

Living With a Star Research at U.S. Air Force Research Laboratory

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The Sun is the prime drive of space weather, which impacts both the near-Earth environment and United States Air Force (USAF) assets. The solar program within the Air Force Research Laboratory (AFRL) addresses solar source of disturbances that impact USAF assets both directly and indirectly. Solar-driven space weather impacts on the USAF include geomagnetic storms from coronal mass ejections, solar energetic particle, radio bursts, and both short-term (flares) and long-term changes to the solar EUV irradiance. This talk will present highlights of heliophysics research conducted at USAF that utilizes data from NASA's Solar Dynamics Observatory (SDO). Automated detection of coronal holes in SDO/AIA images are used to validate and improve the Air Force Data Assimilative Photospheric Flux Transport model (ADAPT). ADAPT models the photospheric magnetic field and forecasts it out 1-, 3-, and 7-days. These fields are used to drive models of the corona and solar wind. Maps of coronal holes can be used to validate the photospheric magnetic maps.

ADAPT is also used to forecast the daily EUV irradiance for input into atmospheric drag models. These forecasts are validated with the EVE data. EUV irradiance data from EVE is also being used to develop a hybrid physics model for improved now-casting of the response of the ionosphere to flares. Both AIA images and EVE spectra are being used to determine the coronal sources of the F10.7 radio index, a standard proxy for the EUV. Finally, AIA images and EVE spectra are being used to understand the relationship between H-alpha flare importance and GOES flare class.