

GOES-17 SUVI Level 1b (L1b) Data Release
Provisional Data Quality
Read-Me for Data Users
May 14, 2019

The GOES-R Peer Stakeholder Product Validation Review (PS-PVR) for GOES-17 Solar Ultraviolet Imager (SUVI) Level 1b (L1b) Provisional Maturity was held on May 14, 2019. As a result of this review, the PS-PVR panel 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 a pixel resolution 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 come in two varieties: 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 cal/val activities and product optimization.

Users of the GOES-17 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 2019 February 1. 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 GOES-17 yaw flips requires a look-up table update, so data immediately following yaw flip could have inaccurate navigation metadata. For the current period of validity, data between yaw flip on 2019 March 27 at 20:35 UT and 2019 April 9 at 00:00 UT may contain incorrect navigation metadata.
3. There is a known offset in reported radiance across all channels between SUVI L1b files from GOES-16 and GOES-17. The relative calibration of the two 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. Pinholes in the GOES-17 SUVI entrance filters have led to visible light leaks in several channels. The issue is most pronounced in the 94 Å channel, and artifacts may be present in L1b files from this channel as a result. A change in GOES-17 operations to be deployed at a later date should eliminate these artifacts.
5. Some metadata entries in SUVI L1b files may be incorrect or incomplete. The BUNIT keyword specifying image units is not present in SUVI FITS products. The EFF_AREA keyword does not include the effect of the camera quantum efficiency on the instrumental effective area.
6. The location of Sun center specified by the CRPIX1 and CRPIX2 keywords could be erroneous in the event of special SUVI operations. Users should validate that this information is correct before performing calculations that require accurate information in these fields. Aside from the post-yaw-flip case noted above this should be an extremely rare occurrence.
7. Spikes in the images resulting from particle impacts with the SUVI camera can, in some cases, cause significant contamination in the radiometric signal. These problems have a particularly pronounced effect on the in aggregate radiometric metadata fields in short exposures images.
8. Bad pixels are not presently fully tracked and repaired in SUVI images, users may encounter negative valued pixels or NANS in the image array. Note also that the bad pixel table (or Data Quality Flag) in SUVI L1b files is not presently representative of either the location or correction of these bad or patched pixels. It should not be used. However, there are no known bad pixels on the GOES-17 SUVI, so the impacts of this issue on file usability should be minimal.
9. The GOES-17 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.

10. 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.

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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