GOES-19 ABI L2+ Aerosol Detection Product (ADP)
Provisional Data Quality
March 12, 2025
Read-Me for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for the GOES-19 Advanced Baseline Imager (ABI) L2+ Aerosol Detection Product (ADP) Provisional Maturity was held on March 12, 2025. As a result of this review, the panel chair declared that this product meets the criteria for Provisional Maturity.

ABI L2+ ADP includes flags describing the presence of aerosol (including smoke/dust) in the atmosphere over land and over ocean, associated quality flags to indicate the confidence level (low, medium, and high) of the detected smoke/dust, a flag to indicate within/out of the sun-glint region, and flags to indicate within/outside of the valid solar and satellite view zenith angle ranges. All flags are reported as binary 1/0 (yes/no). ADP is produced during the daytime over clear-sky and snow-free regions, over both land and water, when the satellite view zenith angle is less than 90° and the solar zenith angle is less than 87.5°.

- *Measurement range*: ADP is reported as a binary yes/no (present/not present) measurement for smoke/dust when aerosol loading is above the product detection limit (i.e., typically when aerosol optical depth is ≥0.2).

- *Temporal coverage*: ADP is produced only during the daytime when the solar zenith angle is less than 87.5° and the satellite view zenith angle is less than 90°.

- *Refresh*: In ABI Mode 6 ("flex mode"), ADP is available every 10 minutes for the Full Disk and Continental United States (CONUS) sectors, and every 5 minutes for the Mesoscale sectors. In ABI Mode 4 ("continuous full disk"), ADP is available every 5 minutes for the Full Disk and CONUS sectors and is not produced for the Mesoscale sectors.

- *Spatial coverage*: ADP is produced for the Full Disk, CONUS, and Mesoscale sectors, depending on the scan mode. Low solar and satellite elevations (i.e., solar zenith angle larger than 70°, view zenith angle larger than 60°) reduce the spatial coverage of ADP at the high and medium confidence levels.

- *Spatial resolution*: ADP is produced on the ABI fixed grid, with a resolution ranging from 2km at nadir to ~20km at the edge of ABI's Earth view.

- *Quality*: A preliminary evaluation of GOES-19 ADP smoke/dust detection compared to AERONET data for a very short validation period of <3 months indicates that accuracy, probability of correct detection (POCD), and probability of false detection (POFD) are about 82%, 70%, and 11% for smoke detection, and 89%, 76%, and 15% for dust detection. Over the same evaluation period, these GOES-19 quality metrics are comparable to those for GOES-16 & -18 ABI ADP, which are Full Maturity validation. Therefore, GOES-19 ABI ADP is expected to meet the requirements of 80% POCD for dust over land and water, 70% POCD for smoke over water, and 80% POCD for smoke over land with a longer validation period of 52 weeks.

- In general, the top 2 confidence levels (high and medium confidence), which automatically exclude smoke/dust detection within the sun-glint region and outside of the valid solar/view zenith angle ranges, are recommended for quantitative applications.

The GOES-R ABI ADP algorithm was updated from the Baseline to the Enterprise algorithm on April 17, 2024. The full description and formats of the baseline ABI ADP are given in 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 Enterprise algorithm description will be added to a future PUG revision.

Both the Baseline and the Enterprise versions of the algorithm used to derive ADP from GOES-R ABI observations are described in their respective algorithm theoretical basis documents (ATBDs) located on STAR's GOES-R ATBD webpage: https://www.star.nesdis.noaa.gov/goesr/documentation_ATBDs.php. The Baseline version is described in the document "Algorithm Theoretical Basis Document for ABI Aerosol Detection Product". The Enterprise version is described in the document "Algorithm Theoretical Basis Document for ABI Enterprise Processing System Aerosol Detection Product".

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.
- 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 calibration/validation activities and product optimization.

Users of Provisional data bear 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 Provisional maturity ADP data 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. These products are sensitive to upstream processing, such as the quality of the calibration, navigation, snow/ice mask and cloud mask.

Known product issues being resolved include:
1. False smoke detection over thin clouds over land at large view/solar angles;
2. Occasional false low confidence dust detection over bright surfaces at large view/solar angles, such as over the Andes Mountains.

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

Contacts for specific information on the ABI L2+ ADP product:

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