

SORCE SIM Release Notes for Version 24, Level 3 data product

SIM data Version 24 appears in three locations, on the LISIRD website (see:

<http://lasp.colorado.edu/lisird/sorce/>), on the SORCE website (see:

<http://lasp.colorado.edu/home/sorce/data/>) and on the NASA DAAC (see:

https://disc.gsfc.nasa.gov/datasets/SOR3SIMD_024/summary/).

An IDL reader for the ASCII formatted data present on the SORCE web site is available at:

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

Table 1 below gives a description of available time and wavelength ranges for each location.

Table 1. Time and wavelength ranges for each location

Time Range	Wavelength Range (nm)		
	2003/04/14 - present	240 – 2400	300 – 2400
	SORCE	LISIRD	NASA DAAC

Previously, large gaps in the spectral record occurred in the infrared portion of the spectrum. It was believed that spacecraft operations were limiting the available time to acquire data; however, we updated the code that accounts for OBC corrections, leading to an acquisition of data in this wavelength range that was being missed in prior versions. The new spectral record is shown in Figure 1.

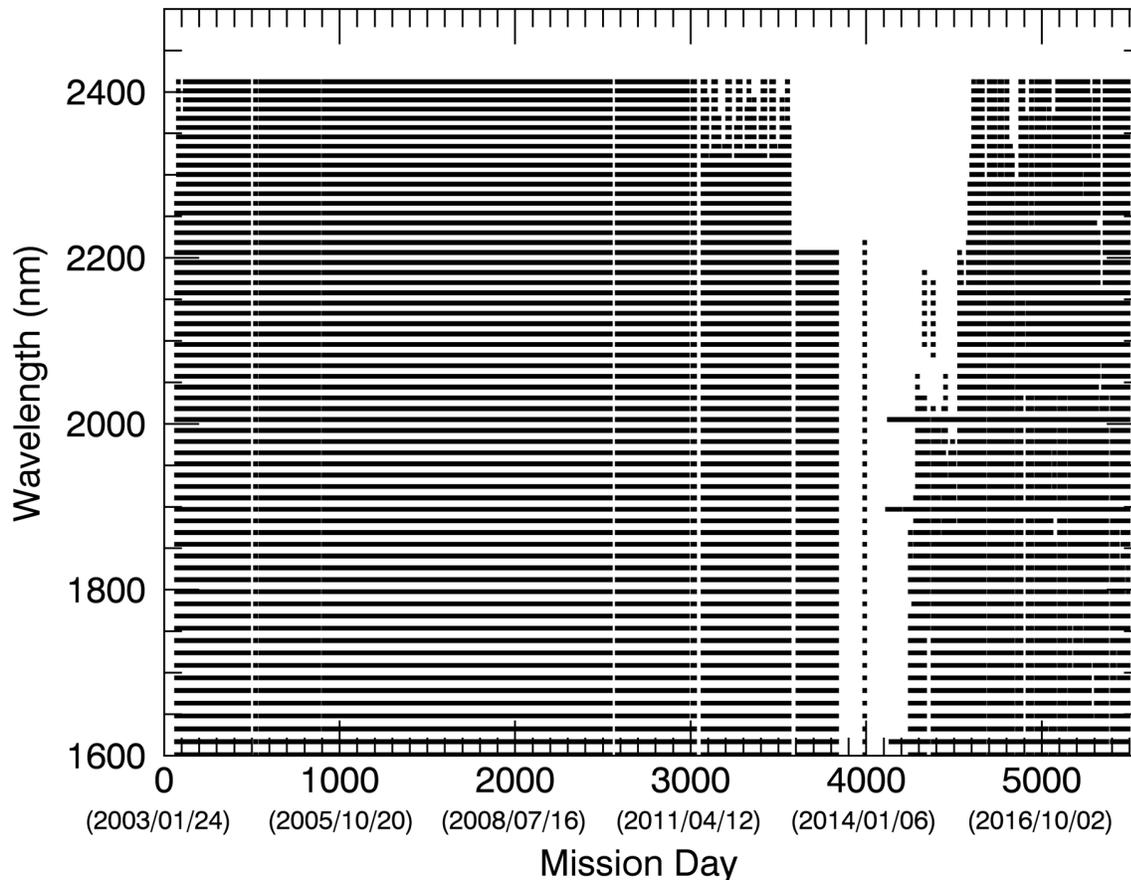


Figure 1 Full data acquisition record for the infrared portion of the spectrum (1600-2400 nm).

