GOES-18 ABI L2+ Cloud Optical and Microphysical Properties (COMP)
Full Data Quality
December 20, 2024
Read-Me for Data Users

GOES-R Advanced Baseline Imager (ABI) L2+ products will achieve Full Validation maturity by default after two years of Provisional and Operational use with no major anomalies reported (minor product improvements may still be occurring). As a result, GOES-18 Cloud Optical and Microphysical Properties (optical depth and particle size; COMP) products are considered Full Validation maturity as of January 4, 2025.

The Baseline COMP algorithm was transitioned to the Enterprise COMP algorithm on March 9, 2023. The ABI Cloud Optical Properties for both Daytime (DCOMP) and Nighttime (NCOMP) provide cloud optical depth (COD) and cloud particle size (CPS) over the Full Disk (FD) of the GOES-ABI domain, COD and CPS over the Contiguous United States (CONUS) region, and CPS over both Mesoscale (MESO) regions. They also include the processing information flags, parameter quality indicators and error estimates in the intermediate product (IP) files. All products are created at a nominal 2 km resolution.

The ABI L2+ CPS and COD products assign each earth-navigated cloudy pixel a value. Non-cloudy pixels or those for which the retrieval was not successful receive fill values. For pixels with solar zenith angles less than or equal to 82º (daytime), valid CPS values can range from 0 to 160 μm and valid COD values can range from 0.5 to 50.0 while pixels with solar zenith angles greater than 82º (nighttime) will have valid CPS values ranging from 2.0 to 50.0 μm and valid COD values ranging from 1.0 to 8.0. CPS and COD values outside those ranges are considered less accurate and their usage is not recommended. Similarly, pixels with solar zenith angles between 65º and 90º should be considered less accurate and do not meet the product specifications. Daytime CPS and COD values are derived using visible and near-infrared channels while the nighttime CPS and COD values are derived from near-infrared and infrared channels.

A full description and format of the CPS and COD products can be found 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 algorithms that are used to derive the DCOMP and NCOMP products from GOES-18 ABI observations are described in detail in the "Algorithm Theoretical Basis Document for Daytime Cloud Optical and Microphysical Properties" and "Algorithm Theoretical Basis Document For Enterprise Nighttime Cloud Optical Depth, Cloud Particle Size, Cloud Ice Water Path, and Cloud Liquid Water Path", respectively, located on STAR's GOES-R ATBD webpage: https://www.star.nesdis.noaa.gov/goesr/documentation_ATBDs.php.

Full maturity, by definition, means that:
- Validation, quality assurance, and anomaly resolution activities are ongoing.
- Incremental product improvements may still be occurring.
- Users are engaged and user feedback is assessed.
- Product performance for all products is defined and documented over a wide range of representative conditions via ongoing ground-truth and validation efforts.

- Products are operationally optimized, as necessary, considering mission parameters of cost, schedule, and technical competence as compared to user expectations.
- All known product anomalies are documented and shared with the user community.
- Product is operational.

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-18 ABI Full maturity COMP 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. This product is sensitive to upstream processing, such as the quality of the calibration, navigation and the other cloud algorithms (mask, type/phase, height).

Known issues at Full Validation include:
1. Missing values occur randomly due to upstream L1b issues;
2. The upstream cloud algorithms can lead to clear regions being assigned a cloud optical depth or cloudy regions being classified as clear sky, hence receiving no CPS value;
3. Issues in the NWP products can cause upstream cloud algorithms to misidentify cloudy pixels as non-cloudy so CPS retrievals are not performed;
4. Optically thin cirrus clouds are sometimes misclassified as liquid water, supercooled liquid water or mixed phase, which impacts CPS values;
5. The risk of misclassifying liquid water clouds as ice is greatest in regions with broken cumulus clouds, hence CPS values are impacted in those situations;
6. The ability to correctly identify clouds that have both liquid water and ice within the portion of the cloud influencing the measured ABI radiances is limited;
7. Any past or future calibration changes to channels involved in the day or night CPS retrievals can impact the CPS retrievals.
8. DCOMP produces more thick clouds with COD greater than 80. Information depth is low due to radiation saturation.

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