GOES-19 SUVI Level 1b (L1b) Data
Beta Data Quality
November 4, 2024
Read-Me for Data Users

On November 4, 2024, the GOES-R Program Scientist declared that the GOES-19 SUVI L1b products met the criteria for Beta Maturity.

Beta maturity, by definition, means that:

- Initial calibration applied (L1b);
- Rapid changes in product input tables / algorithms can be expected;
- Product quick looks and initial comparisons with ground truth data not adequate to determine product quality;
- Anomalies may be found in the product and the resolution strategy may not exist;
- Product is made available to users to gain familiarity with data formats and parameters;
- Product has been minimally validated and may still contain significant errors; and
- Product is not optimized for operational use.

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 file 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 (W $m^{-2}$ $sr^{-1}$), 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.

Users of the GOES-19 SUVI L1b data should be aware that these products are only at a Beta level of maturity, meaning that these data are preliminary and non-operational. These data are currently undergoing testing and initial calibration and validation. The products are made available to users to gain familiarity with data formats and parameters in accordance with the GOES-R Product User Guide (PUG). Beta products have been minimally validated and may still contain significant errors. They are not optimized for operations or research. Users bear responsibility for inspecting the data and understanding the known caveats prior to use.

Persons desiring to use the GOES-19 SUVI Beta maturity L1b products for any reason, including but not limited to scientific and technical investigations, should involve the responsible NOAA scientists before proceeding.

Below is the list of caveats that have been identified and are under analysis. Solutions are in development and testing:

1. 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.
2. 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.
3. The GOES-19 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.
4. 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.

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.

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

NCEI contacts for specific information on the SUVI L1b data:
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