Version 24 of SORCE SIM employs the same correction methodology as employed in Version 23 SIM but now:

1. Includes a revision in the exposure time record, bringing the exposure record up-to-date rather than extrapolating the exposure.
2. As in Version 23 data, offset corrections are performed 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 passages 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. This problem is exacerbated in the SIM data during the DO-op mode since there is an ambiguity in closing the 225-day data gap in the extension of this record.
3. Since DO-Op mode SORCE makes solar observations during the daylight part of the orbit and goes into safe-hold every eclipse. This limitation requires multiple consecutive SIM measurements to be pieced together to generate a full spectrum. We noticed fluctuations in the irradiance during DO-Op mode and discovered outliers present in the data numbers. These outliers were the result of the mean being taken of an oversized dataset. Improvements to the code were undertaken to correct the outliers, as shown in Figure 2.
4. Temperature fluctuations were more prevalent in the DO-Op mode compared with earlier in the mission. The changes in temperature had the largest impact on the IR diode, especially at longer wavelengths. As a result of this finding we improved the temperature correction for the IR diode (Figure 3).

Users of SIM Version 24 should consult the Version 22 and 21 version 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.

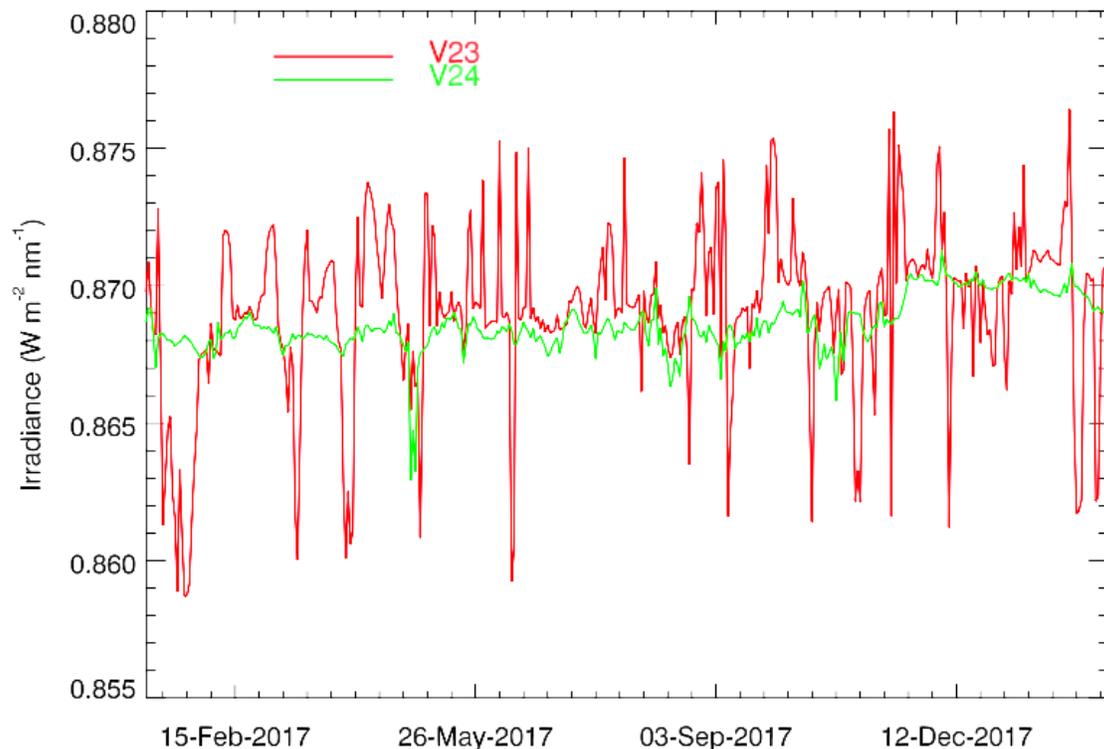


Figure 2 Dataset after the outliers in data numbers were corrected (V24) compared with V23 at 919.9 nm.

