

Project Details

ROSES ID: NNH08ZDA001N

Selection Year: 2009

Program Element: Focused Science Topic

Topic: Use Inner Heliospheric Observations to better constrain Coronal Mass Ejection (CME) and Solar Energetic Particle (SEP) Event models.

Project Title:

Tracking CMEs Through the Inner Heliosphere

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Project Member(s):

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Summary:

Objective: To study the propagation of coronal mass ejections (CMEs) through the inner heliosphere.

Method: We will accomplish this objective by combining remote-sensing observations from the STEREO A/B and SOHO spacecraft with in situ measurements from the Venus Express (VEX), Messenger (MSGR), ACE/WIND, STEREO A/B, and SOHO spacecraft, taking advantage of the favorable spacecraft conjunctions and multipoint viewing opportunities that these spacecraft are providing. Specific activities will include (1) determining the evolution of CME-deflected streamers and their associated shocks; (2) mapping the interaction between co-rotating interaction regions (CIRs) and CMEs; (3) determining the origin and evolution of very slow wind; (4) comparing CME observations with MHD simulations.

Importance: The study of CME-deflected streamers will provide information about the shocks that accelerate solar energetic particles (SEPs) and constrain models of the resulting heavy ion populations. The study of CIRs and CMEs will reveal how the slow CMEs are swept up by solar wind streams and how the fast CMEs drive shocks through those streams. By determining the origin of the very slow solar wind, we will learn how to interpret HELIOS observations of very slow wind at 0.3 AU and thereby help in planning for the Solar Probe Mission. By comparing CME models with MHD simulations, we will develop an improved capability to predict the occurrence and propagation of CMEs and shocks through the inner heliosphere.

NASA Relevance: These objectives are consistent with NASA's Strategic Goal of understanding the Sun and its effects on Earth and the solar system (as described in Table I and Sections I(a) and IV(e) in the ROSES Summary of Solicitation). Also, they are directly related to the stated goals of the Inner Heliospheric Study of CMEs and SEPs - an objective of NASA's Living With A Star Program of Targeted Research and Technology.

Publication References:

Summary: no summary

Reference:

Rouillard, A. P.; Davies, J. A.; Forsyth, R. J.; Savani, N. P.; Sheeley, N. R.; Thernisien, A.; Zhang, T.-L.; Howard, R. A.; Anderson, B.; Carr, C. M.; Tsang, S.; Lockwood, M.; Davis, C. J.; Harrison, R. A.; Bewsher, D.; Fränz, M.; Crothers, S. R.; Eyles, C. J.; Brown, D. S.; Whittaker, I.; Hapgood, M.; Coates, A. J.; Jones, G. H.; Grande, M.; Frahm, R. A.; Winningham, J. D.; (2009), A solar storm observed from the Sun to Venus using the STEREO, Venus Express, and MESSENGER spacecraft, *Journal of Geophysical Research*, Volume 114, Issue A7, CiteID A07106, doi: 10.1029/2008JA014034

Summary: no summary

Reference:

Rouillard, A. P.; Sheeley, N. R.; Tylka, A.; Vourlidas, A.; Ng, C. K.; Rakowski, C.; Cohen, C. M. S.; Mewaldt, R. A.; Mason, G. M.; Reames, D.; Savani, N. P.; StCyr, O. C.; Szabo, A.; (2012), The Longitudinal Properties of a Solar Energetic Particle Event Investigated Using Modern Solar Imaging The Astrophysical Journal, Volume 752, Issue 1, article id. 44, 20 pp, doi: 10.1088/0004-637X/752/1/44