GOES-19 ABI L2+ Shortwave Radiation Budget (SRB) Release
Provisional Data Quality
March 12, 2025
Read-Me for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for GOES-19 Advanced Baseline Imager (ABI) L2+ Downward Shortwave Radiation: Surface (DSR), Reflected Shortwave Radiation: TOA (RSR), and Photosynthetically Active Radiation (PAR) Provisional Maturity was held on March 12, 2025. As a result of this review, the panel chair declared that these products meet the criteria for Provisional maturity.

The ABI L2+ DSR, RSR, and PAR products include the downwelling shortwave radiation at the surface (DSR), the shortwave radiation reflected at the top of the atmosphere (RSR), and downwelling photosynthetically active radiation at the surface (PAR). The DSR, RSR, and PAR retrievals are produced during daytime with view and solar zenith angles less than 90 degrees. Data over the Full Disk (FD) of the Earth is available at 2-km ABI fixed grid every 10 minutes. The spatial and temporal resolution of these FD products are superior to those in the previous GOES-16-18 Baseline products, so the Continental United States (CONUS) and mesoscale (MESO) domain products are no longer produced.

- *Measurement range*: 0 to 1300 W m^{-2} for RSR, 0 to 1500 W m^{-2} for DSR, and 0 to 700 W m^{-2} for PAR.

- *Temporal coverage*: RSR, DSR, and PAR retrievals are made only during daytime with solar zenith angles less than 90 degrees.

- *Refresh*: RSR, DSR, and PAR are produced every 10 minutes; they represent instantaneous fluxes at the time indicated in the files.

- *Spatial coverage*: The products are produced in the Full Disk (FD) domain. Low solar and satellite elevation (zenith angle larger than 70°) reduces the spatial coverage in the good-quality data.

- *Spatial resolution*: Products are provided on a 2-km fixed grid.

- *Quality*: A preliminary evaluation of GOES-19 products with data from the NASA Fast Longwave And SHortwave Radiative Fluxes (FLASHFlux) product for RSR, from the Surface Radiation Budget Network (SURFRAD) for DSR and PAR and from the Solar Radiation Network (SOLRAD) for DSR for the period 10/29/2024-1/15/2025 indicates that the product are meeting the requirements. RSR accuracies range from -38 W m^{-2} to 3 W m^{-2} for high (>500) and low (<200) RSR. Accuracies of DSR are between -3 and 18 W m^{-2} corresponding to high (>500) and low (<200) range of DSR. The corresponding PAR accuracy values are -38 and -1 W m^{-2} in the high (>250) and low (<100) ranges.

  In general, the good quality retrievals are recommended for quantitative applications due to their better overall performance. The quality of products is expected to be further improved by updating the function used for calculating the GOES-19 TOA broadband (shortwave) albedo from the narrowband ABI reflectances.

The product quality is sensitive to upstream processing, such as the quality of calibration, navigation, cloud mask, cloud phase, snow mask and total precipitable water.

Full description and format of the DSR and RSR products (GOES-16, GOES-17, and GOES-18 until Apr 17, 2024) are in the Product Definition and User's Guide (PUG) Volume 5 (https://www.ospo.noaa.gov/resources/documents/goes-r.html). (Note that PUG Volume 5 v2.5 describes the Baseline shortwave radiation budget products that do not include PAR.) The Enterprise algorithm used to derive DSR, RSR, and PAR from GOES-19 ABI observations is described in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Downward Shortwave Radiation (Surface), and Reflected Shortwave Radiation (TOA), Enterprise Processing System (EPS) Version", available on STAR's GOES-R ATBD webpage: https://www.star.nesdis.noaa.gov/goesr/documentation_ATBDs.php.

Provisional maturity, by definition, means that:
- 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 select locations, periods, and associated ground truth or field campaign efforts;
- 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, tested, and shared with the user community;
- Testing has been fully documented; and
- Product is ready for operational use and for use in comprehensive calibration/validation activities and product optimization.

Users bear all responsibility for inspecting the data prior to use and for the manner in which the data are utilized. Persons desiring to use the GOES-19 ABI RSR, DSR, and PAR products for any reason, including but not limited to scientific and technical investigations, are encouraged to consult the NOAA algorithm working group (AWG) scientists for feasibility of the planned applications.

Known product issues:

1. The continuous dynamic ancillary data, the 29-day clear-sky instantaneous TOA albedo time-series at each observation time, is being reset when ABI scan mode changes and thus loses past data from time to time; this negatively impacts retrieval quality.

2. Inconsistent units (percent) and valid range (0, 1) in some metadata variables. For example, variable "image_cloud_fraction" states the units are percent, but the data are fraction within 0 and 1.

3. The retrieval algorithm uses coefficients for converting narrowband ABI reflectances to broadband albedos that were derived for GOES-16 not for GOES-19. Once a long record of GOES-19 observations from the operational position becomes available the coefficients will be updated.

4. Occasionally, bands or blocks of missing data may be present in the product files.

5. DQF attributes 'percent_good_retrieval_qf' and 'percent_bad_retrieval_qf' may occasionally have incorrect values.

6. Statistics (mean, minimum, maximum, and standard deviation) are calculated using only good-quality data. Therefore, long names of variables "mean_dsr", "maximum_dsr", "minimum_dsr" and "std_dev_dsr" should include the words "good-quality". For example, for the mean of DSR, the long name should be "mean of **good-quality** downward shortwave radiation: surface".

7. PUG Volume 5 v2.5 describes the Baseline shortwave radiation budget products that do not include PAR, and spatial and temporal resolutions listed are for the Baseline products.

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