

Project Details

ROSES ID: NNH09ZDA001N

Selection Year: 2010

Program Element: Focused Science Topic

Topic: Predict the Onset and Space Weather Impacts of Fast CMEs/Eruptive Flares

Project Title:

The Dynamics of Neutral-Line Flows During CMEs and Flares

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Project Member(s):

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Summary:

We propose a four-year program to systematically characterize neutral-line (NL) flows associated with coronal mass ejection (CME) initiation and flares. The investigation will be accomplished with quantitative measurements of NL flows derived from our unique technology, the optical flow technique DAVE4VM, applied to space-based vector magnetograms from the Solar Dynamics Observatory (SDO) Helioseismic and Magnetic Imager (HMI). Vector magnetograms and accurate velocity maps of active region NL flows are arguably the most important new contributions that HMI will provide for the solar physics community because the photospheric magnetic fields and orientation, magnitude, and duration of NL flows are critical for testing current CME initiation theories and developing predictive models. We will survey NL flows of active regions, combined with the active region topology and the time variation of the unsigned vertical flux. We will analyze the results to test the predictions made by CME models for these three observables and incorporate new observables developed by the theoretical and simulation groups participating in the focused science team. We will collaborate with the other members of the focused science team by providing photospheric observables during eruptions for testing CME initiation theories and for driving lower photospheric boundary of simulations with the observed HMI vector magnetogram evolution and velocity fields derived from the DAVE4VM analysis. This critical component of the focused science team represents a suite of fundamental quantitative tests for CME models and theories. The close collaboration between observation, image processing, and theory simulation elements of the focused science team will produce rapid advancements in our understanding of the initiation and eruption of CMEs and flares and provide guidance for future NASA programs.

Publication References:

Summary: no summary

Reference: Liu, Yang; Zhao, Junwei; Schuck, P. W.; (2013), Horizontal Flows in the Photosphere and Subphotosphere of Two Active Regions, Solar Physics, Volume 287, Issue 1-2, pp. 279-291, doi: 10.1007/s11207-012-0089-3