

GOES-17 ABI L2+ Legacy Atmospheric Profile (LAP) Release

Provisional Data Quality

May 16, 2019

Read-Me for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for the GOES-17 Advanced Baseline Imager (ABI) L2+ Legacy Atmospheric Profile (LAP) products are considered Provisional Maturity for the stable periods of the day as of the Provisional PS-PVR on May 16, 2019.

Up to date information on the GOES-17 cooling system issue can be found on the following web sites:

<https://www.goes-r.gov/users/GOES-17-ABI-Performance.html>

http://cimss.ssec.wisc.edu/goes-r/abi-/band_statistics_imagery.html

The table shown below is derived from the above web sites and is an estimate of cooling system impacts for 2019. The table lists time periods of potential saturation. Users should be vigilant for potential anomalies during these times. The LAP may be usable during some of these time blocks.

Date Range	Saturation increase/decrease	Time of Day
1 Jan - 26 Feb	Channel saturation goes from marginal to unusable by 26 Feb.	Saturation can occur between 0830 - 1730 UTC.
26 Feb - 20 Mar	Channel saturation goes from unusable to marginal.	Saturation can occur between 0900 - 1700 UTC.
20 Mar - 13 Apr	Channel saturation goes from marginal to unusable by 13 Apr.	Saturation can occur between 0900 - 1700 UTC.
13 Apr - 26 May	Channel saturation goes from unusable to marginal.	Saturation can occur between 0900 - 1700 UTC.
26 May - 20 Jul	No Channel saturation	
20 Jul - 30 Aug	Channel saturation goes from marginal to unusable by 30 Aug.	Saturation can occur between 0900 - 1700 UTC.
30 Aug - 23 Sep	Channel saturation goes from unusable to marginal.	Saturation can occur between 0930 - 1630 UTC.
23 Sep - 16 Oct	Channel saturation goes from marginal to unusable by 16 Oct.	Saturation can occur between 0900 - 1700 UTC.
16 Oct - 12 Dec	Channel saturation goes from unusable to marginal.	Saturation can occur between 0900 - 1700 UTC.

The GOES-R ABI LAP products provide Legacy Vertical Temperature Profile (LVT), Legacy Vertical Moisture Profile (LVM), Total Precipitable Water (TPW), and Derived Atmospheric Stability Indices (DSI) over each 5x5 ABI pixels box with clear sky infrared band radiances. DSI includes five atmospheric instability indices: Lifted Index (LI), Convective Available Potential Energy (CAPE), Total Totals Index (TT), K-Index (KI), and Showalter Index (SI).

The GOES-R Series Level I Requirements (LIRD) are not yet updated to reflect the operational Mode 6; however, for completeness the LIRD requirements are stated here: LAP products shall be produced every 15 minutes for Full Disk, 5 minutes for CONUS, and 5 minutes for Mesoscale.

GOES-17 was placed into Mode 6 on April 2, 2019. The cadence of L2 products for Mode 6 are different from Mode 3 and the office requirements defined in the GOES-R L1RD. Legacy Atmospheric Profile products are no produced every 10 minutes for Full Disk, every 5 minutes for CONUS, and every 1 minute for the Mesoscale.

The GOES-R ABI LAP products are retrieved based on the ABI infrared band measurements with NWP (NOAA GFS) short range forecasts as first guess. A full description and format of the LAP products can be found in 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 LAP products from GOES-R ABI observations is described in detail in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Legacy Atmospheric Moisture Profile, Legacy Atmospheric Temperature Profile, Total Precipitable Water, and Derived Atmospheric Stability Indices" (https://www.goes-r.gov/products/ATBDs/baseline/Sounding_LAP_v2.0_no_color.pdf).

Provisional maturity, as defined by the Readiness, Implementation and Management Plan (RIMP) 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;
- Product analysis is sufficient to communicate to users.
- Documentation of product performance exists.
- Testing has been fully documented;
- Product is ready for operational use and for use in comprehensive cal/val activities and product optimization.

Persons desiring to use the GOES-17 ABI Provisional maturity LAP for any reason, including but not limited to scientific and technical investigations, are encouraged to consult the NOAA/NESDIS/STAR Algorithm

Working Group (AWG) scientists for feasibility of the planned applications.

Status of the current LAP products and any remaining minor issues:

1. For the times of the day/year where the GOES-17 detector temperatures are stable, the LAP product performance has basically meeting the requirements since it was declared Beta maturity.
2. Summary of the measured performance of the LAP product as measured against reference data including Suomi-Net GPS (Global Positioning System), AMSR2 (Advanced Microwave Scanning Radiometer 2), RAOB, ECMWF analysis and GDAS analysis, and AERI (Atmospheric Emitted Radiance Interferometer) boundary layer profiles from a GOES-16 field campaign.
 - Accuracy specification (1 mm) and precision specification (3 mm) are met for TPW product.
 - Accuracy specification (1 K above boundary layer and below 400 hPa) and precision specification (2 K above boundary layer and below 400 hPa) are met for Legacy Vertical Temperature Profile.
 - Accuracy specification (18 % between sfc and 300 hPa, 20 % between 300 and 100 hPa) and precision specification (same as accuracy specification) are met for Legacy Vertical Moisture Profile except for the comparison with RAOB above 300 hPa which is likely due to the dry bias of radiosonde observations.
 - Accuracy specification (2 K, 1000 J/kg, 1 K, 2 K, 2K) and precision specification (6.5 K, 2500 J/kg, 4 K, 5 K, 6.5 K) are met for LI, CAPE, TT, KI, SI, respectively, except TT and KI when compared to radiosonde observations (RAOBs). The inclusion of only the atmospheric unstable cases makes the TT (>44) and KI (>26) results closer to the requirements.
3. Missing values are randomly discovered over some boxed areas in Full disk, which is due to the upstream processing: minor issue.
4. The LAP products are affected by the migration of the sun which might be caused by the cloud mask: minor issue.

Users should be aware, that due to the limited spectral information of the ABI, compared to high-spectral resolution infrared sounders, that the most reliable information are the temporal and spatial gradients. The vertical profiles have limited vertical information and hence integrated quantities, such as TPW are preferable. The CAPE that is calculated is a mixed layer version, not just surface-based. To learn more about the LAP validations, check out: <http://soundingval.ssec.wisc.edu/imagery>; where comparisons are routinely made to reference data.

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

Contact for specific information on the ABI L2 LAP products:

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