GOES-19 ABI L2+ Cloud Top Phase (CPH) Release
Provisional Data Quality
18 February 2025
ReadMe for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for the GOES-19 Advanced Baseline Imager (ABI) L2+ Cloud Top Phase (CPH) product was held on 29 January 2025. As a result of this review, the panel chair declared that this product meets the criteria for Provisional Validation Maturity.

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, Continental 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 (https://www.ospo.noaa.gov/resources/documents/goes-r.html). The algorithm used to derive the Cloud Top Phase product from GOES-19 ABI observations is described in detail in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document (ATBD) for Cloud Top Phase". ATBDs are available at: https://www.star.nesdis.noaa.gov/goesr/documentation_ATBDs.php.

By definition, Provisional maturity means that:

- Validation activities are ongoing and the general research community is now encouraged to participate.
- Severe algorithm anomalies are identified and being analyzed. Solutions to anomalies are in development and testing.
- Incremental product improvements may still be occurring.
- Product performance has been demonstrated by analyzing 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 are responsible for inspecting the data prior to use and for the manner in which the data are utilized. Anyone desiring to use the GOES-19 ABI Provisional maturity CPH product 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 calibration and navigation.

Known issues at the Provisional Maturity Validation stage include:

1. Missing values occur randomly due to upstream L1b issues.
2. Co-registration errors can 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. GOES-19 CPH products analyzed during this review contained misidentified ice phase clouds. These misclassified ice phase clouds occurred under “warm” conditions and are typically located on cloud edges. No solution has yet been developed to rectify this issue, although the Cloud Team recommends that the current CPH algorithm should transition to a Cloud Phase product created by the Enterprise Cloud Mask algorithm in the near future since it performs as well or better than the operational CPH algorithm and does not exhibit any noticeable “warm” ice cloud retrievals.

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