

GOES-18 EXIS XRS Level 1b (L1b) Data Release
Full Data Quality
Read-Me for Data Users
December 5, 2023

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) Full Maturity was held on December 1, 2023. As a result of this review, the PS-PVR panel chair declared that the GOES-18 EXIS XRS L1b data be promoted to Full 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 product formats are defined in the GOES-R Product User Guide (PUG), but the PUG may not be fully up-to-date. A science-quality data set is available from the NCEI website (listed below). This updated data set retrospectively corrects the data back to September 2022; a future science-quality data release will be corrected back to June 2022. In addition to L1b data, Level 2 (L2) data products, such as averages, flare summaries, flare locations and plots, based on this scientific data set, also released at this site. Users are strongly encouraged to use these science-quality data sets rather than the operational data.

Full validation means:

- Validation, quality assurance, and anomaly resolution activities are ongoing.
- Incremental product improvements may still be occurring.
- Users are engaged and user feedback is assessed
- Product performance for all products is defined and documented over a wide range of representative conditions via ongoing ground-truth and validation efforts.
- Products are operationally optimized, as necessary, considering mission parameters of cost, schedule, and technical competence as compared to user expectations.
- All known product anomalies are documented and shared with the user community.
- Product is operational.

The following is a list of caveats for the GOES-18 XRS L1b data that have been identified and are under analysis for the science-quality data. 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. A correction is applied in the L2 data.
2. For all three GOES-R satellites, XRS-A is larger by ~32% than on GOES-15; e.g., $XRS-A_{GOES-17} / XRS-A_{GOES-15} = 1.34$. GOES-R XRS were carefully calibrated at NIST, while the fluxes from XRS on GOES-8 through -15 have all agreed with each other. 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 needs a time-dependent correction. Interim 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 for the GOES-17 and the early years of GOES-16 and -18.
6. The data is not always flagged when the satellite is in the penumbra.
7. The irradiances contain spikes which are probably due to galactic cosmic rays. These spikes are flagged and removed in the L2 data.

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

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

NCEI contacts for specific information on the EXIS XRS data:

Scientific issues: Janet Machol (janet.machol@noaa.gov)

Data access issues: Pamela Wyatt (pamela.wyatt@noaa.gov)

NCEI websites for GOES-R Space Weather data (daily aggregations of science-quality and operational XRS L1b and L2 data, plots, and documentation):

Current: <https://www.ngdc.noaa.gov/stp/satellite/goes-r.html>

New NCEI website (under development): <https://www.ncei.noaa.gov/products/goes-r-extreme-ultraviolet-xray-irradiance>