Project Details

ROSES ID: NRA-NNH04ZSS001N
Selection Year: 2005
Program Element: Focused Science Topic

Topic: To determine the solar origins of the plasma and magnetic flux observed in an Interplanetary Coronal Mass Ejection.

Project Title:
Fluxon Modeling of CME Onset

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Summary:
We have developed a simulation framework ("fluxon modeling") that allows us to model 3-D plasma systems with high fidelity on a desktop workstation. We propose to continue developing the technique and to use it to determine the relative importance of three principal proposed mechanisms of CME onset: magnetic breakout, magnetic tether cutting, and plasma mass draining. Our fluxon modeling code eliminates numerical reconnection and scales efficiently to complex systems, allowing us to assess the contributions of reconnection, magnetic morphology, and plasma mass loading to CME onset. In addition to simple systems with prescribed boundary conditions, we will apply the model to existing SOHO observations of actual CMEs to identify which mechanisms were responsible for those eruptions; and to determine the feasibility of predicting time, strength, and size of CME eruptions from magnetic and EUV imaging data. The proposed work is the natural continuation of a previous LWS TR&T project that funded the initial development of fluxons. In addition to enabling the present science investigation, fluxons are a key technology for several of the LWS goals, such as real-time space weather prediction. All software developed under this project will be documented and released freely to the community.

Publication References:

Summary: no summary

Reference: Rachmeler, L. A.; DeForest, C. E.; Kankelborg, C. C.; (2009), Reconnectionless CME Eruption: Putting the Aly-Sturrock Conjecture to Rest, The Astrophysical Journal, Volume 693, Issue 2, pp. 1431-1436, doi: 10.1088/0004-637X/693/2/1431