TRMM Available Products

[As of Aug. 1, 2018]

Standard Products

Processing Level	Satellite / Instrument	Product [Product Identifier]	Key Parameters	File coverage	Available Latest Product Version (Caveats)
1	TRMM/PR	PR L1B [PU1]	Received Power	TRMM orbit (Torbit*)	Ver. 05 (See: page 2)
	TRMM/TMI	TMI L1B [TMI]	Brightness Temperature (Tb)	Torbit	Ver. 05 (See: page 3)
	TRMM/TMI	TMI L1C [TMI]	Inter-Calibrated Brightness Temperature (Tb)	Torbit	Ver. 05 (See: page 3)
	TRMM/VIRS	VIRS L1B [V1B]	Radiance	Torbit	Ver. 05 (See: page 4)
2	TRMM/PR	PR L2 [PU2]	Reflectivities, 3D Precipitation	Torbit	Ver. 06 (See: page 5)
		SLH-PR L2 [LHP]	Spectral latent heating	Torbit	Ver. 06 (See: page 6)
	TRMM/TMI/GPROF	TMI L2 [TL2]	Precipitation, Total Precipitable Water	Torbit	
	TRMM/PR-TMI /COMB	PR-TMI Comb L2 [TC2]	PR-TMI retrieval 3D Precipitation	Torbit	
3	TRMM/PR	PR L3 Daily (TEXT) [P3D]	Precipitation	0.1°x 0.1° Daily	Ver. 06 (See: page 5)
		PR L3 Daily(HDF5) [P3Q]	Precipitation	0.25° x 0.25° Daily	Ver. 06 (See: page 5)
		PR L3 Monthly [P3M]	Precipitation	0.25° x 0.25° Monthly	Ver. 06 (See: page 5)
		SLH-PR L3 Gridded orbit [LHG]	Spectral latent heating	0.5°x 0.5° Gorbit	Ver. 06 (See: page 6)
		SLH-PR L3 Monthly [LHM]	Spectral latent heating	0.5°x 0.5° Monthly	Ver. 06 (See: page 6)
	TRMM/TMI/GPROF	TMI L3 Monthly [TL3]	Precipitation	0.25° x 0.25° Monthly	
	TRMM/PR-TMI /COMB	PR-TMI Comb L3 [TC3]	Precipitation	0.25° x 0.25° Monthly	
		PR-TMI CSH L3 [CSH]	Gridded Orbital Convective Stratiform Heating	0.25° x 0.25° Gorbit	
		PR-TMI CSH L3 [CSF]	Monthly Convective Stratiform Heating	0.25° x 0.25° Monthly	

* Torbit is the TRMM orbit calculated from the southern most point back to the southern most point
TRMM Product is available from the below site.
https://gportal.jaxa.jp/gpr/

Oct 3rd, 2017

Release Notes for the PR Level 1 products

All users of PR Level 1 data should keep in mind the following changes in Version 5 products.

＜Major changes in the PR Level 1 products from TRMM Version7 to GPM Version 5＞

1. Changes of the PR's calibration parameters.
   JAXA reexamined the PR's calibration parameters in the GPM Version 5 products based on a new knowledge obtained by GPM/DPR's calibration. With the new parameters, the measured radar reflectivity factors increase by about +1.1 dB from the corresponding TRMM Version 7 products, and PR's normalized surface cross section (σ0) statistics agrees with KuPR's σ0.

2. Improvements of beam-mismatch correction.
   The boost of the TRMM satellite orbit from 350 km to 402.5 km in August 2001 caused a mismatch of the transmitted and received antenna beam directions (called as "beam-mismatch") by one pulse due to PR's fixed hardware design. Although the beam-mismatch has been partially corrected in TRMM Version7 products by using the method described in Takahashi and Iguchi (2004), a systematic bias has remained near the surface and bright band. JAXA applied a new correction method in GPM Version5 products to mitigate the correction error (Kanemaru et al., in preparation).

3. Improvements of geolocation.
   Since the satellite attitude and orbit information was reexamined by NASA/PPS, the geolocation of PR's IFOV (Instantaneous Field of View) was improved.

4. Data format was changed to the same format as GPM/KuPR's format.
   PR's Level 1 product format in GPM Version 5 was changed to the same format as KuPR's Level 1 product in GPM Version 5. Users can refer to the following web site.
   http://www.eorc.jaxa.jp/TRMM/documents/PR_algorithm_product_information/top_e.html

RELEASE NOTES OF GPM VERSION 05/TRMM VERSION 08 TMI CALIBRATION

This release of TRMM V8 data will become part of the GPM data suite. The TRMM V08 TMI calibration and correction are updated based on deep space and special maneuver data, as well advanced algorithms used in GPM GMI calibration. Updates include Antenna Patten Correction (APC) and antenna emissivity correction (these have major impacts on T_b) and a number of other updates described below. The magnitudes of T_b changes can be seen in Figure 1. The T_bs are increased around 2-3 K at low end of T_b for most channels, reflecting an over warm-correction of V7 for cold T_b. Corrections at warm end are small except for 19 GHz channels.

