Project Details

ROSES ID: NNH06ZDA001N
Selection Year: 2007
Program Element: Focused Science Topic

Topic: Predict Emergence of Solar Active Regions Before they are Visible

Project Title:
A Study of Seismic Signatures of Active Regions in Farside Imaging for Applications to Space-Weather

PI Name: Frank Hill
PI Email: fhill@noao.edu
Affiliation: National Solar Observatory
Project Member(s):
- Hanasoge, Shravan Mukunda; Collaborator;Tata Institute of Fundamental Research
- Fontenla, John ; Collaborator; NorthWest Research Associates
- Lindsey, Charles Allan; Collaborator; NorthWest Research Associates, Inc.
- Duvall, Thomas L.; Collaborator; NASA/GSFC
- Birch, Aaron C; Co-I; Max Planck Institute for Solar System Research
- Leibacher, John W.; Co-I; National Solar Observatory
- Gonzalez Hernandez, Irene ; Co-I; National Solar Observatory

Summary:
The investigators will conduct a comprehensive statistical study of the relation between the holographic seismic signatures of active regions and their magnetic and intensity configurations for further improvements in imaging active regions on the Sun's far surface and further extension of farside imaging to space weather and other applications.

The program we propose consists of two substantial parts: 1) Improvements in the calibrations of holographic seismic images based on the evaluation of nearside signatures, and 2) Application of holographic diagnostics, both nearside and farside, to simulations of active regions to be produced by a closely related program.

This study can be regarded as a continuation of a NASA-supported research that has extended farside imaging techniques to GONG observations covering the entire far hemisphere of the Sun and has substantially improved the quality of the original farside images, which initially covered less than half of the Sun's far hemisphere. The early stages of Part (1) have already commenced under the current NASA program, which is about to expire. This is based on the relatively simple assumption that the farside signature characterizes an "acoustic Wilson depression" proportional to the square magnetic field alone, which is already recognized as inadequate. The new program will take into account field inclination, and intensity and the underlying thermal anomalies these may signify in plages and sunspots. A realistic interpretation of the farside seismic signatures is crucial for improved space-weather applications, particularly for our understanding of the connection between farside signatures and prospects for major flares and Coronal Mass Ejections (CME). Part (2) will be conducted in close collaboration with CoIs at NWRA and Stanford, who will produce simulations of active regions for control applications of our farside imaging techniques. These are essential for a working assessment of the diffuse artifacts projected into farside images by active regions on the Sun's near surface. A comprehensive determination of the diffuse artifact is crucial to a practical extrapolation of changes in the global coronal magnetic field and the impact of active regions that emerge on the Sun's far surface, including an assessment of prospects for large flares and CMEs. It is, moreover, essential to the application of farside imaging to solar irradiance forecasting, which it is now heavily in demand. The program we propose will be conducted with CoIs and collaborators doing closely related theoretical modeling and simulations at NWRA and Stanford. We will also work closely with collaborators at LASP and the SOHO/SWAN project who are working on visible and UV irradiance forecasting.

Publication References:

Summary: no summary

Reference: Komm, R.; Hill, F.; (2009), Solar flares and solar subphotospheric vorticity, Journal of Geophysical Research,

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