

Title: The Sensitivity of Empirical Regression Models of Solar Irradiance to Underlying Methodology

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Abstract:

Magnetic variability in the Sun can be observed through 2 surface manifestations, sunspot darkening and the faculae brightening. These magnetic features drive irradiance variability on the Sun. Therefore, one approach to solar irradiance modeling is to apply a linear regression technique called ordinary least squares (OLS) to proxies of magnetic variability and solar irradiance observations in order to generate scaling coefficients that estimate the Sun's irradiance on any given day when these proxies are available. Proxies used for the model include: sunspot number, area, and location for sunspot darkening and the Magnesium II index for faculae. Demonstrated consistency between irradiance estimates and satellite irradiance observations have provided confidence in this modeling approach. However, what if a different regression technique, such as orthogonal distance regression (ODR) was used? How could the estimates differ, and how can we evaluate the changes? In our report, we address these questions with comparisons between the different multiple linear regression methodologies, in this particular case ODR and OLS. We quantitatively evaluate differences in estimated irradiances against observations at solar rotational and solar cycle time scales.