GOES-16 SUVI Bright Region Report Level 2 (L2) Data Release
May 24, 2024
Read-Me for Data Users

The GOES-16 Solar Ultraviolet Imager (SUVI) is NOAA's operational solar extreme-ultraviolet imager. The SUVI Level 2 Bright Region Report files in these directories are produced by NOAA's National Centers for Environmental Information in Boulder, Colorado. These data have been created from interpreting SUVI Level 2 Thematic Maps (TM). Please note that these files are considered to be experimental and thus will be improved in future releases. Users requiring assistance with these files can contact the NCEI SUVI team by emailing goesr.suvi@noaa.gov.

An example python script illustrating how to use and display information from these files is available at https://cires-stp.github.io/goesr-spwx-examples/examples/suvi/plot_suvi_l2_brght.html.

A SUVI Bright Region is a portion of the solar disk that demonstrates enhanced brightness when compared to portions of the solar disk that are considered “quiet corona”. The enhanced brightness of the Bright Regions is responsible for increased EUV and X-ray flux, which effects upper atmospheric heating. Bright regions are not the same as, but are often associated with solar active regions and NOAA sunspots.

The Bright Region files are provided in netCDF format and contain the following datasets:

`bnd_loc_car`	-	`Bright Region boundaries in Carrington coordinates`
`bnd_loc_hg`	-	`Bright Region boundaries in Heliographic Stonyhurst coordinates`
`bnd_loc_pix`	-	`Bright Region boundaries in Pixel coordinates (referring to the pixels in the corresponding TM)`
`brght_area`	-	`Area in pix^2 of each bright region`
`brght_extent_hg`	-	`Maximum extent of each bright region in N (lat), S (lat), E (lon), W (lon) order, in Heliographic Stonyhurst coordinates`
`cardinal_directions`	-	`Dimension for brght_extent_hg, number of cardinal directions`
`center_loc_car`	-	`Bright Region center location in Carrington coordinates`
`center_loc_hg`	-	`Bright Region center location in Heliographic Stonyhurst coordinates`
`center_loc_pix`	-	`Bright Region center location in Pixel coordinates (referring to the pixels in the corresponding TM)`

center_loc_rtheta	-	Bright Region center location in R-Theta coordinates
degraded_status	-	Marks if the file is considered degraded or not
euv_status	-	Marks if EUV flare was detected by the TM
feature_number	-	Dimension for number of flares detected in the thematic map
location	-	Dimension for flare coordinates (x/y = 2)
num_brght_regions	-	Number of Bright Regions found in the TM
peak_flux	-	Peak bright region flux: radiance of the brightest pixel in that wavelength channel
peak_loc_car	-	Peak location in Carrington coordinates
peak_loc_hg	-	Peak location in Heliographic Stonyhurst coordinates
peak_loc_pix	-	Peak location in Pixel coordinates (referring to the pixels in the corresponding TM)
peak_loc_rtheta	-	Peak location in R-Theta coordinates
srs_status	-	Associated sunspot group number from SRS report
time	-	Dimension, time in seconds after 01 Jan 2000 at 12 UTC (epoch time format, see python script for details)
tot_flux	-	Total integrated bright region flux in which the flare is embedded, by wavelength
vertex	-	Dimension, number of vertices for the associated bright region
wavelength	-	Dimension, the six SUVI wavelengths in ascending order
xrs_status	-	Marks if flare was detected in the same time window in XRS.07

Explanation of boundary vertices:
The boundary vertices are limited to between 6 and 16 points. The lower limit is to provide a proper minimum representation of each boundary, the upper limit is due to legacy vertex array length limitations.

Explanation of center and peak locations:
Peak location is simply the brightest pixel of the bright region for each wavelength. The center location is a weighted centroid of all pixels that were marked as ‘bright region’ in the thematic map, also for each wavelength.

Users are invited and encouraged to report anomalies or send other comments or questions about the files and data therein to the SUVI team via the email address above. The NCEI team will update these files to correct known errors and address user comments on a best-effort

basis. User feedback will drive changes and optimization of files for realtime distribution once this service commences.

KNOWN ISSUES

1. Pre ~Nov 2022, the ‘time’ variable (in seconds since 2000-01-01 12:00 UTC) was rounded in such a way that the hours/minutes were excluded. Validation was done with files after this time only, due to the need to correlate data with a SunPy map made with data from a similar time.
2. Occasionally, bright region boundaries are uncharacteristically small and/or thin, and do not properly surround the bright region determined by the thematic map. We are currently working on a fix for this issue.
3. There might be small variations in different coordinate systems due to differences in calculations done via textbook mathematical formulas vs. using SunPy/Astropy.
4. Helioprojective Cartesian coordinates are not yet implemented.

ACKNOWLEDGMENT & DATA USE POLICY

Do not redistribute these files. Refer all users to the NCEI file distribution site at:

https://data.ngdc.noaa.gov/platforms/solar-space-observing-satellites/

More information about the GOES-R Space Weather instruments and data is available at the NCEI website for GOES-R Space Weather data:

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

Where possible, users should acknowledge use of GOES data with the AAS Facilities keyword:

http://journals.aas.org/authors/aastex/facility.html

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CONTACTS FOR FURTHER INFORMATION

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NCEI website for GOES-R Space Weather data:

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