

GOES-16 ABI L2+ Aerosol Detection (ADP) Release
Provisional Data Quality
January 28, 2019
Read-Me for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for Advanced Baseline Imager (ABI) L2+ Aerosol Detection (ADP) Beta Maturity was held on March 19, 2018. As a result of this review, the PS-PVR panel did not recommend that the ABI ADP product be declared Provisional Maturity. Two main issues were identified: the algorithm was not detecting dust at certain times of the day or when dust is thin and stringent quality flags were screening the data. The algorithm team made needed changes to the algorithm and mitigated the two issues. A revisit after the fix was performed was held on December 6, 2018 and resulted in ADP being declared Provisional.

The ABI L2+ ADP includes the 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) for the detected smoke/dust and also flags to indicate within/out of the sun-glint region and within/out of valid solar/viewing zenith angle range. All flags are reported as binary 1/0 (yes/no).

The ADP is produced during the daytime over clear-sky and snow-free regions, over both land and water; with view zenith angle less than 90 degrees and solar zenith angle less than 87.5 degrees.

- *Measurement range:* binary yes/no (present/not present) for smoke/dust for conditions when aerosol loading is high (conditions when aerosol optical depth is generally greater than 0.2).
- *Temporal coverage:* ADP is produced only during daytime with solar zenith angles less than 87.5°.
- *Refresh:* ADP is produced every 15 minutes for the Full Disk (FD) and in the Continental United States (CONUS) domains, and every 5 minutes the Mesoscale domain; it represents instantaneous detection at the time indicated in the files. *In the future, if GOES-16 is commissioned to scanning full disk every 10 min, the ADP product refresh rate will change to every 10 minutes.*
- *Spatial coverage:* ADP is produced in the Full Disk (FD), the Continental United States (CONUS) AND also Mesoscale domains. Low solar and satellite elevation (i.e. solar zenith angle larger than 60°; viewing zenith angle larger than 70°) reduces the spatial coverage in the top 2 confidence smoke/dust flag data.
- *Spatial resolution:* ADP is produced in fixed grid, with a resolution ranging from 2km at sub-satellite point to ~20km at the edge of earth view.
- *Quality:* A preliminary evaluation of GOES-16 smoke/dust detection in ADP against both AERONET measurements and CALIPSO Vertical feature mask product indicates that accuracy, probability of correction detection (POCD) and probability of false detection (POFD) are about 95-99%, 87-94% and 18-22% for smoke detection, and 98-99%, 87-88% and 4-24% for dust detection.

In general, the smoke/dust flags with top 2 confidence levels, which automatically exclude data within sun-glint region and out of valid solar and viewing zenith angle range, are recommended for quantitative applications due to their better overall performance.

Full description and format of the ADP product is 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 ADP from GOES-16 ABI observations is described in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Aerosol Detection Product" (http://www.goes-r.gov/products/ATBDs/baseline/AAA_AIP_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 obtained from select locations, periods, and associated ground truth or field campaign efforts;
- Product analysis is sufficient to establish product performance 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; and
- Product is ready for operational use and for use in comprehensive cal/val activities and product optimization.

Users bear all responsibility for inspecting the data prior to use and for the manner in which the data are utilized. Users desiring to use the GOES-16 ABI Provisional maturity ADP products 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:

1. False smoke detection over thin clouds over land at large viewing/solar angles.
2. Occasional false low confidence dust detection over bright surface at large viewing/solar angles, such as over Andes Mountains.

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