GOES-18 ABI L2+ Ice Concentration and Extent (AICEF)
Full Data Quality
November 25, 2024
Read-Me for Data Users

GOES-18 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 Ice Concentration and Extent is considered Full Validation maturity as of January 4, 2025.

The ABI L2+ Ice Concentration and Extent (AICEF) product identifies pixels covered with ice over water surfaces in clear-sky conditions and estimates ice concentration and ice surface temperature. No land applications are included. It includes associated data quality flags, mean, maximum, minimum, and standard deviation. Ice cover is the location of ice over inland lakes, rivers, and ocean waters. Ice concentration reports the fraction (in percentage) of the ice for those ice-covered pixels. Ice surface temperature reports the skin (radiating) temperature of those ice-covered pixels. The ice cover mask is generated for each pixel over a water surface, and ice concentration and ice surface temperature are calculated for each pixel covered with ice. All products are for pixels under clear-sky conditions only.

The GOES-18 ABI ice concentration and extent daytime product is generated from ABI band 2 (0.64 µm), band 3 (0.86 µm), band 5 (1.6 µm), band 14 (11.2 µm), and band 15 (12.3 µm). The nighttime product is generated from ABI bands 14 (11.2 µm) and 15 (12.3 µm).

The ice concentration product requirements are:

- *Measurement range*: 0 – 100%
- *Temporal coverage*: Solar Zenith Angle less than 67 degrees (for the Day product; a Night product is also available)
- *Refresh*: 180 minutes
- *Spatial coverage*: Local Zenith Angle less than 67 degree
- *Spatial resolution*: 3 km
- *Quality*: Measurement Accuracy of 10.0% and Measurement Precision 30.0%

There are no requirements for ice extent.

A full description and format of the ice concentration and extent 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 algorithm used to derive the ice concentration and extent product from GOES-18 ABI observations is described in detail in the "ABI Algorithm Theoretical Basis Document For Ice Surface Temperature, Ice Concentration, and Ice Cover from VIIRS, ABI, and METimage", 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 ice concentration and extent 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 the quality of the calibration, navigation, the cloud mask, and land/water mask.

The status of the GOES-18 ice concentration and extent product and any remaining known issues that are being resolved are:

1. Summary of the measured performance of the ice concentration product as measured against reference data:
    a. Accuracy specifications for Full Disk (FD), Contiguous United States (CONUS), and Mesoscale (MESO) products are met in general based on validation results with respect to retrievals from other satellite-based instruments.
    b. Precision specifications are also met in general based on validation results with respect to retrievals from other satellite-based instruments.
2. Case studies show some water pixels are falsely identified as ice during nighttime and some ice pixels are not detected during daytime.
3. Missing ice or false ice are often due to errors in the cloud mask. Though the overall impact is small, errors can be large on the local scale.
4. Validation of ice concentration was done with a lower-resolution passive microwave product. Validation with higher resolution products (e.g., Landsat) is limited.

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

Contacts for specific information on the ABI L2 Ice Concentration and Extent product:
Yinghui Liu, yinghui.liu@noaa.gov
Feng He, fenghe@wisc.edu
Xuanji Wang, xuanjiwang@wisc.edu
Jeff Key, jeff.key@wisc.edu