

## 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:**

Predicting Active Region Emergence, Evolution, and Flare Productivity using Local Helioseismic Measurements and Discriminant Analysis

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**Summary:**

Prediction of solar active region emergence, growth, and energetic activity is central to the objectives of LWS and is needed for determining periods of time which will be safe for extra-vehicular activity by the crews of the ISS, Space Shuttles, and future long term missions. In order to address the Focused Science Topic predict the emergence of solar active regions before they are visible, we propose a comprehensive study consisting of three main components: (1) local helioseismic measurements of preemergent and emerged active regions using MDI/SOHO and HMI/SDO data; (2) semi-analytical and numerical modeling of the helioseismic signatures expected for preemergent and emerged active regions; and (3) statistical searches for helioseismic predictors of active region emergence, evolution, and energetic activity.

The modeling component will be to estimate the helioseismic measurements that would be expected for different flow, sound speed, and magnetic field configurations associated with preemergent and emerged active regions, including the effects of surface magnetic fields. The identification and removal of surface effects will be important in detecting preemergent active regions.

The statistical studies will be based on Discriminant Analysis (DA), a statistical method for determining how to best distinguish between samples of two or more mutually exclusive groups in a given parameter space such that a new measurement can then be classified as belonging to a particular group.

The NRA describes the prime measure of success for this work will be to demonstrate a statistically significant ability to predict the location of new active regions before they are visible on the surface of the Sun and also their evolution. The application of DA to search for statistically significant helioseismic predictors of active region emergence and evolution provides a direct test of this prime measure.

## Publication References:

no references