GOES-18 ABI L2+ Cloud Type and Cloud Top Phase (CPH)
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 Type and Cloud Top Phase (CPH) is considered Full Validation maturity as of January 4, 2025.

The ABI L2+ Cloud Top Phase product assigns each earth-navigated pixel one of the following classifications: clear sky (based on the ABI clear sky mask), liquid water, supercooled liquid water, mixed phase, ice phase, or unknown cloud phase. Aside from the clear sky designation, the classification is relative to the highest cloud layer present. Only infrared channels are used to determine the cloud thermodynamic phase. The cloud top phase product is generated for every ABI Full Disk (FD) of the Earth, Contiguous United States (CONUS) region, and the Mesoscale (MESO) regions.

A full description and format of the CPH product 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 algorithm used to derive the CPH products from GOES-18 ABI observations is described in detail in the "Enterprise Algorithm Theoretical Basis Document for Cloud Type and Cloud Top Phase", 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 Cloud Top Phase 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 cloud mask.

Status of the CPH product and any remaining known issues:

1. Missing values occur randomly due to upstream L1b issues.
2. Co-registration errors commonly cause misclassifications at cloud edges and in convective clouds.
3. The upstream cloud detection algorithm can lead to clear regions being assigned a cloud thermodynamic phase or cloudy regions being classified as clear sky.
4. Optically thin cirrus clouds are sometimes misclassified as liquid water, supercooled liquid water or mixed phase.
5. The risk of misclassifying liquid water clouds as ice is greatest in regions with broken cumulus clouds.
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. The baseline cloud phase classification is sometimes inconsistent with near-infrared based assessments of cloud phase, such as false color imagery constructed with phase sensitive near-infrared spectral channels.
8. A small peak of ice phase pixels in warm temperatures is observed in histograms of cloud top temperature. The issue is observed in all ABI sensors. Initial investigations place these pixels on cloud edges. As of this writing, analysis is ongoing. However, the current operational phase product still meets validation specifications, but users should be aware of this issue. Since the operational cloud phase algorithm is not undergoing further development, the Cloud Science Team wants to transition the cloud phase algorithm to cloud phase/type produced by the Enterprise Cloud Mask algorithm in the near future. This desired transition will allow for further algorithm development, economize both algorithm maintenance and operational processing, and resolve the aforementioned cloud phase artifacts.

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

Contacts for specific information on the ABI L2 CPH product:
Jaime Daniels jaime.daniels@noaa.gov
Mark Kulie mark.kulie@noaa.gov