

GOES-18 ABI L2+ Sea Surface Temperature (SST) Release
Provisional Data Quality
November 21, 2022
Read-Me for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for the GOES-18 Advanced Baseline Imager (ABI) Baseline L2+ Sea Surface Temperature (SST) Provisional Maturity was held on November 21, 2022. The PS-PVR panel chair recommended that the ABI Baseline SST product be declared Provisional.

GOES-18 ABI Baseline SST product is generated consistently with GOES-16 and GOES-17 ABI Baseline L2 SST products. For each 10 minute Full Disk (FD) image, SSTs are derived using a regression equation, applied to brightness temperatures (BTs) in the four longwave ABI window bands 11 (8.5 μm), 13 (10.35 μm), 14 (11.2 μm), and 15 (12.3 μm). A single regression equation is used across day and night, which greatly facilitates the derivation of a smooth and continuous diurnal cycle. SSTs are calculated and reported in all ocean pixels (including e.g. cloud, ice, etc.) up to 10 km inland. Subsequently, all 10 minute images within 1 hour are aggregated into 1-hr composites. Only clear-sky pixels (i.e. marked with the good quality flag, DQF=0), are recommended for use. The DQF is set using the ABI Clear-Sky Mask (which is external to the SST algorithm) and the SST Quality Control (QC; performed as a part of the SST algorithm). The SST QC uses the same four ABI bands employed for SST retrievals, plus bands 2 (0.64 μm) and 7 (3.9 μm).

A full description and format of the SST product can be found in 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 SST product from GOES-17 ABI observations is described in detail in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Sea Surface Temperature" (<https://www.star.nesdis.noaa.gov/goesr/docs/ATBD/SST.pdf>).

Provisional maturity, by definition, means that:

- Validation activities 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 from select locations, periods, and associated ground truth and field campaign efforts.
- Product analysis is sufficient to establish product performance relative to expectations.
- 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, and tested.

- Testing has been fully documented.
- Product is ready for operational use and for use in comprehensive calibration/validation activities and product optimization.

Status of the current SST product and any remaining known issues that are being resolved:

1. Summary of the performance of the SST product as measured against reference *in situ* data:
 - The GOES-R SST accuracy specification (defined as a FD mean bias with respect to quality controlled *in situ* data) of $\pm 3.1\text{K}$ is easily met for most retrieval conditions with satellite zenith angles $\leq 67^\circ$
 - The GOES-R SST precision specification (defined as a FD standard deviation, SD, with respect to quality controlled *in situ* data) of 1K is easily met for most retrieval conditions with satellite zenith angles $\leq 67^\circ$
 - Visual, qualitative and quantitative comparisons with GOES-17 are satisfactory
2. Several technical issues have been identified to facilitate the use of the SST data
 - Large QF/SST outages may appear as rectangular blocks of highest quality data (which in fact may be cloud or otherwise degraded SST data)
 - Time Stamps/Bounds in file names/attributes may occasionally be set wrong
 - Information on the algorithm version is not included in files' global attributes

In order to mitigate some of the known GOES-18 baseline SST issues and limitations, transition to the NOAA Enterprise SST system, Advanced Clear-Sky Processor for Ocean (ACSPO), is underway. It is planned that the Baseline SST product in the GOES-R ground system will be replaced by the ACSPO SST in 2024, rendering the previous baseline descriptions and issues irrelevant. Until then, mitigations for the currently operational baseline SST product are underway. Users of the GOES-18 ABI Provisional maturity Baseline SST product (be it for scientific and technical investigations, or for any other applications), should be aware of above listed issues and limitations, and encouraged to consult the STAR Algorithm Working Group scientists for feasibility of the planned applications, and alternatives.

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

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