

GOES-16 ABI L2+ Legacy Atmospheric Profile (LAP) Release,
Provisional Data Quality
February 23, 2018
Read-Me for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for the Advanced Baseline Imager (ABI) L2+ Legacy Atmospheric Profile (LAP) Provisional Maturity was held on February 22, 2018. As a result of this review, the PS-PVR panel recommended that the ABI LAP products be declared Provisional.

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 ABI LAP products are retrieved based on the ABI infrared band measurements with NWP (NOAA GFS) short range forecasts as first guess. The LAP products are generated every 15 minutes over the ABI Full Disk (FD), every 5 minutes over the Continental United States (CONUS) region, and every 1 minutes over the Mesoscale (MESO) regions.

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-16 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, 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 from select locations, periods, and associated ground truth and field campaign efforts.
- Product analysis is sufficient to establish product performance relative to expectations.
- 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, and tested.
- 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-16 ABI Provisional maturity LAP products 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. The LAP product is sensitive to upstream processing that includes the quality of the

calibration, navigation, and cloud mask.

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

1. The LAP product performance has been stable (basically meeting the requirements) since it was declared Beta maturity on 16 May 2017.
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.

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

Contacts for specific information on the ABI L2 LAP product:

Wayne MacKenzie wayne.mackenzie@noaa.gov

Tim Schmit tim.j.schmit@noaa.gov

Jaime Daniels jaime.daniels@noaa.gov