind observations from multiplespacecraft are available, we investigate these three basis issues: (a) what is the transverse, small (earth radii)-scale, steady-state and transient, structure of the solar wind near the earth, their properties, evolution, and interactions; (b) how does this structure propagate and evolve from L1 orbit to the earth, (c) can we reliably and accurately predict the solar wind at the earth from a single or more in situ measurements at L1. Our overall goal will be to recommend the optimal number and spacing of spacecraft in L1 halo orbits to provide accurate solar wind input for the LWS program.
The project will be based on both numerical modeling of the solar wind and analysis of solar wind observations from L1 (WIND and ACE) and near earth spacecraft (IMP 8, GEOTAIL, and Interball-tail). We will simulate the propagation of 3D structures from L1 to the earth and the reverse using a special implementation of the 3D MHD code developed by Odstricil. This code has been successfully used to investigate the interaction between transient disturbances with the background structures solar wind. The much smaller physical domain of interest here will enable use of very fine numerical spatial and temporal resolution. We will apply data assimulation techniques developed in meteorology to infer the transverse structure of the solar wind at L1 from the observations. This analysis will help to specify appropriate input data and evaluate importance of dynamic phenomena for the simulations. We will test and refine the structure at L1 by propagating it to the earth in the code.
Important results will be provided at the very beginning of the NASA LWS program in order to provide scientific background for the eventual incorporation of spacecraft constellation at the L1-halo orbit within the future space weather network.

Publication References:

no references