March 30, 2022.

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

The GPM Global Rainfall Map (GPM-GSMaP) Level 3 product version 04A (Algorithm version 7) was released to the public since January 17, 2017, V04B was released since March 2, 2017, V04C was released since March 27, 2017, V04D was released since May 9, 2017, V04E was released since October 11, 2017, V04F was released since May 11, 2018, and V04G was released since May 15, 2019. However, because of some reasons, the GPM-GSMaP Level 3 product version 04H was released to the public since March 30, 2022.

Updates from version 04G to version 04H

- Changes of AUTOSNOW format (code update only (i.e. no difference in quality with 04G).

Updates from version 04F to version 04G

- Fix in initialization bugs in the passive microwave radiometer algorithm.
- Changes of the processing environments (OS, intel compiler versions).

Updates from version 04E to version 04F

- Fix in the orographic/nonorographic rainfall classification scheme. Note that this will be effective over the land in latitudes of 20S-60S.
- Improvement in screening of surface snow over the land which may lead to abnormal precipitation.
- Improvement of the gauge-calibrated method in the near-real-time product

Updates from version 04D to version 04E

- Improvement in handling abnormal IR values in the GSMaP_MVK algorithm
- Fix of a very minor issue of the GSMaP_GMI algorithm

Updates from version 04C to version 04D

- Install of a table related to the Tb calibration of GMI L1 V05

Updates from version 04B to version 04C, connected with bug-fixing of “PrecipRateGC” in the following products.

- All standard products in V04A
- Standard products since March 1, 2017 in V04B.

Updates from version 04A to version 04B are following.

- Adding a missing value in “snowProbability” of the GSMaP Hourly (3GSMAPH).
- Bug-fixing in “snowProbability” of the GSMaP Monthly (3GSMAPM).
- Bug-fixing in “satelliteInfoFlag”.

Update from version 03 (Algorithm version 6) to version 04A (Algorithm version 7) are following.

1) Improvement of the GSMaP algorithm using GPM/DPR observations as its database
2) Implementation of a snowfall estimation method in the GMI & SSMIS data and a screening method using NOAA multisensor snow/ice cover maps in all sensors
3) Improvement of the gauge-correction method in both near-real-time and standard products
4) Improvement of the orographic rain correction method
5) Improvement of a weak rain detection method over the ocean by considering cloud liquid water

For details, following URLs can be helpful for your reference.
http://www.eorc.jaxa.jp/GPM/doc/product_info/release_note_gsmapv04-v7_en.pdf

(For the Japanese)
http://www.eorc.jaxa.jp/GPM/doc/product_info/release_note_gsmapv04-v7_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 snowfall estimation method for the GMI & SSMIS data was installed in the V04 product, but it still needs to be validated and improved further. In addition, several biases and/or gaps may be appeared in the mid-latitude ocean, due to changes of the estimation method. In addition, sometimes, surface snow or sea ice may be misidentified as precipitation signal, especially in spring season. Users should be cautious of estimations over the cold surface (in particular, below 273.2 K).
2. The orographic/non-orographic rainfall classification scheme has been implemented in the GSMaP algorithm for passive microwave radiometers (Yamamoto and Shige, 2014). The scheme is switched off for regions (e.g. the Sierra Madre Mountains in the United States and Mexico) where strong lightning activity occurs in the rainfall type database because deep convective systems for the regions are detected from the scheme involved in the orographic rain condition. The scheme improves rainfall estimation over the entire Asian region, particularly over the Asian region dominating shallow orographic rainfall. However, overestimation and false-positive of orographic rainfall remain. This is because the orographic rainfall conditions have moderate thresholds for global application. We examine to resolve their problems.
3. 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.

4. Although the GSMaP_Gauge_NRT is a near real time version of the GSMaP_Gauge, the products does 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

5. Brightness temperatures used in rainfall retrievals of GCOM-W/AMSR2 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.
6. Scan errors may be occasionally found in rainfall retrievals of SSMIS (microwave imager/sounder) on board the DMSP-F16, DMSP-F17 and DMSP-F18 satellites. This problem will be corrected in the future version of L1c data.
7. MHS data used in the GSMaP product was changed form Level 1B to Level 1C. The Scattering Index (SI) in the AMSU-A/MHS algorithm is changed at altitude higher than 40 degrees. However, we have not yet fully evaluated the effect. We would like to know evaluation and validation results of the GSMaP AMSU-A/MHS rainfall retrievals. We appreciate if you give us some feedback.