

Project Details

ROSES ID: NNH10ZDA001N

Selection Year: 2011

Program Element: Solar Dynamics Observatory

Project Title:

Self-Organized Criticality in Solar Physics

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Summary:

The solar corona is a nonlinear dissipative system

that exhibits self-organized criticality (SOC),

regarding the generation of magnetic flux elements,

nanoflares, microflares, large flares, and CMEs.

With AIA we can study for the first time extensive

statistics of these SOC phenomena with high

spatial resolution, high cadence, and comprehensive

temperature coverage, which will greatly

improve new physical insights into the dynamics

and statistics of solar phenomena, such as

the role of nanoflares for coronal heating, the

universal relationship between the fractal geometry

of energy dissipation domains and energy frequency

distributions, or scaling laws between geometric

and physical solar flare parameters. SOC phenomena

are also common in geophysics (earthquakes),

magnetospheric physics (auroral emission, substorms),

stellar physics (stellar flares), pulsars (giant pulses),

and accretion disks around black holes. We propose to

analyze and model SOC phenomena from SDO/AIA and HMI data,

which have optimum cadence, spatial resolution, and complete

time and temperature coverage.

Publication References:

Summary: no summary

Reference: Liu, Wei; Title, Alan M.; Zhao, Junwei; Ofman, Leon; Schrijver, Carolus J.; Aschwanden, Markus J.; De Pontieu, Bart; Tarbell, Theodore D., (2011), Direct Imaging of Quasi-periodic Fast Propagating Waves of ~ 2000 km s⁻¹ in the Low Solar Corona by the Solar Dynamics Observatory Atmospheric Imaging Assembly, The Astrophysical Journal Letters, Volume 736, Issue 1, article id. L13, 6 pp, doi: 10.1088/2041-8205/736/1/L13

Summary: no summary

Reference: Foullon, Claire; Verwichte, Erwin; Nykyri, Katariina; Aschwanden, Markus J.; Hannah, Iain G.;(2013), Kelvin-Helmholtz Instability of the CME Reconnection Outflow Layer in the Low Corona, The Astrophysical Journal, Volume 767, Issue 2, article id. 170, 18 pp, doi: 10.1088/0004-637X/767/2/170

Summary: no summary

Reference: Joshi, N. C.; Uddin, W.; Srivastava, A. K.; Chandra, R.; Gopalswamy, N.; Manoharan, P. K.; Aschwanden, M. J.; Choudhary, D. P.; Jain, R.; Nitta, N. V.; Xie, H.; Yashiro, S.; Akiyama, S.; Mäkelä, P.; Kayshap, P.; Awasthi, A. K.; Dwivedi, V. C.; Mahalakshmi, K.; (2013), A multiwavelength study of eruptive events on January 23, 2012 associated with a major solar energetic particle event, Advances in Space Research, Volume 52, Issue 1, p. 1-14, doi: 10.1016/j.asr.2013.03.009