

SORCE SIM Release Notes for Version 21, Level 3 data product

SIM data Version 21 in LISIRD (see: <http://lasp.colorado.edu/lisird/sorce/>) covers the wavelength range 310.25 to 2412.34 over the extended time span of 2003/4/14 to 2013/03/14. A change to the commanding script for the IR scan was made on 2012/10/30 resulting in shorter wavelength coverage, missing the data at wavelengths longer than 2200nm. This dataset includes the first year of the mission and up to the time of the major battery failure when the instruments were turned off for several months. The mission and SIM data resumed on March 12, 2014 in the SORCE hybrid mode of operation. Data subsequent to 2013/03/14 will be included in the next version of SIM data (Version 22).

SIM data on the SORCE website (see: <http://lasp.colorado.edu/home/sorce/data/>) will include the wavelength range extended in the ultraviolet to 240.02 to partially overlap with the SOLSTICE data product and give the user the option to use either of these data sets. An IDL reader for the ASCII format is available at:

http://lasp.colorado.edu/home/sorce/data/lasp.colorado.edu/sorce/file_readers/read_lasp_ascii_file.pro

Version 21 of SORCE SIM is an incremental improvement on Version 20 that includes these corrections:

1. Improved offset corrections at the boundaries where spacecraft safe-hold events introduce offsets in the measured irradiance. Offset corrections are made by selecting time periods before and after the safe-hold events where the passage of solar active regions do not disturb the locally flat time series. The difference in the median irradiance for these two time ranges is added to the time series after the safe-hold event. Version 21 SIM data performs a re-analysis with better-defined time periods used to determine these offsets.
 - a. The purple trace of Figure 1 shows the irradiance difference (V20-V21) for the integrated UV (240-306 nm). There are no notable changes in the UV spectra in V21 relative to V20.
 - b. The green trace is for the combined visible and infrared channels from 312-1600 nm. The locations of the offset corrections at the safe-hold boundaries are noted with vertical dashed lines. Note that the data segments after the safe-hold events are flat indicating that these adjustments are of a constant change in the irradiance scale with no change in the slope of the line segments.
 - c. No changes in the degradation model from Version 20 data have been conducted for the UV (240-307 nm), the visible (310-950 nm), and the near infrared (950-1600 nm) portions of the spectrum, so these wavelength regions in Version 21 are identical to Version 20 with the exception of the adjustments seen at the safe-hold boundaries. Data users of Version 21 should consult the Version 20 notes found at <http://lasp.colorado.edu/home/sorce/instruments/sim/sorce-sim-data-products-release-notes/> for more information about the data correction methodology.
2. The modifications to degradation model were made in the time series for the 1600-2400 nm spectral range where an over-estimate of the degradation kappa-function was corrected to remove a non-physical trend apparent in the Version 20 integrated spectrum. The red trace in Figure 1 shows the difference in the integrated irradiance between V20 and V21. Note that irradiance alignments at the safe-hold boundaries are still made in this wavelength region, but changes in slope throughout the mission are observable indicating the change in the degradation model. The highest quality SIM infrared record is for wavelengths less than 2200 nm. Data is available for wavelengths between 2200 and 2400 nm, but the user should be aware of excessive missing data in this wavelength range.
3. These corrections improve the overall agreement with the measurement of the TSI. Figure 2 shows the integrated V21 data integrated between 240-2200 nm relative to the TSI with 54.17 Wm^{-2} subtracted to account for the unmeasured portion of the SIM. After this contribution is removed, SIM agrees with the TSI to $\pm 0.22 (1\sigma) \text{ Wm}^{-2}$ or about 160 part per million.
4. Future releases of SIM will include the following activities:
 - a. Version 22 of SIM will extend the SIM record up to the present time and include data in the SORCE hybrid mode after mid-March of 2014 and re-instate the daily processing and publishing of the SORCE SIM data. This release will mostly consist of an extension of the V21 data discussed in this note. Expected release of the data will occur in early March of 2015.

- b. Version 23 of SIM will continue the analysis with emphasis on:
- i. Continued analysis of the effective solar exposure for the UV and the VIS photodiodes. We will expand our analysis to optimize a new effective solar exposure that can be applied uniformly to all detectors.
 - ii. The ESR data remains significantly noisier after the start of the power cycling. These are attributed to either changes in the electrical characteristics of the ESR or a potential lag in the measured and actual temperatures of the ESR.
 - iii. A remnant temperature effect is still present in the IR photodiode in the latter part of the mission, and to a lesser extent in the VIS photodiode. Initial investigations indicate that the temperature response of these photodiodes may be changing over the course of the mission.

