TSIS SIM Release Notes for Version 4, Level 3 data product

TSIS SIM data Version 4 appears in three locations on the LISIRD website (see http://lasp.colorado.edu/lisird/data/tsis_ssi_24hr) the TSIS website (see: http://lasp.colorado.edu/home/tsis/data/) and on the NASA DAAC (see: https://disc.gsfc.nasa.gov/datasets/)
Instrument line spread function details are now available on the TSIS SIM website: (http://lasp.colorado.edu/home/tsis/data/ssi-data/)
An IDL reader for the ASCII formatted data present on the TSIS web site is available at: http://lasp.colorado.edu/data/tsis/file_readers/read_lasp_ascii_file.pro

Version 4 change list:

- Reprocessed degradation corrections utilizing latest Channel C scan from early April 2020.
- Improved Channel C degradation correction to use a bi-annually-updated degradation rate per unit exposure rather than the constant rate used in previous releases. (This update results in a irradiance change between roughly 0 - 350ppm. The larger changes are seen later in the mission and in the UV where degradation is more significant)
- Updated diode background signal calculation to improve filtering of poor values.
- Removed 2 wavelengths from the standard wavelength grid (1846.259nm, 2138.012nm). These wavelengths were from the overlap of different scans in the operational plan and caused a significant irregularity in the spacing of the wavelength grid. This led to an issue with the Level3 processing causing these wavelengths to be reported as missing more often than expected.
- Added Doppler magnitude correction. This is at most a +/- 70 ppm change.

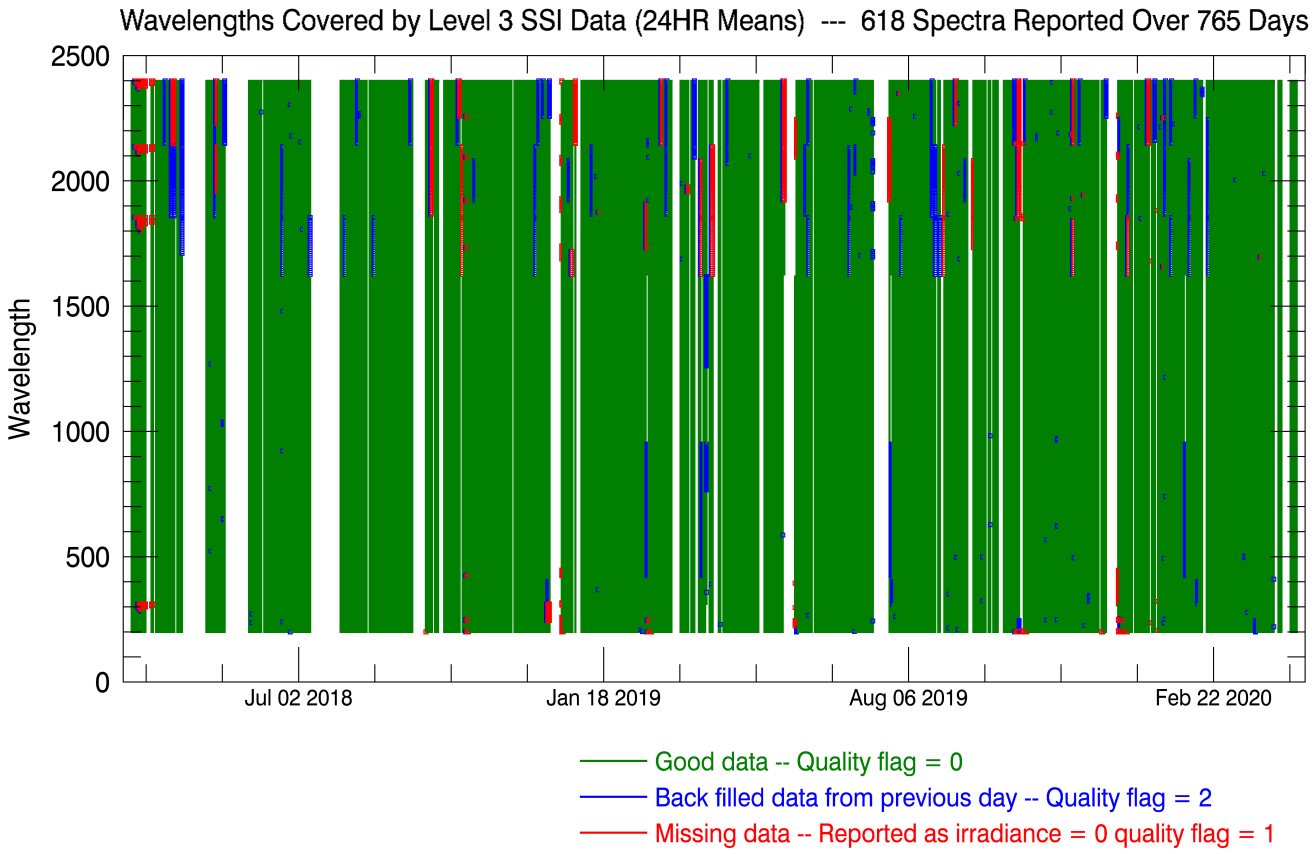
- A note to the user: Temperature extremes, due to changes in beta angles and eclipse durations, have resulted in instrumental effect in the data. Analysis is ongoing to derive new instrument corrections accordingly. This correction will be applied in future data releases with associated uncertainties. Temperature changes have been experienced throughout the mission but the aforementioned effect is primarily noticeable during 3 separate periods of high temperatures slightly above the nominal range. These periods are: (2019/01/13 – 2019/01/23) (2019/11/09 – 2019/11/24) (2020/01/11 – 2020/01/23).

