

GOES-18 SUVI 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 Solar Ultraviolet Imager (SUVI) Level 1b (L1b) Provisional Maturity was held on 22 November 2022. As a result of this review, the PS-PVR panel chair recommended that the SUVI L1b data be promoted to Provisional Validation Maturity.

SUVI L1b data consist of solar images in six extreme-ultraviolet passbands — 94 Å, 131 Å, 171 Å, 195 Å, 284 Å, and 304 Å — with a variety of exposure times and filters in place to ensure each image set captures the full dynamic range of solar phenomena. SUVI images have dimensions of 1280×1280 pixels, each with an angular resolution of 2.5 arcsec per pixel, for a total field of view of 53.3 arcmin square. Some corners of each passband are obscured by instrumental vignetting.

SUVI files are produced in two formats: netCDF and Flexible Image Transport System (FITS). In both cases, image metadata provide the image navigation information necessary to locate and orient the Sun with respect to well-known astronomical coordinate systems. For both file formats, these metadata follow the World Coordinate System (https://fits.gsfc.nasa.gov/fits_wcs.html) conventions for FITS files. Users who are unfamiliar with these conventions are highly encouraged to review “Coordinate Systems for Solar Image Data” (Thompson, 2006), which is linked from this page.

Images are reported in units of radiance ($\text{W}/\text{m}^2 \text{sr}^{-1}$), but care must be taken to handle the data array appropriately. In netCDF files, users should be sure to apply the ‘scale_factor’ and ‘add_offset’ attributes. In FITS files, users should apply the BSCALE and BZERO FITS keywords following the standard convention for each file format. Some FITS and netCDF readers may apply these corrections by default.

Provisional validation means:

- 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 obtained from other sun-observing EUV instruments.
- 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 SUVI L1b data bear responsibility for inspecting the data and understanding the known caveats prior to use. Below is the list of caveats that have been identified and are under analysis. Solutions are in development and testing:

1. SUVI L1b data are presently valid beginning with observations on 22 August 2022. Observations prior to this date are radiometrically calibrated but have incorrect image navigation metadata. NCEI will reprocess and release the early mission data using the Provisional Maturity algorithm and look-up tables.
2. The calculation of image navigation metadata after yaw flips of the GOES satellites requires a look-up table update, so data immediately following yaw flip could have inaccurate navigation metadata. No yaw flips are currently planned for GOES-18.
3. There is a known offset in reported radiance across all channels between SUVI L1b files from GOES-16, GOES-17, and GOES-18. The relative calibration of the individual data sets is reliable, but users may experience issues when attempting to use these data products interchangeably. NCEI is currently studying this problem and will provide updated re-scaling parameters and look-up tables to eliminate the offset at a later date.
4. Some metadata entries in SUVI L1b files may be incorrect or incomplete. The EFF_AREA keyword does not include the effect of the camera quantum efficiency on the instrumental effective area.
5. Spikes and bad pixels are not corrected for in SUVI L1b images, users may encounter negative valued pixels or NaNs in the image array. Users should note that there is an additional image array that is the bad pixel table (or Data Quality Flag) in the SUVI L1b files.
6. The GOES-18 platform location presently is specified in Earth-Centered Earth-Fixed (ECEF) coordinates by the OBSGEO-X, -Y, and -Z keywords. Users requiring platform location in heliocentric coordinate systems can refer to Hapgood (1992; [http://dx.doi.org/10.1016/0032-0633\(92\)90012-D](http://dx.doi.org/10.1016/0032-0633(92)90012-D)) for information on coordinate conversions.
7. Some users may encounter compatibility issues between some netCDF readers and FITS standard keywords that include a hyphen such as DATE-OBS when they appear in the netCDF version of SUVI L1b files. Users are encouraged to contact NCEI to report such problems and for guidance on possible workarounds.
8. There is a small, uncorrected, and varying contribution to the camera roll angle (CROTA) for all SUVI instruments. An investigation of the root cause and mitigation is currently ongoing. NCEI will correct past L1b data through reprocessing.

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

Users are strongly encouraged to contact the NCEI GOES-R SUVI team in the event they have questions or encounter difficulties with SUVI files. The NCEI website provides additional information and access to SUVI L1b files <https://doi.org/10.7289/V5FT8J93>.

NCEI contacts for specific information on the SUVI L1b data:

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