GOES-19 ABI L2+ Ice Concentration and Extent
Provisional Data Quality
February 28, 2025
Read-Me for Data Users

The Peer/Stakeholder Product Validation Review (PS-PVR) for the GOES-19 Advanced Baseline Imager (ABI) L2+ Ice Concentration and Extent product was held on February 19, 2025. The PS-PVR panel chair declared that the product has reached Provisional Maturity. This Provisional declaration means that the data are ready for operational use.

The ABI L2+ Ice Concentration and Extent (AICEF) product identifies pixels covered with ice over water surfaces under 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; and ice concentration reports the fraction (in percentages) of the ice for those ice-covered pixels; and ice surface temperature reports the 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-R 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 (https://www.ospo.noaa.gov/resources/documents/goes-r.html). The algorithm used to derive the ice concentration and extent product from GOES-19 ABI observations is described in detail in the "ABI Algorithm Theoretical Basis Document For Ice Surface Temperature, Ice Concentration, and Ice Cover", located on STAR's GOES-R ATBD webpage: https://www.star.nesdis.noaa.gov/goesr/documentation_ATBDs.php.

Provisional maturity, by definition, means that:

- Validation and quality assurance activities are ongoing and the general research community is now encouraged to participate.
- Severe algorithm anomalies are identified and under analysis. Solutions to anomalies are in development and testing.
- Incremental product improvements may still be occurring.
- Product performance has been demonstrated through analysis of a small number of independent measurements obtained from select locations, periods, and associated ground truth or field campaign efforts.
- Product analysis is sufficient to communicate product performance to users relative to expectations (Performance Baseline).
- Documentation of product performance exists that includes recommended remediation strategies for all anomalies and weaknesses. Any algorithm changes associated with severe anomalies have been documented, implemented, tested, and shared with the user community.
- Testing has been fully documented.
- Product is ready for operational use and for use in comprehensive calibration/validation activities and product optimization.

Provisional 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-19 ABI Provisional 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 and 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 and precision specifications for FD, CONUS, and Meso products are met in general based on validation results with respect to retrievals from other satellite-based instruments.
    b. The overall accuracy and precision in the nighttime retrievals are better than those during the daytime.
2. Known issues include:
    a. Case studies show some water pixels are falsely identified as ice during nighttime and some ice pixels are not detected during daytime.
    b. 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.
3. Validation of ice concentration with a lower-resolution passive microwave ice concentration product has been carried out. Validation with ice concentration with much higher resolution, e.g., Landsat, is in progress.

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:
Feng He fenghe@wisc.edu
Yinghui Liu yinghui.liu@noaa.gov
Xuanji Wang xuanjiwang@wisc.edu