

GOES-19 EXIS XRS Level 1b (L1b) Data Release

Provisional Data Quality

Read-Me for Data Users

March 14, 2025

The GOES-R Peer Stakeholder Product Validation Review (PS-PVR) for GOES-19 Extreme Ultraviolet and X-Ray Irradiance Sensors (EXIS) X-Ray Sensor (XRS) Level 1b (L1b) Provisional Maturity was held on March 11, 2025. As a result of this review, the PS-PVR panel chair recommended that the GOES-19 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-19 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). Data released prior to the Provisional release date of March 11, 2025, contain significantly more issues, some of which are described in the GOES-19 EXIS L1b Beta Release notes. These earlier data should not be used.

Later this year, a corrected GOES-19 L1b data set will be released on the NCEI website (listed below) which will also be retrospectively corrected to September 2024 and will include the latest fixes. Additionally, L2 products such as averages, flare summaries, 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 of a small number of independent measurements.
- 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-19 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-19 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, for instance when 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 four GOES-R satellites, XRS-A is larger by approximately 32% than on GOES-15; e.g., $\text{XRS-AGOES-17} / \text{XRS-A GOES-15} = 1.34$. GOES-R XRS were carefully calibrated at NIST, while the fluxes from XRS on GOES-8 through -15 have all agreed with each other. This discrepancy is under investigation and is believed to be due to calibrations with the GOES-8 through -15 data.
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 offsets and XRS-A2 and -B2 responsivities will be updated in the near future.
5. The dispersion and cross-dispersion angles during eclipses and lunar transits are currently set to fill values, instead of the calculated values.
6. The data are currently not flagged when the satellite is in the penumbra.
7. The XRS L1b data formats may deviate slightly from those as defined in the PUG.

Persons desiring to use the GOES-19 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-19 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:

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NCEI website for GOES-R Space Weather data (daily aggregations of XRS L1b data and L2 data):

<https://www.ncei.noaa.gov/products/goes-r-extreme-ultraviolet-xray-irradiance>