



October 19, 2026

Release note for GPM Global Rainfall Map (GPM-GSMaP)

The GPM Global Rainfall Map (GPM-GSMaP) Level 3 product version 06A (Algorithm version 9) was released to the public since October 19, 2026.

Update from version 05 (Algorithm version 8) to version 06A (Algorithm version 9) are following.

A. Passive microwave (PMW) algorithm

- Added GOSAT-GW/AMSR3.
- Fixed an issue in the specification of the convective/stratiform precipitation mixing ratio.
- Fixed an error in precipitable water vapor calculations in which the uppermost atmospheric layer was omitted.
- Changed the rain/no-rain classification method from the RNC method (Seto et al. 2005) to machine learning-based methods (RF/LF) for GMI and AMSR3.
- Improved the scattering-based retrieval algorithm using machine learning (SVM).
- Improved precipitation retrieval algorithms for SSM/I and SSMIS by revising precipitation inhomogeneity treatment and rainfall intensity correction weighting based on brightness temperature polarization differences.
- Changed the snowfall detection and retrieval method from a LUT-based approach to a machine learning-based approach (XGBoost) for GMI, SSMIS, and AMSR3.
- Changed low-temperature screening from brightness temperature-based screening to atmospheric field data-based screening for MWS.
- Fixed false precipitation retrievals caused by AUTOSNOW misclassification.
- Applied the dynamic land/ocean classification method to SSM/I and SSMIS (additionally implemented).

B. Normalization module for PMW retrievals

- Changed the inter-sensor precipitation normalization method from histogram matching to the Bouwer+04 method.

C. PMW-IR Combined algorithm

- Implemented motion vector estimation using NEXRA precipitable water vapor.
- Improved precipitation estimation over polar regions beyond 60° latitude by introducing NEXRA precipitable water vapor and gauge adjustment.
- Implemented a cloud classification method using machine learning (SOM).
- Fixed excessive precipitation estimates over island regions caused by inconsistencies in histogram-matching land/ocean lookup tables.

D. Gauge-adjustment algorithm

- Fixed unnatural gauge-adjustment artifacts.



E. Data format

- Updated to TKIO-3.102 and changed the input/output format from HDF5 to netCDF4.

F. Others

- Minor bug fix

For details, following URLs can be helpful for your reference.

http://www.eorc.jaxa.jp/GPM/doc/product_info/release_note_gsmav06-v9_en.pdf

(For the Japanese)

http://www.eorc.jaxa.jp/GPM/doc/product_info/release_note_gsmav06-v9_ja.pdf

Followings are remarks and known bugs in current version of GPM-GSMaP product to be fixed in future versions.

Remaining problems

A. Retrieval issues

1. The PMW algorithm introduced in the V05 product overestimates the amount of precipitation for heavy precipitation such as typhoons and convective precipitation, and also confirms that weak precipitation is generally difficult to be detected in MWS. Misidentifying snow or sea ice as precipitation signals has been issued in the V04 product, but this issue has not been fully solved in the V05 product; the extension to the polar regions and the introduction of precipitation and snowfall estimation in low temperature regions make false strong precipitation more apparent, especially in the winter hemisphere. Users should be cautious of estimations over the cold surface (in particular, below 273.2 K).
2. The use of static stability in low-level troposphere as a condition for determining topographic precipitation has made it possible to identify orographic heavy precipitation in inland areas and areas where convective precipitation is dominant. However, overestimation and false-positive of orographic rainfall remain. We examine to resolve this issue.
3. The PMW precipitation retrieval algorithm introduced machine learning-based rain/no-rain classification methods (RF/LF), but these methods have only been implemented for GMI and AMSR3. In addition, the snowfall detection and retrieval method was changed to an XGBoost-based approach; however, it has only been implemented for sensors equipped with high-frequency channels, namely GMI, SSMIS, and AMSR3. As a result, snowfall estimates still exhibit sensor-dependent characteristics. These limitations originate from the use of training data generated from GMI brightness temperatures. Applying the trained models to other sensors requires inter-sensor brightness temperature correction, which has not yet been fully implemented.
4. The MMN module introduced in the V05 product largely affects the accuracy after precipitation correction due to the amount and bias of sampling of each sensor. For example, if there is a missing period and the number of missed rainfall cases is large, the average rainfall is likely to deviate from the true value, resulting in an incorrect value. In addition, the MMN algorithm is not able to change no rainfall to rainfall presence. Improvements in rain/no-rain classification method and the brightness temperature correction method are required.



5. The PMW-IR Combined algorithm introduced vertically integrated water vapor derived from NEXRA and extended precipitation estimation to all regions, including polar areas. The basic retrieval framework is identical to that used for IR and NEXRA. To maintain long-term data consistency, the conventional IR-only retrieval is applied equatorward of 60° latitude, while NEXRA-based retrieval is applied poleward of 60° latitude. Between 50° and 60° latitude, precipitation estimates from IR and NEXRA are blended to ensure a smooth transition across the boundary. Because retrieval accuracy degrades under low-temperature conditions, Kalman filter-based precipitation adjustment is not applied poleward of 60° latitude or over sea-ice and snow-covered regions. In these areas, only the propagation of microwave-derived precipitation is performed.
 6. The precipitation estimation of gauge-calibrated hourly rainfall product (GSMaP_Gauge) depends on a large part on the Climate Prediction Center (CPC) Unified Gauge-Based Analysis of Global Daily Precipitation data sets provided by NOAA. If the CPC data sets have good estimation of precipitation in a region, the GSMaP_Gauge data sets also will show good scores in the region. However, in case the CPC data sets under or overestimate the rain fall rate seriously or miss the rainfall event, the GSMaP_Gauge product also estimates or misses the precipitation in a similar manner as the CPC data sets. Note that the CPC data sets and hence the GSMaP_Gauge data do not always show accurate estimation particularly over less dense gauge region.
 7. Although the GSMaP_Gauge_NRT is a near real time version of the GSMaP_Gauge, the products do not use the gauge measurement directly. Since the global gauge measurement takes much time to collect and process the data from all over the world, the gauge data is not available in near real time. Hence, in the GSMaP_Gauge_NRT product, only the error parameters derived from the GSMaP_Gauge are used to adjust the GSMaP_NRT estimation, which is named as the GSMaP_Gague_NRT. We would like to know evaluation and validation results of this product for improvement. We appreciate if you give us some feedback.
- B. Calibration issues
8. Brightness temperatures used in rainfall retrievals of GCOM-W/AMS2 and GPM-Core/GMI are bias-corrected using parameters provided by JAXA. These parameters may be modified in future when calibration of each Level 1B data is updated.