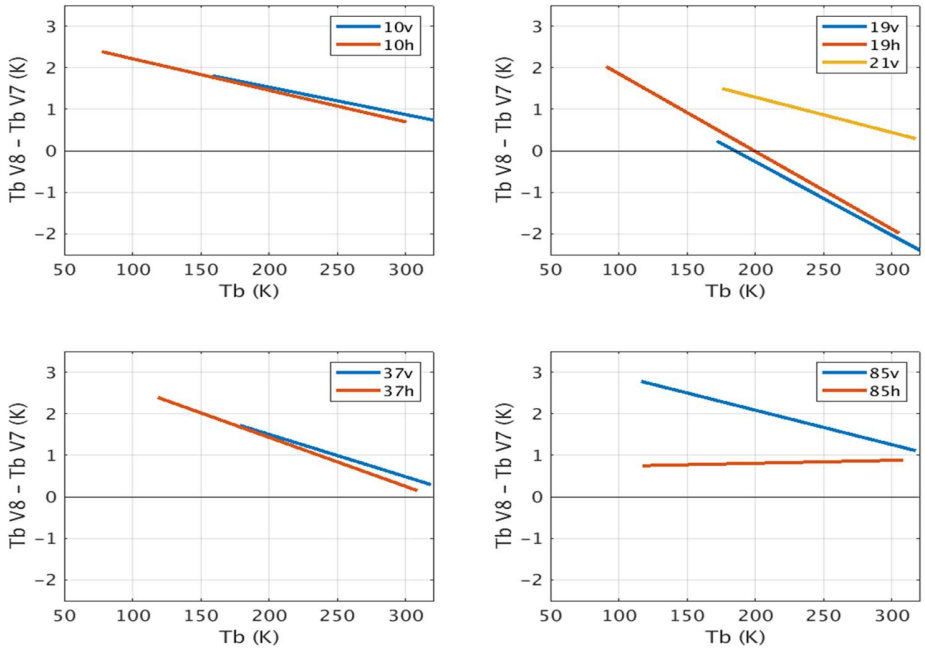


Figure 1. TMI T_b changes from V07 to V08.

1. Adjusted TMI APC. This adjustment is the major improvement from V07 to V08 in TMI antenna pattern correction. The adjustment is based on the data from TMI deep space and other special maneuvers, and refinements of the analysis from the GPM Inter-calibration Working Group (X-CAL). T_b changes vary from channel to channel and are functions of brightness temperatures.

2. Added TMI emissive antenna correction to replace the V7 empirical warm correction. The adjustment is based on the data from TMI deep space and other special maneuvers, and refinements of the analysis from the GPM Inter-calibration Working Group (X-CAL). T_b changes vary from channel to channel and are functions of brightness temperatures.

3. Used multiple scan calibration to replace the V7 single scan calibration. This reduced the along-track noise ±0.5 K but have no impact on long-term average.

4. Added correction on warm intrusions (moon and RFI) onto cold load and sun intrusions onto the hot load. These events typically last less than a few hundred scans for some orbits.

RELEASE NOTES OF GPM VERSION 05/TRMM VERSION 08 VIRS CALIBRATION

This release of TRMM V8 data will become part of the GPM data suite.

1. No change of radiometric calibration from V7 to V8. Radiances for all VIRS channels are identical between V7 and V8.

2. V8 added computation of surface reflectance for visible channels and brightness temperatures (Tb) for infrared channels. The V8 VIRS L1B products contain Radiance for all channels, as well as surface reflectance for channels 1 and 2 and Tb for channels 3, 4, and 5. V7 products do not have surface reflectance and Tb.

July 9, 2018

Release Notes for the PR Version 8/GPM PR Version 06A

Level 2 and Level 3 products

＜Major changes in the PR Level2 and Level3 products from Version 7 to Version 8＞

1. The format of version 8 products has been changed as described in “Precipitation Processing System (PPS), Primer for Tropical Rainfall Measuring Mission (TRMM), Satellite Products in the Global Precipitation Measurement (GPM) Era, Moving from HDF4 to HDF5 Level 2 and Level 3 Products, Version 1.0” (NASA, 2018).
2. A new calibration factor and radar parameters are applied to the data processing. Radar reflectivity factors and surface cross sections from the new PR products are now consistent with those from the DPR Ku products.
3. An improved algorithm is applied to correct for the beam-mismatch effect after the orbit boost of the TRMM satellite. New products have smaller contamination from surface echoes and show a better symmetric pattern of received echo statistics between the left and right swaths.
4. PR data are processed by essentially the same algorithm that is used to process the DPR/KuPR data. There are a few improvements associated with the DPR V06 algorithm. They include the new classification algorithm and improved angle-bin dependence of rain classification.

