Project Details

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Project Title:
Using SDO To Study Active Region Moats, Coronal Cavities, Dimmings, and Coronal Hole Formation

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Summary:
OBJECTIVES/APPROACH: Employing simultaneous, coaligned SDO/AIA and SDO/HMI observations, we will carry out the following four projects: (1) We will study the formation and growth of the dark moats (also known as circumfacular areas) surrounding active regions, in the context of the evolving photospheric field. A particular goal will be to understand the role of supergranular convection, reconnection, and flux cancellation in the transition from fibril structures to PIL-aligned filaments. (2) We will track coronal cavities to determine if they have a tendency to evolve from arcade-like structures to flux ropes with circular cross sections. In addition, we will test our prediction that the preferred direction of the cavity spinning motions changes from equatorward to poleward as the polar fields weaken. (3) We will exploit the multiple EUV channels provided by AIA to study the temperature dependence of coronal dimmings, and to seek further support for our hypothesis that most of the coronal plasma cooler than 1 MK is not expelled in eruptive events. (4) We will study the formation of coronal holes during the emergence of active regions, and determine whether the formation process is accompanied by the expansion of coronal loops or the ejection of mass. In addition, we will investigate the causes of the observed short-term fluctuations in coronal hole boundaries and relate these fluctuations to in situ measurements of the slow solar wind.

METHODS: The AIA and HMI observations will be combined with EUV observations STEREO/EUVI, which provide complementary viewing angles, and with white-light observations from the SOHO/LASCO and STEREO/COR1 and COR2 coronagraphs, which will allow us to determine if coronal hole formation and coronal dimmings are accompanied by expanding loops and ejections into the heliosphere. We will also employ our flux transport code to simulate the evolution of active region moats and coronal holes. PFSS extrapolations of the observed photospheric field will be used to determine the coronal fieldline topology and the locations of open field regions.

RELEVANCE: This proposal directly takes up the LWS TR&T challenge to exploit the SDO data to "characterize the properties, evolution, and terrestrial consequences of the solar magnetic field."

Publication References:

no references