

GOES-16 and GOES-17 ABI L2+ Land Surface Albedo
Provisional Data Quality
August 30, 2021
Read-Me for Data Users

The Peer/Stakeholder Product Validation Review (PS-PVR) for the GOES-16 and GOES-17 Advance Baseline Imager (ABI) L2+ Land Surface Albedo Provisional Maturity was held on August 26, 2021. As a result of the review, the ABI Land Surface Albedo (LSA) products were declared Provisional Maturity for both satellites. The influence of GOES-17 cooling system issue on the GOES-17 LSA product is negligible because LSA is a daytime product and relies on the shortwave data only.

The ABI L2 LSA provides instantaneous shortwave broadband blue-sky Albedo over wavelengths between 0.4 and 3.0 μm . It is defined as the ratio between outgoing and incoming shortwave irradiance under natural illumination at the earth surface. The product includes associated data quality flags and percentage of each flag value, mean, maximum, minimum, and standard deviation of LSA. The LSA product provides spatial and temporal continuous surface albedo information. The LSA value under clear-sky condition is comparable and commits well with the ground measurements; while the LSA value under cloudy-sky conditions provides the contemporary surface status under clear-sky condition, not comparable with the simultaneous ground reference with influence from the cloud.

- *Measurement range:* 0-1
- *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 LSA product accuracy is 0.08 Albedo Units; and that of precision is 10%. According to the validation of the product from June-August, the products from both satellites have demonstrated a much smaller bias and higher precision.

GOES-17 was placed into Mode 6 on April 2, 2019. Despite this change, its LSA product continues to be generated with the same refresh rate and spatial resolution.

A full description and format of the ABI LSA product will be available in a future revision of the Product Definition and User's Guide (PUG) document (<http://www.goes-r.gov/products/docs/PUG-L2+-vol5.pdf>). The algorithm used to derive the LSA product from GOES-16 ABI observations is described in detail in the "ABI Algorithm Theoretical Basis Document for Land Surface Albedo" (https://www.star.nesdis.noaa.gov/goesr/documentation_ATBDs.php).

Provisional maturity, by definition, means that:

- Validation and quality assurance 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 communicate product performance to users 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.
- Product is ready for operational use and for use in comprehensive cal/val activities and product optimization.

Provisional 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 Provisional maturity LSA 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. Although the influence of FPM temperature on GOES-17 LSA is negligible, the input cloud mask does suffer from an impact during “warm” period. A quality flag marking the possible influence of FPM temperature on cloud would be written into the LSA after the cloud mask is integrated.

Status of the current GOES-16 and GOES-17 LSA products and any remaining known issues that are being resolved:

1. Missing LSA images occur randomly due to upstream AOD input not being available for a scene, thus causing the blocks of fill data. A mitigation plan is proposed by using closest AOD within the day and an AOD climatology in development by the STAR AOD team.
2. The algorithm uses the latest clear-sky TOA reflectance observations to simulate BRDF model being used in the following day’s LSA retrieval. Thus, there is at least a one-day lag in reflecting some surface dynamic events, such as seasonal snow or fire, depending on the length of the previous cloud coverage period.
3. The current summertime validation results suggest a minor over-estimation of ground shortwave albedo than the in-situ measurements.
4. Statistics (mean, maximum, minimum and standard deviation) and some of the DQF percentage values in the metadata in the operational data files from the ground system are incorrect.
5. The G17 ‘warm period’ mitigation flag denoting the influence to upstreaming cloud mask is invalid.
6. The AOD related quality flag is to be refined. The current version denotes only AOD

availability; however, the new version will demonstrate the AOD quality and if the AOD data source is from a real-time product or a climatology.

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