Caveat

1. PR’s rain estimates over land have significantly (about 15%) decreased in V8 from V7 because of the introduction of new calibration and the use of a location-dependent offset for the default DSD model in the DPR/KuPR algorithm. New PR estimates of rainfall rate over land are about 20% smaller than the corresponding estimates by the TMI. Note, however, that PR estimates over ocean have increased slightly.

Release Notes for TRMM SLH V8A and GPM SLH V6

July 12, 2018

The LUT for mid and higher latitudes was newly developed in the GPM SLH V5. In the TRMM SLH V8A and GPM SLH V6, the same LUT for mid and higher latitudes is applied and LUT for tropics is the same as TRMM SLH V7A. Some recommendations to users of orbital data are listed below, for TRMM SLH V8A and GPM SLH V6 retrieved as tropical precipitation or those as mid latitude precipitation. The separation between the tropics and the mid latitudes should be done referring to the rainTypeSLH values stored in the orbital data, and described in Table 1.
Although the SLH algorithm and Tables are the same as GPM SLH V5 for mid-latitude and TRMM SLH V7A for tropics, respectively, because of the change in input PR/KuPR Level 2 data (2APR/2AKu), TRMM SLH V8A and GPM SLH V6 products differ from TRMM SLH V7A and GPM SLH V5 products, respectively.

Table 1. description for rainTypeSLH

(a) Tropics and subtropics	(b) Mid and higher latitudes
0: No precipitation 1: Convective 2: Shallow stratiform 3: Deep stratiform 4: Deep stratiform with low melting level 5: Intermediary 6: Other	0: No precipitation 110: Convective 121: Shallow stratiform 122: Deep stratiform, downward decreasing 123: Deep stratiform, downward increasing 124: Deep stratiform, subzero 160: Other
Mask	
900: Tibet, winter mid-lat etc. 910: Suspicious extreme	

(i) No precipitation or Masked out pixels (rainTypeSLH=0, 900, or 910)

SLH values are not estimated.

(ii) Release note for tropical algorithm (0< rainTypeSLH <10)

Analysis showed consistency among GPM SLH V4, V5 and TRMM SLH V7A estimates over the coverage of TRMM/PR during a GPM and TRMM overlapping

observation period (April-June 2014). Note that:

0. Vertical levels are changed from 19 levels to 80 levels.
1. Shallow non-isolated echo has been classified as stratiform by rain type classification algorithm for TRMM/PR, but as convective by that for GPM/KuPR, affecting SLH estimates. To give consistent SLH estimates from GPM/KuPR with those from TRMM/PR, shallow non-isolated echo is classified as stratiform in GPM SLH V4.
2. Differences of sampling between TRMM/PR and GPM/KuPR affect SLH estimates. The greater global coverage of the GPM Core Observatory (65°N/S) compared to the TRMM coverage (35°N/S) decreases sampling of GPM/DPR over the coverage of TRMM/PR, especially at around the satellite inclination latitudes of 35°N/S, affecting SLH estimates there.
3. Retrieval for high mountains/winter mid-latitudes pixels will be developed.
4. For tropical latent heating, due to the change of vertical levels from 19 levels to 80 levels, users are recommended to smooth the profile vertical for a few levels to avoid the spurious peak at around 0degC level.

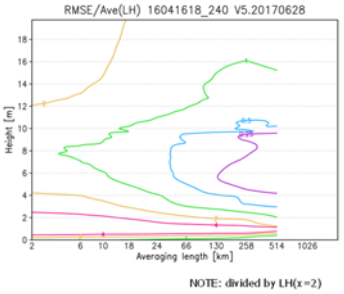
(iii) Release Note for Mid-latitude algorithm (rainTypeSLH>100)

A. In look up table ranges where sampling numbers did not satisfy the criteria, values are discarded or extrapolated from nearest neighbor bins, depending on the precipitation type. Sampling number criterion is basically 30, but 60 is chosen for deep stratiform LUT with precipitation maximum at the near surface level. Corresponding range for the convective LUT is PTH>10.5km.

B. Recommendation for horizontal averaging at the utilization of products SLP or SLG of GPM SLH V05.

B1. Eddy flux convergence in Q1R and Q2 are estimated assuming that the size of "large-scale grids" is 100kmx100km. Therefore, it is recommended to average horizontally in this spatial scale to utilize Q1R or Q2.

B2. Horizontal averaging of about 50km x 50km, or 100 pixels with GPM DPR sampling, is recommended, in order to limit root mean square errors (RMSE) calculated between estimated LH from LFM-simulated precipitation, less than a half of the mean value at the LH peak height of ~5.5km (for Case 1).



(iv) Release Note for L3 (gridded; SLG and Monthly; SLM) product

From the TRMM SLH V8A and GPM SLH V6 product, we added the unconditional variables (UnCnd) for each rain type, and modify the variable name including conditional variables (Cnd). Please refer to the ATBD.