

Project Title:

Using SDO/HMI Observations to Probe Beneath the Sun's Magnetic Regions

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Project Information:

The objective of the proposed research is to determine the internal and subsurface structure of solar magnetic flux concentrations, such as sunspots and plage. This will be achieved through a combination of local helioseismic data analysis and theoretical modeling of the interaction between solar oscillations and magnetic flux concentrations. We will develop models for the internal and subsurface structure of solar magnetic flux concentrations that are consistent with both local helioseismic measurements and measurements of the magnetic field at the solar photosphere. To make these measurements we will use the Helioseismic and Magnetic Imager (HMI) on the Solar Dynamics Observatory (SDO). To determine the internal and subsurface structure of solar magnetic flux concentrations we will take the following approach: (1) Construct a set of magnetohydrostatic models for a given magnetic flux concentration using the magnetic field observed at the photosphere as a constraint. (2) Use numerical simulations of wave interactions with the magnetohydrostatic models to generate synthetic helioseismic data. (3) Apply helioseismic measurement procedures to both the observational data and the synthetic data. (4) Select the models that provide the best agreement with observations. This approach will be validated using artificial data from realistic magnetoconvection simulations where the subsurface structure of the magnetic flux concentration is known.

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Citations: