

Project Details

ROSES ID: NRA-03-OSS-01

Selection Year: 2004

Program Element: Independent Investigation: LWS

Project Title:

Creation of a Composite Solar Ultraviolet Irradiance Data Set

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Summary:

A detailed knowledge of solar ultraviolet (UV) irradiance is critical to understanding the Sun-Earth system because of its impact in the terrestrial atmosphere. Satellite measurements of solar UV irradiance have been made since 1978, and numerous data sets are available (Nimbus-7 SBUV, SME, NOAA-9 and NOAA-11 SBUV/2, UARS SUSIM and UARS SOLSTICE). However, no single data set covers more than one 11-year solar cycle. Comparisons between overlapping data sets show both absolute offsets and time-dependent drifts. These differences need to be resolved in order to evaluate solar UV variations on longer time scales for climate studies. This proposal will merge the individual solar UV irradiance data sets from all available satellite instruments to create a unified composite UV irradiance data set. The wavelength range is 120-400 nm, which represents solar radiative input to the Earth's atmosphere from the surface to the mesosphere. The time period covered by the composite UV data set is November 1978 to the present, representing more than two complete solar cycles. Absolute offsets between data sets will be adjusted using comparisons to recently published reference spectra. Time-dependent differences between instruments during periods of data overlap will be evaluated using confidence limits assigned by the respective instrument scientists, as well as irradiance variations predicted by the Mg II proxy index. The composite irradiance product will then be created using a weighted combination of the observed irradiance data. This composite UV data set, in turn, will make it possible to examine relationships between irradiance and proxy data on multi-decade time scales. The composite UV irradiance data set will benefit additional areas of the Living With a Star program. We plan to merge our product with spectral irradiance data from the recently launched SORCE mission to provide a continuous irradiance data record for future climate studies. The solar extreme ultraviolet (EUV) spectral region below 120 nm provides energetic input for the ionosphere and thermosphere, but has not been measured with sufficient frequency or wavelength coverage to construct an equivalent irradiance data set. The composite UV irradiance data set will provide a comprehensive comparison product for all available EUV data sets, such as SOHO time series and TIMED SEE irradiances. This data set will also provide an improved basis for the development of empirical forecast models of solar activity.

Publication References:

Summary: "

Reference: Matthew DeLand / Science Systems Applications, Inc.-Creation of a Composite Solar Ultraviolet Irradiance Data Set

Summary: no summary

Reference: DeLand, M. T.; Floyd, L. E.; Rottman, G. J.; Pap, J. M.; (2004), Status of UARS solar UV irradiance data, Advances in Space Research, Volume 34, Issue 2, p. 243-250, doi: 10.1016/j.asr.2003.03.043

Summary: no summary

Reference: DeLand, Matthew T.; Cebula, Richard P.; Hilsenrath, Ernest; (2004), Observations of solar spectral irradiance change during cycle 22 from NOAA-9 Solar Backscattered Ultraviolet Model 2 (SBUV/2), Journal of Geophysical Research, Volume 109, Issue D6, CitelD D06304, doi: 10.1029/2003JD004074

Summary: no summary

Reference:

Viereck, Rodney A.; Floyd, Linton E.; Crane, Patrick C.; Woods, Thomas N.; Knapp, Barry G.; Rottman, Gary; Weber, Mark; Puga, Lawrence C.; DeLand, Matthew T.; (2004), A composite Mg II index spanning from 1978 to 2003, Space Weather, Volume 2, Issue 10, CiteID S10005, doi: 10.1029/2004SW000084

Summary: no summary

Reference: Deland, Matthew T.; Cebula, Richard P.; (2008), Creation of a composite solar ultraviolet irradiance data set, Journal of Geophysical Research: Space Physics, Volume 113, Issue A11, CiteID A11103, doi: 10.1029/2008JA013401