

GOES-17 ABI L2+ Rainfall Rate / Quantitative Precipitation Estimate (RRQPE) Release
 Provisional Data Quality
 May 16, 2019
 Read-Me for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for the GOES-17 Advanced Baseline Imager (ABI) L2+ Rainfall Rate / Quantitative Precipitation Estimate (RRQPE) Provisional Maturity was held on May 16, 2019. As a result of this review, the PS-PVR panel recommended that the ABI RRQPE product be declared Provisional for the cold periods of the day.

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 2019. The table represents potential saturation. The user should be more vigilant of potential anomalies during these times. The RRQPE product may be usable during some of these time blocks.

Date Range	Saturation increase/decrease	Time of Day
1 Jan - 26 Feb	Channel saturation goes from marginal to unusable by 26 Feb.	Saturation can occur between 0830 - 1730 UTC.
26 Feb - 20 Mar	Channel saturation goes from unusable to marginal.	Saturation can occur between 0900 - 1700 UTC.
20 Mar - 13 Apr	Channel saturation goes from marginal to unusable by 13 Apr.	Saturation can occur between 0900 - 1700 UTC.
13 Apr - 26 May	Channel saturation goes from unusable to marginal.	Saturation can occur between 0900 - 1700 UTC.
26 May - 20 Jul	No Channel saturation	
20 Jul - 30 Aug	Channel saturation goes from marginal to unusable by 30 Aug.	Saturation can occur between 0900 - 1700 UTC.
30 Aug - 23 Sep	Channel saturation goes from unusable to marginal.	Saturation can occur between 0930 - 1630 UTC.
23 Sep - 16 Oct	Channel saturation goes from marginal to unusable by 16 Oct.	Saturation can occur between 0900 - 1700 UTC.
16 Oct - 12 Dec	Channel saturation goes from unusable to marginal.	Saturation can occur between 0900 - 1700 UTC.

The ABI L2+ RRQPE product assigns each earth-navigated pixel a rainfall rate ranging from 0 to 100 mm/h. Only infrared channels are used to determine the rainfall rate. The RRQPE product is generated for every ABI Full Disk (FD) of the Earth.

The GOES-R Series Level 1 Requirements (LIRD) are not yet updated to reflect the operational Mode 6; however, for completeness the LIRD requirements are stated here: RRQPE shall be produced every 15 minutes for Full Disk.

GOES-17 was placed into Mode 6 on April 2, 2019. The cadence of L2 products are different from Mode 3 and the official requirements defined above. RRQPE is produced every 10 minutes for Full Disk.

A full description and format of the RRQPE 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 RRQPE products from GOES-17 ABI observations is described in detail in the "GOES-R Advanced Baseline Imager (ABI) Algorithm Theoretical Basis Document for Rainfall Rate / QPE" (http://goes-r.noaa.gov/products/ATBDs/baseline/Hydro_RRQPE_v2.0_no_color.pdf).

Provisional maturity, by definition, means that:

- Validation 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;
- Documentation of product performance exists;
- Testing has been fully documented; and
- 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 RRQPE products 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 and navigation. In particular, the accuracy of the provisional GOES-17 ABI RRQPE product may be severely degraded or the product may contain fill values between the hours of 09-18 UTC at times of the year when the focal plane module temperature is significantly elevated as a result of the loop heat pipe issue.

Additional known issues at the Provisional validation stage include:

1. Missing values occur randomly due to upstream L1b issues;
2. Parallax effects, which can produce displacements away from the satellite sub-points as high as 20 km for towering cumulonimbus near the edge of the satellite scan area. A parallax adjustment will be implemented in a future version of the algorithm.
3. False alarms occur due to incorrect identification of cirrus clouds as raining. An update to correct false rainfall in cold air outbreaks (caused by temperature inversions) had the side effect of compromising the ability to distinguish cirrus from cumulonimbus. Note that this is a general weakness of IR-only products because the IR bands provide information about conditions at the cloud top only, and is exacerbated by the use of a fixed set of retrieval coefficients for all seasons. This will be mitigated in a future version of the algorithm by routinely updating the calibration.
4. Significant amounts of missed stratiform precipitation during the winter. IR brightness temperatures have extremely limited sensitivity to spatial and temporal variations in stratiform rainfall and efforts to capture related cloud-top information using multiple IR bands has resulted in only limited success; the problem is exacerbated by the use of a fixed set of retrieval coefficients for all seasons; this will be mitigated in a future version of the algorithm by routinely updating the calibration. The product can be used with greatest confidence for convective rainfall.
5. Limb cooling effects, which can result in missed rainfall (due to limb cooling causing incorrect classification of rainfall type) or false alarm rainfall (due directly to limb cooling) where the satellite zenith angle exceeds 50 degrees. Users in the eastern half of the CONUS should use GOES-16 RRQPE instead of GOES-17 RRQPE. This issue will be addressed in a future version of the algorithm.
6. Incorrect location of fine-scale surface rainfall features caused by wind shear. Since hydrometeors falling through and from a cloud are carried along by the ambient winds, highly sheared vertical wind profiles can produce significant displacements (on the order of kilometers in extreme cases) between the cold cloud tops and the surface rainfall. Efforts are being made to correct for this in a future version of the algorithm.

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

Contacts for specific information on the ABI L2 RRQPE product:

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