

GOES-18 SUVI Thematic Maps Level 2 (L2) Data Release
January 9, 2023
Read-Me for Data Users

The GOES-18 Solar Ultraviolet Imager (SUVI) is NOAA's operational solar extreme-ultraviolet imager. The SUVI Level 2 Thematic Map files in these directories are produced by NOAA's National Centers for Environmental Information in Boulder, Colorado. These data have been processed from Level 2 High Dynamic Range (HDR) composite SUVI images. The FITS file headers are populated with metadata to facilitate interpretation by users of these observations. 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.

The SUVI Thematic Maps product is a Level 2 data product that (presently) uses a machine learning classifier to generate a pixel-by-pixel map of notable solar features digested from all six SUVI spectral channels. The map is provided as a numeric array in the main HDU, and a key to map features appears in a FITS extension table in the second HDU. Maps generated in real-time are available from the beginning of 2023.

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

Several classifiers can be used by the SUVI Thematic Maps algorithm, including both classical maximum-likelihood classifiers and machine learning random forest classifiers. Operational SUVI Thematic Maps are presently generated by the random forest classifier method.

All of the individual classifiers are discussed in detail in Hughes et al. (2019; <https://doi.org/10.1051/swsc/2019036>). Representative scientific code is available on github.com at <https://github.com/jmbhughes/thmap>. The random forest classifier works in a two step process:

- 1) training a model and
- 2) classifying new maps

Model training is performed by providing expert-created annotated composite images to a machine learning algorithm. The algorithm creates an ensemble of decision trees tuned specifically for thematic map creation based on the contents of SUVI HDR composite images.

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. Occasionally not all required inputs are available with the latency and/or data quality required for real-time thematic map processing. In those cases, the quality of the map may be degraded. A FITS keyword (DEGRADED) indicates whether any quality issues were detected within the map inputs that could degrade product performance.
2. Real-time maps are generally produced at 4-minute cadence, but there are infrequent data gaps in the existing archive.
3. In general, the FITS metadata in these map products identify the classifier method and classifier training set used in map generation (ALGORITHM and TRAINING keywords, respectively). However, some of the files in the initial release are missing these keywords. Contact the SUVI team for more information about the specific algorithm and training used to generate these files.
4. Improvements in data processing and products are ongoing. Users may encounter inconsistencies in file format or data quality within this archive. Contact the SUVI team with questions regarding these ongoing improvements.

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>