Table 1 gives a description of available time and spectral range for the data. A data latency of nominally 25 days will occur for the processing of instrument degradation correction. This delay may be extended due to ISS operations and high beta angles. The data latency is driven by the cadence at which observations on the secondary channel, which are used in the degradation correction model, are obtained.

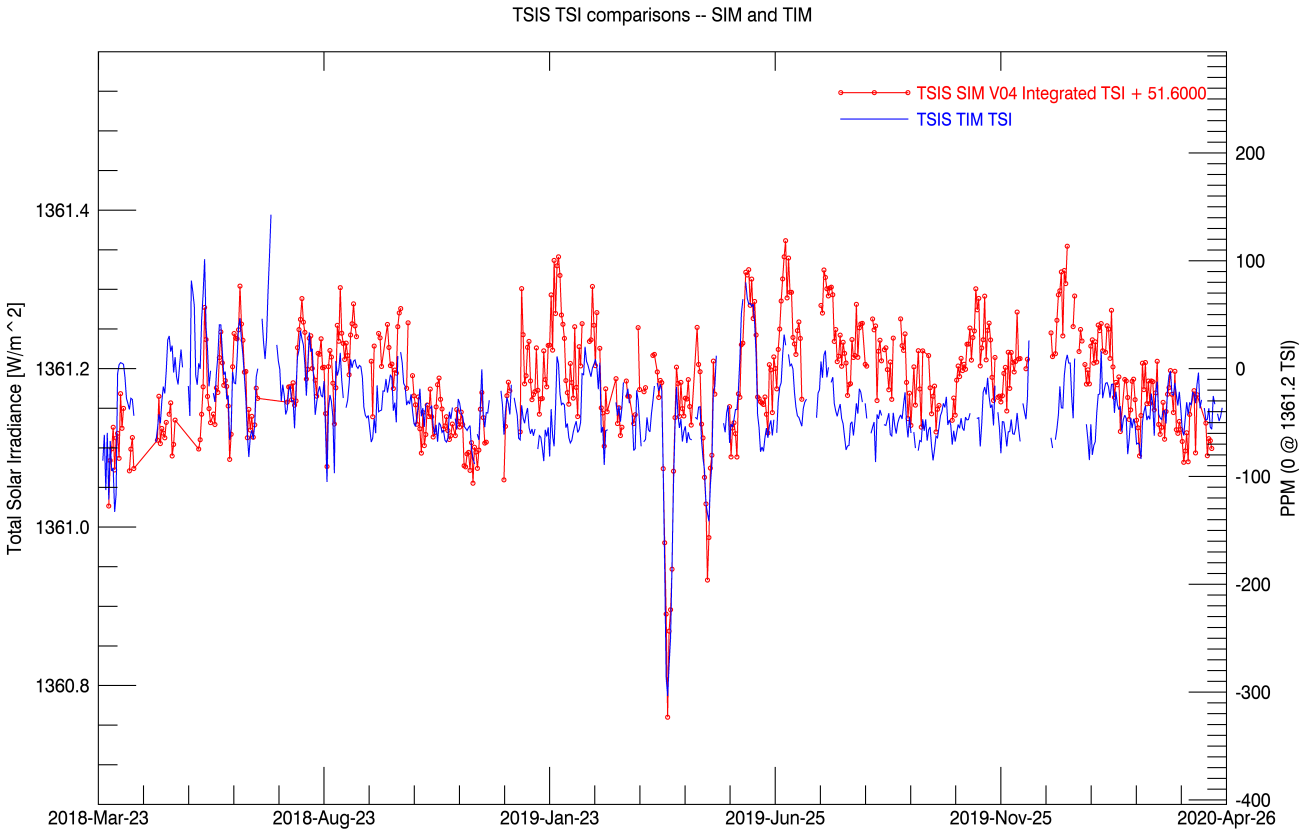
Table 1: Time and spectral range of the dataset.

