

GOES-17 ABI L2+ Ice Concentration and Extent Release
 Provisional Data Quality
 January 21, 2021
 Read-Me for Data Users

The Peer/Stakeholder Product Validation Review (PS-PVR) for the GOES-17 Advance Baseline Imager (ABI) L2+ Ice Concentration and Extent Provisional Maturity was held on January 21, 2021. As a result of the review, the ABI Ice Concentration and Extent (AICEF) product was declared Provisional for the cold, stable periods of the day and night.

Up to date information on the GOES-17 cooling system issue can be found on the following web sites:
<https://www.goes-r.gov/users/GOES-17-ABI-Performance.html>
http://cimss.ssec.wisc.edu/goes-r/abi-/band_statistics_imagery.html

The table shown below is pulled from the above web site and is an estimate of times of peak interruption for 2021. The table represents potential saturation. The user should be more vigilant of potential anomalies during these times. The product may be usable during some of these time blocks, especially when the cooling timeline is being run. This cooling timeline runs for 6 hours a day during the below date ranges (approximately) and products are only produced for the 15 minute Full Disk and a 2 minute mesoscale, while other Earth scenes, e.g. CONUS, are replaced with cooling stares.

Date Range	Saturation Increase/Decrease	Approximate Time of Day
4 Feb – 3 March	The cooling timeline is implemented. Channel saturation begins starting with bands in this order: 12, 16, 10, 8, 9, 11 from marginal to unusable by the middle of the time period (mid and late February) and back to marginal by the end of time period.	Saturation may occur between approximately 1100-1700 UTC. Peak saturation occurs at the middle of the time period at approximately 1330 UTC.
2 April – 3 May	The cooling timeline is implemented. Channel saturation begins starting with bands in this order: 12, 16, 10, 8, 9, 11, 15, 14 from marginal to unusable by beginning to middle of time period (early to mid-April) and back to marginal by the end of the time period.	Saturation can occur between approximately 1100-1600 UTC. Peak saturation occurs at the beginning to middle of the time period at approximately 1300 UTC.
3 August – 3 Sept	After a 1-day spike when the cooling timeline is turned on, Channel saturation begins starting with bands in this order: 11, 9, 8, 10, 16, 12 from marginal to unusable near the end of the time period (late August) to mostly marginal by the end of the time period.	Saturation can occur between approximately 1100-1600 UTC. Peak saturation occurs near then end of the time period at approximately 1330 UTC.
9 October – 5 Nov	The cooling timeline is implemented. Channel saturation begins starting with bands in this order:	Saturation can occur between approximately 1100-1600 UTC.

	12, 16, 10, 8, 9, 11, 15, 14 from marginal to unusable by the middle of the time period (mid October) to marginal by the end of the time period.	Peak saturation occurs at the middle of the time period at approximately 1300 UTC.
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GOES-17 was placed into Mode 6 on April 2, 2019. Despite this change, the ice concentration product continues to be generated every three hours for every ABI Full Disk (FD) of the Earth, over the Continental United States (CONUS) region, and 2 Meso domains.

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 6 products are for pixels under clear-sky conditions only.

The GOES-R ABI ice concentration and extent daytime product is generated from ABI bands 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 will be available in a future revision of the Product Definition and User's Guide (PUG) document (<http://www.goes-r.gov/products/docs/PUG-L2+-vol5.pdf>). The algorithm used to derive the ice concentration and extent product from GOES-17 ABI observations is described in detail in the "ABI Algorithm Theoretical Basis Document For Ice Surface Temperature, Ice Concentration, and Ice Cover" (https://www.star.nesdis.noaa.gov/goesr/documents/ATBDs/Baseline/ATBD_GOES-R_IceConcentration_v1.2_Feb2019.pdf).

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 cal/val 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-17 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 the land/water mask. In particular, the accuracy of the provisional GOES-17 ABI ice concentration and extent product may be severely degraded or the product may contain fill values between the hours of 11-17 UTC at times of the year when the ABI focal plane module temperature is significantly elevated as a result of the GOES-17 Loop Heat Pipe (LHP) issue.

The status of the current GOES-17 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 FD, CONUS, and 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.
 - c. The overall accuracy and precision in the nighttime retrievals are better than those during the daytime.
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 in progress.
5. As stated above, these GOES-17 results are for the cold, stable periods of the day and night.

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:

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