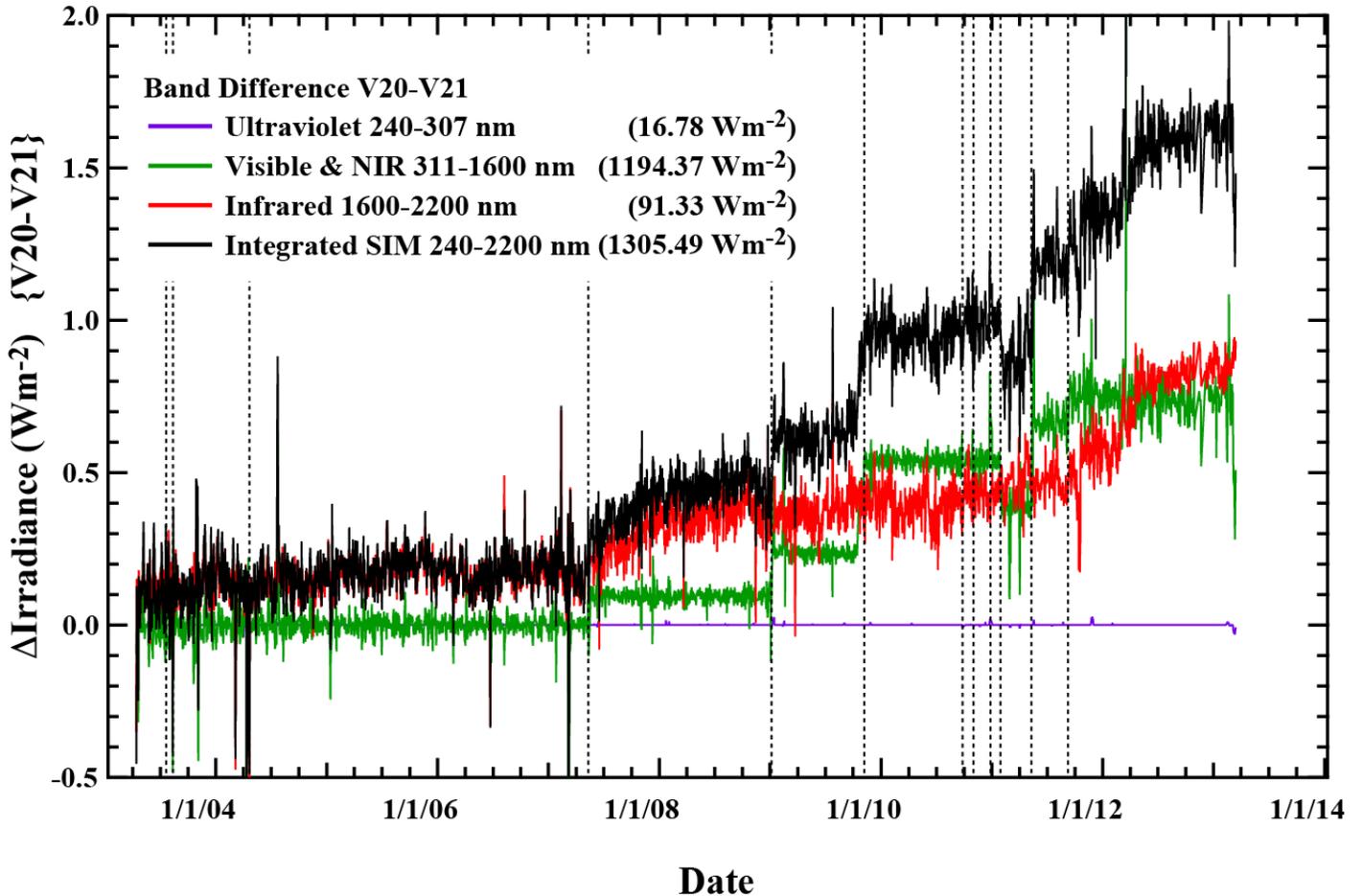


Figure 1. A comparison SIM V20 minus V21 in integrated bands that correspond to the full usable range of each of the SIM detectors that cover the 240 to 2200 nm spectral range of SIM data. V21 ultraviolet data (purple trace) matches the V20 processing. Offset corrections are made in visible and infrared channels that produce the green trace in this figure. Vis1 and IR photodiode data are combined in this trace. Note that for these two detectors there are step-wise corrections at the safe-hold boundaries that differ between V20 and V21. The red trace in this figure is for the ESR data over the 1600-2200 nm range where the degradation model was changed to remove a non-physical trend in the data that appears in V20. For this spectral range, offset adjustments are still made the safe-hold boundaries. The parenthetical values in legend is the V21 irradiance value for the solar minimum in February of 2009.

