GOES-16 ABI L2+ Rainfall Rate / QPE (RRQPE) Release
Provisional Data Quality
March 30, 2018
Read-Me for Data Users

The GOES-R Peer/Stakeholder Product Validation Review (PS-PVR) for ABI L2+ Rainfall Rate / QPE (RRQPE) Provisional Maturity was held on March 30, 2018. As a result of this review, the PS-PVR panel recommended that the ABI Rainfall Rate / QPE product be declared Provisional.

The ABI Rainfall Rate / QPE 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 rainfall rate product is generated for every ABI Full Disk (FD) of the Earth every 15 minutes whether the satellite is in Scan Mode 3 or 4.

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-16 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 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; 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-16 ABI Provisional maturity Rainfall Rate 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.

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. It is hoped that a parallax adjustment can be implemented in a future version of the algorithm.
3. False alarms occur due to incorrect identification of cirrus clouds as raining. A January 25 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; it is hoped that this can 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; it is hoped that this can 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. 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.

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