# Project Details

**ROSES ID:** NNH14ZDA001N
**Selection Year:** 2014
**Program Element:** Physics of the Inner Heliosphere

**Topic:** Physics-based methods to predict connectivity of SEP sources to points in the inner heliosphere, tested by location, timing, and longitudinal separation of SEPs

**Project Title:**
Advanced MHD Models and Analysis for Solar Probe Plus and Solar Orbiter

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**Summary:**
We propose to develop a sophisticated modeling capability to capitalize on the unique measurements expected from Solar Probe Plus (SPP) and Solar Orbiter (SolO). The model will help to integrate these measurements with those from other spacecraft, including STEREO and SDO, and Earth-based observations, into a coherent picture of the inner heliosphere. We will refine an existing 3D MHD model of the corona and solar wind, together with a focused set of tools, so they can be used to interpret observations and to plan observing campaigns for SPP and SolO. We will improve our Wave-Turbulence-Driven (WTD) model to accurately capture the physics of the solar wind. An accurate model will provide a global context to connect in situ and imaging observations, and will allow researchers to investigate the relationship between different observed quantities, and their consistency with solar wind models.

The proposed model will predict the large-scale environment in the vicinity of the spacecraft, to better tailor observing sequences and to optimize instrument pointing for remote sensing. The model will identify expected crossings from slow wind to fast wind (and vice versa), as well as regions with intermediate-speed highly variable solar wind streams. Our model will connect remote images of streamers, pseudostreamers, and coronal holes with in situ solar wind measurements. We propose to develop sophisticated tools based on coronal magnetic field topology to identify particularly interesting regions and to map these out into the solar wind to check their possible intersections with the orbit of SPP or SolO. We also plan to provide a robust 1D model along open magnetic field lines to rapidly scope out the consistency between measured fields and solar wind models.

Our model will be developed to run continuously by specifying time-dependent boundary conditions from measurements of photospheric magnetic fields, to produce an evolving prediction of the solar wind. The parameters in the model will be calibrated by matching with solar observations. The model will be developed to a level of readiness suitable for use during the SPP and SolO missions, and will be shared with the community and SPP and SolO science investigators via NASA's Community Coordinated Modeling Center.

# Publication References:

**Summary:** no summary

**Reference:** Vourlidas, Angelos; Howard, Russell A.; Plunkett, Simon P.; Korendyke, Clarence M.; Thernisien, Arnaud F. R.; Wang, Dennis; Rich, Nathan; Carter, Michael T.; Chua, Damien H.; Socker, Dennis G.; Linton, Mark G.; Morrill, Jeff S.; Lynch, Sean; Thurn, Adam; Van Duyne, Peter; Hagood, Robert; Clifford, Greg; Grey, Phares J.; Velli, Marco; Liewer, Paulett C.; Hall, Jeffrey R.; DeJong, Eric M.; Mikic, Zoran; Rochus, Pierre; Mazy, Emanuel; Bothmer, Volker; Rodmann, Jens; (2016), The Wide-Field Imager for Solar Probe Plus (WISPR), Space Science Reviews, Volume 204, Issue 1-4, pp. 83-130, doi: 10.1007/s11214-014-0114-y