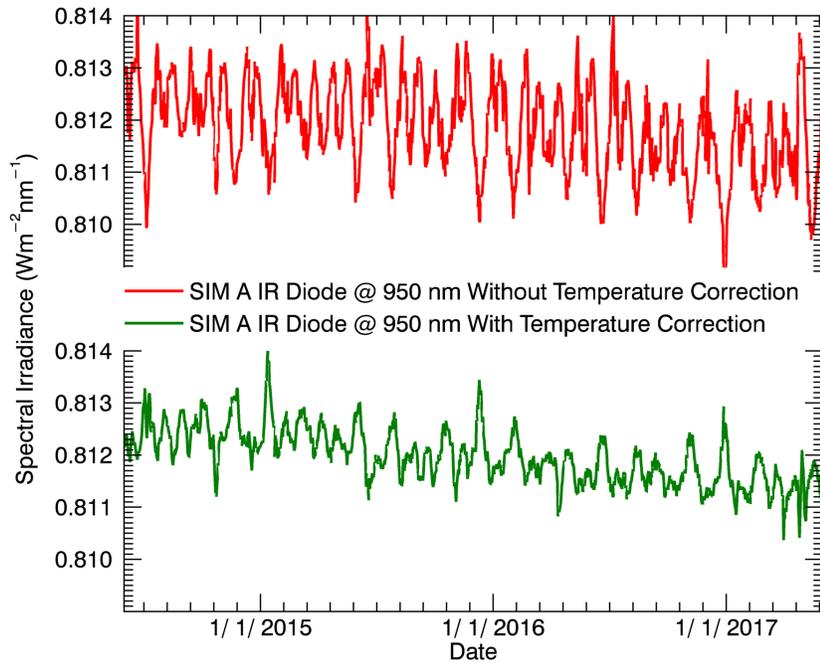


Figure 3 Before (top) and after (bottom) the temperature correction was made.

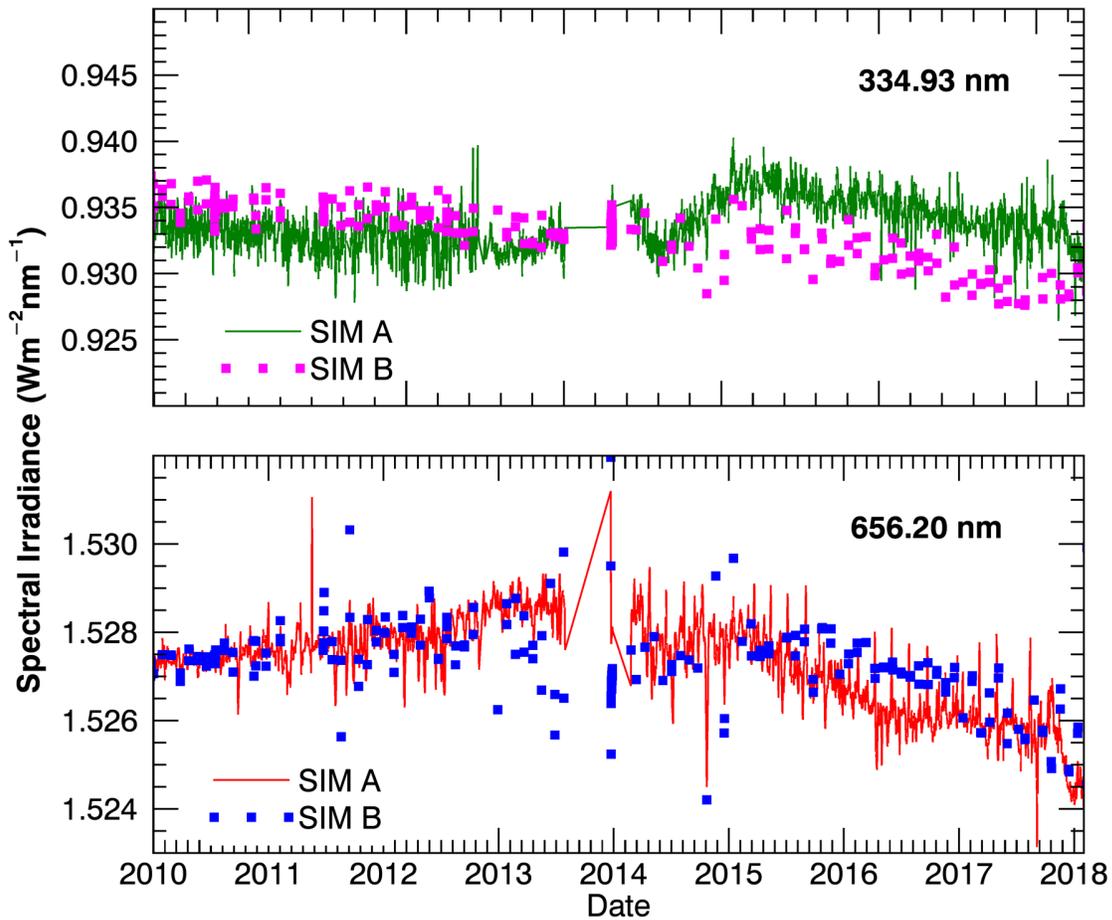


Figure 4 The time series of SIM A and B solar irradiances for 335 and 656 nm.

The successful resumption in the production of daily SIM data is reflected by continued agreement between the SIM A and SIM B channels. Figure 4 shows the time series of SIM A and B solar irradiances for 335 and 656 nm leading up to the December 2013 SORCE irradiance campaign and then into the DO-Op mode in 2014. SIM data in the power-cycling 2011 – 2013 period have higher uncertainties due to larger temperature changes over each orbit. SIM quality improved slightly in the DO-Op mode due to more consistent instrument operations. The high level of coherence between the two SIM channels indicates that degradation methodology used for SIM corrections can be continued to be used.

