

GOES-16 ABI L2+ Cloud Top Parameters (CTP)
Full Data Quality
May 16, 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-16 Cloud Top Parameters (Height [CTH], Temperature [CTT], and Pressure [CTp]) is considered Full Validation maturity as of February 16, 2020.

The GOES-16 ABI CTP product generates the cloud-top height, cloud-top temperature, and cloud-top pressure products from the 11 μm , 12 μm , and 13.3 μm infrared observations. The Enterprise version of CTP replaced the Baseline version on March 9, 2023. We worked closely with the Derived Motion Winds (DMW) Team to ensure that this upgrade was acceptable to the global NWP community for their data assimilation systems. Major changes include: 1) retaining the Baseline version of the low-level inversion routine, 2) Reverting to the top-down version for converting CTT to CTp. The GOES-R Series Level I Requirements (LIRD) states the Cloud Top Height shall be produced every 60 minutes for CONUS and Full Disk, and 5 minutes for Mesoscale. The Cloud Top Pressure will be produced every 60 minutes for CONUS and Full Disk. The Cloud Top Temperature will be produced every 15 minutes for Full Disk, and every 5 minutes for Mesoscale. However, in current normal Mode 6 operations, the CTp product is generated every 10 minutes for Full Disk, every 5 minutes over the CONUS region, and every 1 minute over the Mesoscale regions.

A full description and format of the CTP 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 algorithm used to derive the CTP products from GOES-16 ABI observations is described in detail in the "Enterprise Algorithm Theoretical Basis Document for Cloud Height", 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.

Persons desiring to use the GOES-16 ABI Full maturity CTP products for any reason, including but not

limited to scientific and technical investigations, are encouraged to consult the NOAA/NESDIS/STAR Algorithm Working Group (AWG) scientists for feasibility of the planned applications. The CTP product is sensitive to upstream processing that includes the quality of the calibration, navigation, cloud mask, and cloud type/phase.

Status of the CTP products and any remaining known issues that are being resolved:

1. Summary of the measured performance of the CTP products as measured against reference data:
 - Accuracy specifications are met for all 3 products when compared with MODIS C6 MYD35 EDRs. Precision specifications are met for CTH and CTp, and nearly met for CTT.
 - For scenarios which are consistent with the retrieval assumptions (single layer, known phase) the cloud top products are within specifications for accuracy when compared to CALIPSO. The precision is just missing for CTH and CTT due to extremely tight precision specifications.
 - CTp returned from the DMW algorithm shows the CTp, when compared to CALIPSO, is within specifications.
2. The Derived Motion Winds (DMW) Team relies on accurate CTP products in their algorithm. The Algorithm Working Group (AWG) Cloud Team meets with the AWG DMW Team regularly to discuss ongoing issues and progress with CTP as it relates to optimizing the DMWs.
3. The CTP products need to attain a balance between meeting CTP requirements, as well as providing accurate products for the DMW team. This will be an ongoing issue as there will always be development within the CTP and DMW software.

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