Time Range	Wavelength Range (nm)
2018/03/14 - present	200-2400

Temporal gaps in acquiring TSIS SIM data have occurred due to a number of factors. These factors include ISS operational activities (i.e. orbit boost), ISS anomalies (i.e. power outages), and ISS obstructions that occur at extreme beta angles. The ISS obstructions can result in partial or complete loss of spectra for a given day. A partial loss of spectra occurs when shortened data collection time periods preclude observations of the full solar spectrum. Early in the mission, spectral gaps also occurred due to an error in instrument planning and operations. That error has since been fixed. Figure 1 shows the TSIS SIM data acquisition record. Colored points indicate portions of the spectrum that are missing (indicated in the data record with a quality flag = 1) or that have been backfilled from the previous day (indicated in the data record with a quality flag = 2). Backfilling is never done when temporal gaps in the data exceed 1 day.



As of 04/17/2- TSIS SIM data are available on 80.7% of days since the beginning of nominal operations.



The SIM TSI is generated by integrated the SIM spectra from 200nm – 2400nm and adding an offset to account for the rest of the spectrum that SIM does not measure. Only complete spectra with no missing or back filled values were used to generate this plot. This plot is meant to display the quality of long-term stability corrections of the integrated SSI against the measured TSI from TIM (which has a stability correction uncertainty of ~10 ppm/year) and not the absolute calibrations, thus the exact offset of 51.6[W/m^2] was chosen arbitrarily to match TIM as closely as possible. However, this value is close to the theoretical expected value of ~4% of TSI that falls outside of SIM's spectral range.

Definition of Uncertainties

Instrument Uncertainty (in Watts/m^2/nm) is a pre-launch measure of instrument uncertainty with contributions from component and unit-level instrument laboratory characterizations and calibrations with the final end-to-end full spectrum validation of the measured irradiances against a NIST-traceable cryogenic radiometer performed in LASP's Spectral Radiometer Facility. Reported uncertainties for Version 1 represent an upper limit to the calibration accuracy for each spectral band pending the resolution of an additional correction in the polarization dependence of the entrance slit transmission discovered after SIM launch.

Measurement Precision (in Watts/m^2/nm) is derived from a measure of the on-orbit variance in the scan-to-scan repeatability in the observed spectral irradiances. This value is an upper limit of measurement precision.

Measurement Stability (in Watts/m^2/nm) is a relative metric of the overall on-orbit degradation correction uncertainty. It has contributions from uncertainty due to post-processing of data (including correction of

instrument degradation), and uncertainty due to differences between observed irradiances for the 3 separate SIM channels. Note: This is reported as 0 after the most recent bi-annual Channel C scans.