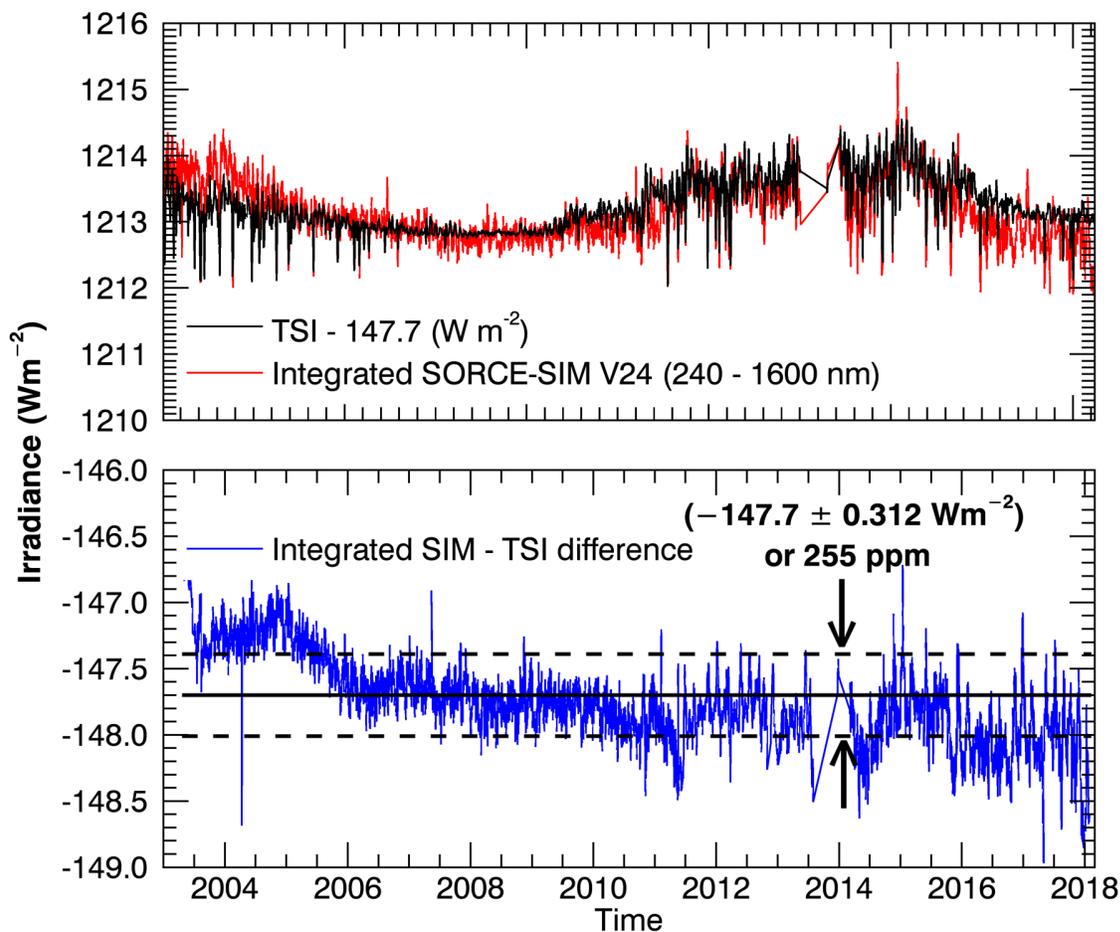


Figure 5. The SIM V24 data integrated from 240 to 1600 nm are consistent with the TSI with an offset of 147.7 W/m^2 to account for the other wavelengths not measured by SIM. The differences of $\pm 0.31 \text{ W/m}^2$ (255 ppm) are comparable to the preflight SIM 100 ppm/year stability goal. The majority of the difference seen between the TIM and the integrated SIM are related to the inability to perfectly correct the irradiance jumps at the safe-hold boundaries.

We observed a gradual departure from agreement of SIMA and SIMB at 280 nm starting in the year 2011. We suspect that the exposure of the prism to the sun is causing degradation profiles that vary with wavelength. In V25 we intend to explore this possibility with the analysis of prism degradation with respect to wavelength and time.

Version 25 of SIM Processing will include the following activities with emphases on:

1. Evaluation of the time dependencies associated with prism degradation
2. Continue to improve the combination of scans during the post DO-Op mode
3. Analysis of time dependent temperature corrections
4. Update the diode degradation correction