GOES-16 ABI L2+ Land Surface Reflectance
Full Data Quality
April 30, 2024
Read-Me for Data Users

GOES-R Advance Baseline Imager (ABI) L2+ products will achieve Full Validation maturity by default after two years of Provisional and Operational use with no major anomalies reported (minor product improvements may still be occurring). As a result, the GOES-16 Land Surface Reflectance (also referred to as bidirectional reflectance factor [BRF]) product is considered Full Validation maturity as of August 26, 2023.

- The ABI L2 BRF provides the spectral land surface reflectance, i.e., a ratio between outgoing radiance at one given direction and incoming radiance in another direction (which may be the same as or different from the incoming direction). In this product, the outgoing direction is the satellite's viewpoint, while the incoming direction is the direction of solar illumination. The BRF is produced at the following wavelengths: 0.47 µm, 0.64 µm, 0.86 µm, 1.61 µm, and 2.26 µm, corresponding to bands 1, 2, 3, 5, and 6. The product includes associated data quality flags and percentages of each flag value, along with the mean, maximum, minimum, and standard deviation of the BRF for each band. The ABI BRF provides continuous spatial and temporal surface reflectance information. Under clear-sky condition, the ABI BRF compares well with ground measurements; however, the GOES-R BRF under cloudy-sky conditions reflects the contemporary surface status under clear-sky condition, and is thus not comparable with ground references influenced by cloud.
- *Measurement range*: 0-2
- *Temporal coverage*: Solar zenith angle at < 67 degrees. Daytime solar zenith angle
- *Refresh*: 10 minutes for FD, and 5 minutes for CONUS
- *Spatial coverage*: Full Disk, CONUS, Meso
- *Spatial resolution*: 2 km
- *Quality*: The requirement of ABI BRF product accuracy is 0.08; and that of precision is 0.08. According to the validation of the product in different seasons, the product has met the requirement in all bands.

A full description and format of the ABI BRF product will be available in v2.5 of the Product Definition and User's Guide (PUG) Volume 5: Level 2+ Products, located on OSPO's GOES-R documents webpage: https://www.ospo.noaa.gov/Organization/Documents/goes-r.html. The algorithm used to derive the BRF product from GOES-R ABI observations is described in detail in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Surface Albedo" (https://www.star.nesdis.noaa.gov/goesr/documentation_ATBDs.php).

Full maturity, by definition, means that:

- Validation, quality assurance, and anomaly resolution activities are ongoing.

- Incremental product improvements may still be occurring.
- Users are engaged and user feedback is assessed.
- Product performance for all products is defined and documented over a wide range of representative conditions via ongoing ground-truth and validation efforts.
- Products are operationally optimized, as necessary, considering mission parameters of cost, schedule, and technical competence as compared to user expectations.
- All known product anomalies are documented and shared with the user community.
- Product is operational.

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-16 ABI Full maturity BRF product 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. This product is sensitive to upstream processing, such as the quality of the calibration, navigation, cloud mask, and Aerosol Optical Depth (AOD).

Status of the GOES-16 BRF product and any remaining known issues that are being resolved:

1. The BRF1 (blue band BRF) is more sensitive to AOD input than other bands and shows a higher relative error in comparison with reference value from atmospherically corrected BRF using AOD ground measurements, although all the channels are within the mission requirements.
2. Access to BRF input intermediate product to four-level cloud conditions has inhibited the efficiency of product monitoring. It is expected that the four-level cloud mask will be written into the BRF quality flag in the future.
3. BRF quality is sensitive to input AOD quality. The AOD quality is suggested to be reflected in an overall quality score within the BRF quality flag, which will be effective in the upcoming version.

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

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