

Project Details

ROSES ID: NNH06ZDA001N

Selection Year: 2007

Program Element: Focused Science Topic

Topic: Solar Origins of Irradiance Variations

Project Title:

Physics-based Modeling of Emission in Active Regions

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Summary:

The structure and dynamics of active region magnetic fields play a crucial

role in the production of EUV and X-ray emission from the Sun. A key

impediment to a more comprehensive understanding and prediction of this

emission has been that models of active region magnetic fields based on real

data (e.g., nonlinear force-free models) have largely been disconnected from

studies of coronal heating and emission.

Static loop models, the most common method for study emission, have thus far

been unsuccessful in explaining some important properties of coronal loops.

We propose to use physics-based models of active region magnetic fields that

use solar magnetograms as boundary conditions and include realistic energy

transport (radiative losses, anisotropic thermal conduction, and coronal

heating) in the transition region and corona to investigate emission in

active regions.

We will investigate three aspects of active region physics

that may lead to time-dependent behavior of the coronal plasma:

(1) Thermal non-equilibrium; (2) Non-steady coronal heating; (3) Magnetic

field evolution. Preliminary results suggest our model may be capable

of explaining some of the mysterious properties of coronal loops.

Our model will produce quantitative predictions

of emission that we will test against observations from SOHO, TRACE,

Yohkoh, and SXI. Our proposed program is also highly relevant to the

upcoming Solar-B, STEREO, and SDO missions.

Publication References:

Summary: no summary

Reference: Lionello, R., Linker, J. A., and Mikic, Z. 2009, "Multispectral Emission of the Sun During the First Whole Sun Month: MHD Simulations," ApJ, in press

Summary: no summary

Reference: Riley, Pete; Linker, Jon A.; Mikic, Zoran; Lionello, Roberto; (2008), Global MHD Modeling of the Solar Wind and CMEs: Energetic Particle Applications, PARTICLE ACCELERATION AND TRANSPORT IN THE HELIOSPHERE AND BEYOND: 7th Annual International Astrophysics Conference. AIP Conference Proceedings, Volume 1039, pp. 279-285, doi: 10.1063/1.2982459

Summary: no summary

Reference: Lionello, Roberto; Linker, Jon A.; Miki?, Zoran; (2009), Multispectral Emission of the Sun During the First Whole Sun Month: Magnetohydrodynamic Simulations, The Astrophysical Journal, Volume 690, Issue 1, pp. 902-912, doi: 10.1088/0004-637X/690/1/902