

## **How does the Sun's Spectrum Vary: A Summary of NASA SIST Research Activities**

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Our proposal objective is to establish the magnitude and temporal structure of the Sun's irradiance variability at ultraviolet, visible and infrared wavelengths over time scales from months to multiple decades with greater certainty, and to consolidate this new information into an improved proxy model of spectral irradiance variability with associated uncertainties. The primary products of our research efforts include a revised database of solar ultraviolet irradiance made by the Solar Mesosphere Explorer that operated from 1982 to 1989 and an improved version of the Naval Research Laboratory (NRL) solar spectral irradiance model (NRLSSI2) that is publically available as the National Centers for Environmental Information Solar Irradiance Climate Data Record (CDR).

On solar rotation time scales, spanning days to several months, we will show the irradiance variations are relatively, but not completely, well specified. At longer time scales, spanning years to decades, the irradiance variations are less well specified and larger disagreement between irradiance observations and independent models will be shown. Using the SORCE total solar irradiance (TSI) and Lyman alpha measurements, which exhibit unprecedented long-term repeatability, we tested parameterizations from different records of proxies of solar variability (sunspots and faculae) in modeling the TSI and Lyman alpha observations. We made progress in identifying the causes of differences on solar cycle timescales between the NRL2 models and SORCE observations and will show new advances in statistical modeling of irradiance variability.

We will also discuss the current status of our efforts in reanalyzing the SME data. The SME data, spanning nearly one solar cycle in length, has the potential to be an ultraviolet irradiance time series of greater stability because of its limited solar exposure and in-flight degradation monitoring. We will discuss our research efforts that have led to an improved understanding of SME uncertainties.