GOES-18 EXIS XRS Level 1b (L1b) Data Release
Provisional Data Quality
Read-Me for Data Users
December 5, 2022

The GOES-R Peer Stakeholder Product Validation Review (PS-PVR) for GOES-18 Extreme Ultraviolet and X-Ray Irradiance Sensors (EXIS) X-Ray Sensor (XRS) Level 1b (L1b) Provisional Maturity was held on November 17, 2022. As a result of this review, the PS-PVR panel chair recommended that the GOES-18 EXIS XRS L1b data be promoted to Provisional Validation Maturity.

The L1b data products derived from EXIS XRS are soft X-Ray fluxes derived from XRS observations. The XRS X-ray fluxes cover two wavelength bands of 0.05-0.4 and 0.1-0.8 nm. The GOES-18 EXIS XRS L1b Provisional level data products are still undergoing calibrations and corrections. The product formats are defined in the GOES-R Product User Guide (PUG), but the PUG may not be fully up-to-date. Data released prior to the Provisional release date of November 17, 2022 contain significantly more issues, some of which are described in the GOES-18 EXIS L1b Beta Release notes. This earlier data should not be used.

Next year, a corrected GOES-18 L1b data set will be released on the NCEI website (listed below) which will also be retrospectively corrected to June 2022 and will include the latest fixes. Additionally, L2 products such as averages and flare locations based on this scientific data set will be released at this site.

Provisional validation is defined as when the L1b data has the following status:

- Validation activities are ongoing and the general research community is now encouraged to participate.
- Severe algorithm anomalies are identified and under analysis. Solutions to anomalies are in development and testing.
- Incremental product improvements may still be occurring;
- Product performance has been demonstrated through analysis via comparisons of data from GOES-16 , -17, and -18.
- Product analysis is sufficient to establish product performance relative to expectations (Performance Baseline).
- Documentation of product performance exists that includes recommended remediation strategies for all anomalies and weaknesses. Any algorithm changes associated with severe anomalies have been documented, implemented, and tested.
- Testing has been fully documented.
- Product is ready for operational use and for use in comprehensive calibration/validation activities and product optimization.

Users of the GOES-18 XRS L1b data bear responsibility for inspecting the data and understanding the known caveats prior to use.

The following is a list of caveats for the GOES-18 XRS L1b data that have been identified and are under analysis. Solutions are in development and testing.

1. The XRS fluxes will be noticeably contaminated by electrons during periods where X-ray fluxes are low and electron fluxes are high. This will be fixed in the L2 data. The low XRS fluxes in the L1b data should not be used for scientific analysis.
2. For all three GOES-R satellites, XRS-A is larger by ~32% than on GOES-15; e.g., $\text{XRS-A}_{\text{GOES-17}}$ / $\text{XRS-A}_{\text{GOES-15}}$ = 1.34. GOES-R XRS were carefully calibrated at NIST, while the fluxes from XRS on GOES-8 through -15 have all agreed with each other. The source of this discrepancy is unknown and is under investigation.
3. The dark radiation coefficient is not yet being applied. This coefficient is used to correct the fluxes for proton contamination during SEP events. The result is that signals will be artificially high during SEP events, especially in the A2 and B2 channels. Analysis to determine this term is in progress.
4. The dark count determination will be updated using values from periods of lowest electron fluxes. Impact will be to slightly increase fluxes, but this will only be noticeable for the lowest XRS fluxes.
5. The solar_array_current variable is not filled correctly and should not be used.
6. The dispersion and cross-dispersion angles during eclipses and lunar transits are currently set to fill values, instead of the calculated values.
7. The data is currently not flagged when the satellite is in the penumbra.
8. The ECEF_Z range needs to be increased.
9. The XRS L1b sc_power_side variable has a mismatch between flag value and meaning.

Persons desiring to use the GOES-18 XRS Provisional-maturity L1b products for any reason, including but not limited to scientific and technical investigations, should involve the responsible NOAA scientists before proceeding. Users of the GOES-18 XRS L1b data bear responsibility for inspecting the data and understanding the known caveats prior to use.

Contact for further information: OSPO User Services at SPSD.UserServices@noaa.gov

NCEI contacts for specific information on the EXIS XRS L1b data:

Scientific issues: Janet Machol (janet.machol@noaa.gov), Courtney Peck (courtney.peck@noaa.gov)
Data access issues: Pamela Wyatt (pamela.wyatt@noaa.gov)

NCEI website for GOES-R Space Weather data (daily aggregations of XRS L1b data and L2 data):
https://www.ngdc.noaa.gov/stp/satellite/goes-r.html