Project Details

ROSES ID: NNH16ZDA001N
Selection Year: 2016
Program Element: Focused Science Topic

Topic: Advances Toward a Near Real Time Description of the Solar Atmosphere and Inner Heliosphere

Project Title:
The Global State of the Solar Atmosphere and Inner Heliosphere during Cycles 23 and 24

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Summary:
Science Goals and Objectives: The scientific goal of this proposal is to understand the global state of the solar atmosphere and inner heliosphere over two solar cycles. The scientific objective is to examine the properties of large scale heliospheric structures such as coronal mass ejections (CMEs), corotating interaction regions, and the associated phenomena that reflect the global state of the inner heliosphere including the solar atmosphere. The proposed work will build upon the initial discoveries made on the weak geomagnetic disturbances, lack of high-energy solar particle events, and overabundance of halo CMEs in cycle 24 (Gopalswamy et al. 2014, Geophys. Res. Lett., 48, 2673; Gopalswamy et al. 2015, ApJL 804, L23; Gopalswamy et al. 2015, JGR 120, 9221) and focus on the question: How does the state of the inner heliosphere (including the solar atmosphere) affect the large-scale solar/heliospheric structures? Answering this question will help characterize the inner heliosphere thus contributing directly to the advances on the Focused Science Topic.

Methodology: The methodology involves making accurate measurement of solar and heliospheric phenomena that are directly affected by the state of the inner heliosphere: speed and width of coronal mass ejections (CMEs), the plasma and magnetic contents of CMEs reaching 1 AU, CME rate and modulation of galactic cosmic rays, and properties of corotating interaction regions. All these properties will be compared between cycles 23 and 24 to characterize how the physical state of the heliosphere affects the properties of these large-scale structures. The proposed work will exploit the availability of complete multi-spacecraft data for two solar cycles (23 and 24) so that both inter-cycle and intra-cycle variability in the state of the inner heliosphere can be studied. The variability in the physical state is reflected in the physical quantities such as the total pressure in the heliosphere, total pressure inside CMEs, flow speeds, and the heliospheric magnetic field.

Relevance to the Focused Science Topic: The proposed work represents important advances that will greatly facilitate "Near Real Time Description of the Solar Atmosphere and Inner Heliosphere". Understanding the global state of the solar atmosphere and inner heliosphere is also important in achieving physics-based geomagnetic and solar energetic particle forecasting capabilities as identified in Strategic Science Areas 1 and 3. Thus, the proposed effort is highly relevant to the scientific objectives of the Focused Topic "3.1.1 Advances toward a Near Real Time Description of the Solar Atmosphere and Inner Heliosphere."

Publication References:

no references