

Topic: Focused science topic for Strategic Goal 1 (Solar storms): Exploring the magnetic connection between the photosphere and low corona

Project Title:

Understanding the Dynamic Connections Between the Photosphere and Corona

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Project Information:

Global models of the Sun's corona are a critically important component of current and future coupled models of the Sun-Earth system used to study and forecast "space weather." The magnetic field in the corona determines its overall structure and is the source of energy for coronal heating, the solar wind, and other dynamic phenomena such as solar flares and coronal mass ejections. Thus, it is crucial that we understand how to properly integrate measurements of the solar magnetic field into numerical models of the corona.

The only routinely available magnetic field measurements, however, are made not in the corona, but in the photosphere below it, in the form of line-of-sight and vector magnetograms. While the distance separating the low corona and photosphere is a tiny fraction of the Sun's radius, physical conditions change so drastically in these layers that it is not clear how to best incorporate these measurements into numerical models. We will address this challenge by pursuing a two-pronged effort: we will model the emergence and evolution of active region magnetic fields using a numerical model capable of treating the photosphere-to-corona system within a single computational volume; and we will use this first-principles study to validate and improve techniques of incorporating photospheric vector magnetograms into models of the solar atmosphere and corona.

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