Project Details

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Program Element: Solar Dynamics Observatory

Project Title:
Characterizing Coronal Magnetic Null Points and Their Relation to Eruptive Events

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Summary:
The topology of the coronal magnetic field is determined in part by the presence of magnetic null points, making them of fundamental importance in understanding the coronal magnetic field. In addition, the breakout model for the initiation of coronal mass ejections (CMEs) requires the existence of a null point. We propose to model the coronal magnetic field using a Potential Field Source Surface (PFSS) model computed from SDO/HMI vector magnetograms, locate null points in the PFSS model, characterize their evolution, and relate their presence to the occurrence of eruptive events. We will determine the typical lifetime of null points, and how they are formed and vanish in the context of whether they are associated with open field. The high cadence of HMI data will allow for following the evolution of the null points, and for a close temporal association with the start of CMEs, while the full disk magnetograms will allow the global structure of the field to be modeled, and potentially allow for an investigation of the distribution of null points at high latitudes.

The NASA/Heliophysics Living With a Star request 1.3.2, Science Analysis for the Solar Dynamics Observatory (SDO) Initiative "challenges proposers to use the data from the Solar Dynamics Observatory (SDO) to characterize the properties, evolution, and terrestrial consequences of the solar magnetic field". The proposed investigation will characterize the properties and evolution of one key topological feature the coronal magnetic field: null points. Relating their presence to CMEs also has indirect implications for the terrestrial consequences of the solar magnetic field.

Publication References:

Summary: no summary

Reference: Barnes, G.; Birch, A. C.; Leka, K. D.; Braun, D. C.; (2014), Helioseismology of Pre-emerging Active Regions. III. Statistical Analysis, The Astrophysical Journal, Volume 786, Issue 1, article id. 19, 13 pp, doi: 10.1088/0004-637X/786/1/19

Summary: no summary

Reference: Crouch, A. D.; (2015), Resolving the Azimuthal Ambiguity in Vector Magnetogram Data with the Divergence-Free Condition: Implementations for Disambiguating Each Height Independently, Solar Physics, Volume 290, Issue 10, pp.2677-2691, doi: 10.1007/s11207-015-0770-4