

GOES-16 SUVI Level 1b (L1b) Data Release
Full Validation Data Quality
November 5, 2020
Read-Me for Data Users

The GOES-R Peer Stakeholder - Product Validation Review (PS-PVR) for Solar Ultraviolet Imager (SUVI) Extreme Ultraviolet Imagery (EUV) L1b Full Validation Maturity was held on November 5, 2020. As a result of this review, NOAA has confirmed that the SUVI L1b data are at Provisional Validation Maturity as of November 5, 2020.

SUVI 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 ($\text{W/m}^2 \text{str}^{-1}$), 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.

Full Validation means:

- Validation activities are ongoing and the general research community is now encouraged to participate.
- Incremental product improvements may still be occurring.
- Users are engaged and user feedback is assessed.
- Product performance has been demonstrated through analysis of a wide range of independent measurements obtained from other sun-observing EUV instruments.
- Products are operationally optimized, as necessary, considering mission parameters of cost and schedule, as compared to user expectations.
- All known product anomalies are documented, and shared with the user community.
- All product testing, analysis, and results have been fully documented.
- Product considered operational.

Users of the GOES-16 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 prior to declaration of Provisional Maturity was not processed correctly, and NCEI does not recommend that data should be used. NCEI will entertain requests to reprocess and release the early mission data using more up-to-date processing algorithms and look-up tables.

2. 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.
3. Bad pixels and spikes due to cosmic rays are tracked in the Data Quality Flag (DQF) array in a secondary FITS Header Data Unit (or, in the case of netCDF files, an additional array). Details on how to use these arrays are included in metadata in the files themselves. Pixels identified in the DQF are removed and replaced in SUVI L2 HDR composite images.
4. The GOES-16 platform location is very accurately specified in Earth-Centered Earth-Fixed (ECEF) coordinates by the OBSGEO-X, -Y, and -Z keywords. Experimental metadata also provide platform location and pointing information in Stonyhurst Heliographic coordinates. SUVI files are generally compatible with WCS-aware routines in SunPy and SolarSoft IDL.
5. 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.
6. A bug in the implementation of the CONTINUE FITS convention can cause trouble for some FITS readers. Users are encouraged to contact NCEI to report such problems and for guidance on possible workarounds.

Users are encouraged to contact the 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>.

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