BAMS article outline

Title: A new, operational, climate data record for solar irradiance

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* Abstract
* Introduction
* The need for a solar irradiance climate data record
  + NRC National Imperatives for the Next decade (2007) recommended continuity of measuremnets ofr Earth radiation bundget and total solar irradiance
  + Subsequent NRC report identified high priority in preserving long-term climate records, incl. TSI.
  + Kopp and Lean report (Study B) define impacts of a measurement gap in TSI and how well different instrument and/or models can mitigate a potential gap. No current/future instrument other than TIM has the abilities to meet the requirements to measure solar variability at levels for climate study. No gap-filling can meet TSI climate data requirements.
  + Future TSIS mission has measurement requirements defined to detect long-term solar variability that is critical for climate studies (absolute accuracy, stability, and noise).
* Climate Data Record NOAA Vision (robust and reliable, consistent, algorithms, data stewardship, for broad community use)
* Earth Climate Variable: Earth Radiation Budget
* Deliverables/Products
* Description, time range, spectral resolution, daily and time averaged: TSI composites, historical reconstruction, contemporary TSI/SSI (daily, monthly-averaged, yearly-averaged)
* Inclusion of Uncertainties
* NetCDF4 format.
* Data sets created at LASP and Archived at NCDC. Can also download data from LASP LISIRD over a user-specified time and spectral range.
* Stewardship (TSIS ATBD, CDR development, irradiance composites, enable rapid generation of solar irradiance CDR following TSIS launch). Documentation archived at NOAA NCDC
* Time Series Data Updates
* Applications/Users (put near end instead?)
* Algorithm
* NRL TSI and SSI models – version 2 description
  + Combines indices that are representative of solar activity; two such indices are sunspot darkening and facular brightening that are obtained from ground- and space-measurements and converted to delta irradiance units on TSI and SSI, where regression coefficients are determines from the multiple linear regression of the proxies against the observed TSI and (detrended) SSI.
  + Sunspot darkening derived independently by 5 different groups
    - NRL using USAF sunspot regions from white light solar images in the SOON network
    - Mt. Wilson sunspot area index derived from ground-based magnetograms: ftp://howard.astro.ucla.edu/pub/obs/mpsi data/index.dat
    - STARA daily projected sunspot area from SOHO/MDI and SDO/HMI full-disk mages: http://www.nso.edu/staff/fwatson/STARA
    - San Fernando observatory sunspot deficit index: obtained from <http://www.csun.edu/SanFernandoObservatory/dataarchive2013.html> look for the cfdt1 files with suffix 6723 (for 672.3 nm data), grouped by year/month.
    - Debrecen projected sunspot area derived from ground-based images. http://fenyi.solarobs.unideb.hu/DPD/index.html
  + Facular brightening also used ground- and space observations.
    - Mg II (sun as a star, “global”) index obtained from spectra near 280 nm; SORCE/SOLSTICE, Univ. of Bremen Composite
    - Mt Wilson facular area index derived from ground-based magnetograms: howard.astro.ucla.edu (?)
    - San Fernando observatory facular area and facular excess indices (use CFDT1 or CFDT2?) http://www.csun.edu/sfo/dataarchive.html
    - San Fernando observatory Ca II K line emission derived from ground-based images (use CFDT1 or CFDT2?), http://www.csun.edu/sfo/dataarchive.html
    - Ca II K line emission near 390 nm made by KPNO SOLIS and Sacramento Peak, and Kitt Peak Vacuum Telescope.
  + F10.7 <http://www.spaceweather.ca/solarflux/sx-5-eng.php> (use adjusted value; it corrects for Earth-Sun distance).
* Outline Differences from version 1
  + Measurements of TSI used in version 1: SORCE/TIM, SoHO/VIRGO (PMOD composite), ACRIM (Acrim composite), from 1978 to present, adjusted to SORCE/TIM absolute scale
* The model’s absolute scale is on average that of the instrument database (SORCE TIM) used to construct it; based on measurement by SORCE/TIM during solar minimum (date; value)
* The model stability depends on the proxy inputs to the model, and the proxy stability.
* Source Data
* SORCE TIM and SORCE SIM, TCTE; connection to future TSIS TIM/SIM
* TRF/SRF calibration facilities
* Brief Description of corrections/calibrations applied to instrument(s)
* Mg II and USAF sunspot area sources
* Provide web addresses for sources of input data
* Operational Implementation
* Latency (sunspot area files have latency b/c they are monitored by sunspot group number not calendar date, Mg II index updates)
* QA analysis: for inputs operational monitoring of upper/lower bounds, standard deviation, monitoring magnitudes and trends in other sources of Mg II and sunspot (Ca K, F10.7), and in measurements (TIM/TCTE TSI)
* Uncertainty Analysis
* Uncertainty in model assumptions, regression coefficients, model inputs
* Tabulate first values
* Results and Validation
* Plot of (rotational and solar cycle) time series of TSI, with error bars, compared to measurement record and (?) other models of TSI
* Plot of (rotational and solar cycle(?)) time series of bin-integreated SSI with error bars, compared to measurement record and (?) other models of SSI
* Applications/Users (put here in or intro?)
* Conclusion