

GOES-17 ABI L2+ Ice Age and Thickness 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 Age and Thickness Provisional Maturity was held on January 21, 2021. As a result of the review, the ABI Ice Age and Thickness (AITAF) 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](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 age and thickness product is generated for every ABI Full Disk (FD) of the Earth, over the Continental United States (CONUS) region, every three hours.

The ABI L2+ Ice Age and Thickness (AITAF) product includes sea and lake ice thickness and age categories for any pixel covered with ice. It includes associated data quality flags, mean, maximum, minimum, and standard deviation. Ice-free areas are distinguished from first-year ice and older ice areas.

The GOES-R ABI daytime and nighttime Ice Age and Thickness product is generated using other L2 ABI products, including the cloud mask, snow depth, ice surface temperature, and thermal and radiative fluxes. The algorithm will use parameterizations of some input variables if they are not otherwise available. The retrieval is available for each clear and ice-covered pixel.

The Ice Age and Thickness product requirements are:

- *Measurement range:* ice free, first-year ice, and older ice for ice age.
- *Temporal coverage:* Day and night, ice-covered waters under clear sky conditions. Solar Zenith Angle less than 67 degrees for daytime.
- *Refresh:* 3 hours.
- *Spatial coverage:* Full Disk (FD). Retrievals to 80-degree local zenith angle (LZA).
- *Spatial resolution:* 2 km
- *Quality:* 80% correct classification

While not a requirement, the product includes thickness. The required ice age categories – ice free, first-year ice, and older ice - are based on thickness. The product also contains a more extensive set of ice age categories: new, grey, grey white, first-year thin, first-year medium, first-year thick, and older ice.

A full description and format of the ice age and thickness 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 age and thickness product from GOES-17 ABI observations is described in detail in the “Algorithm Theoretical Basis Document For ABI and VIIRS Ice Thickness and Age” ([https://www.star.nesdis.noaa.gov/goesr/documents/ATBDs/Baseline/ATBD\\_GOES-R\\_IceThickness\\_2.2\\_Jan2019.pdf](https://www.star.nesdis.noaa.gov/goesr/documents/ATBDs/Baseline/ATBD_GOES-R_IceThickness_2.2_Jan2019.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 age and thickness 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, notably the cloud mask and ice surface temperature. Of the two, errors in the cloud mask have a greater impact on the ice products. The accuracy of the Provisional GOES-17 ABI ice age and thickness 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 age and thickness product and any remaining known issues that are being resolved are:

1. Summary of the measured performance of the AITAF product as measured against reference data:
  - a. Accuracy specifications for FD and CONUS products are met in general based on inferred validation results with respect to retrievals from ice charts, aircraft, and ice thickness products from other satellite instruments.
  - b. Precision specifications are also met in general based on inferred validation results with respect to retrievals from aircraft and other satellite-based instruments.
2. Missing ice or false ice are often due to errors in the cloud mask. Cloudy pixels that are incorrectly identified as clear generally result in errors in ice thickness, which may then cause errors in ice age. Though the overall impact is small, errors can be large on the local scale.
3. Any changes to ABI calibration or spectral response functions will not influence day or night AITAF retrievals directly, but may have an indirect impact through upstream products such as the cloud mask and ice surface temperature.

4. 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](mailto:SPSD.UserServices@noaa.gov)

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