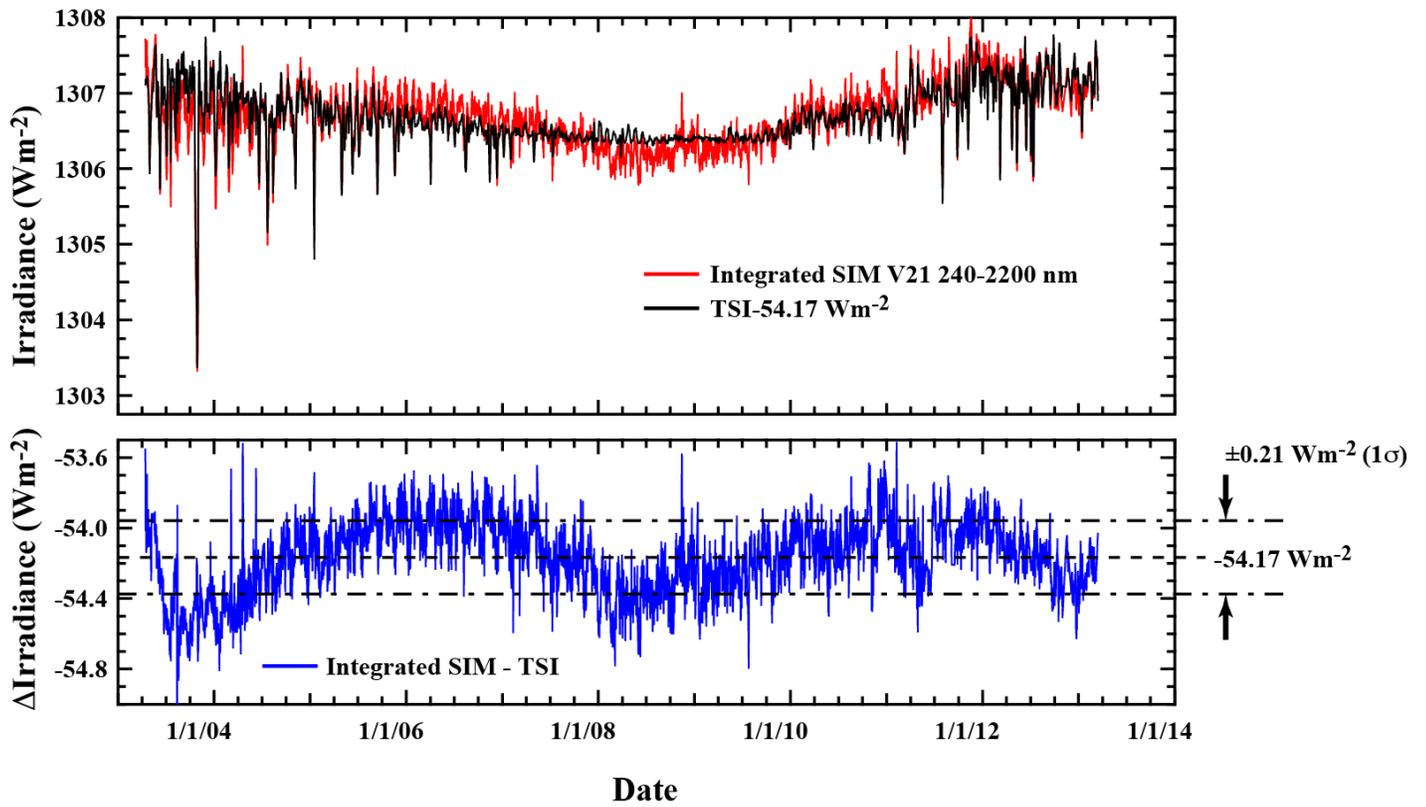


Figure 2. Version 21 of SIM integrated from 240 to 2200 compared to the TSI. The top panel compares the integrated spectrum compared to the TSI with 54.17 Wm⁻² subtracted from the TSI to account for the unmeasured portion of the integrated SIM spectrum. The lower panel shows the difference time series (Integrated V21 SIM - TSI) with a ± 0.21 Wm⁻² (1σ) standard deviation in the difference corresponding to about 160 parts per million.