

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:

Applying Magneto-Convection Simulations to Helioseismology and Flux Emergence

PI Name: Robert F. Stein

PI Email: stein@pa.msu.edu

Affiliation: Michigan State University

Project Member(s):

- Nordlund, Aake ; Collaborator; University of Copenhagen
- Lindsey, Charles Allan; Collaborator; NorthWest Research Associates, Inc.
- Georgobiani, Dali ; Collaborator; Michigan State University
- Kosovichev, Alexander G; Collaborator; New Jersey Institute of Technology
- Zhao, Junwei ; Collaborator; null
- Haber, Deborah A; Collaborator; University of Colorado

Summary:

The goal of this research is to test and refine techniques for detecting active regions before they are visible and to investigate the physical process of flux emergence through the solar surface (focused science topic 3). To achieve this

we will perform realistic, three-dimensional, magneto-convection simulations of a region of the solar surface larger than supergranules (96 Mm wide by 30 Mm deep) for three different situations:

(1) Magneto-convection with an active region

(2) Magneto-convection with horizontal field advected into the domain by inflows at the bottom

(3) The rise of a magnetic flux tube from near the bottom through the

surface.

The data sets produced by these simulations are of large enough dimensions and will be of long enough duration (more than two days) that they will provide a test bed for evaluating and refining local helioseismic techniques -- time-distance, ring diagrams and holography. This will improve our ability to

predict the emergence of magnetic flux before it becomes visible and

to study the structure and evolution of active regions.

Publication References:

Summary: no summary

Reference: Stein, Robert F.; (2012), Solar Surface Magneto-Convection, Living Reviews in Solar Physics, Volume 9, Issue 1, article id. 4, 51 pp, doi: 10.12942/lrsp-2012-4