

Release Notes for GPM SLH V06B

October 2018

revised in December 2018

minor-version-up to 06B in July 2020

The LUT for mid and higher latitudes was newly developed in the GPM SLH V05. In the TRMM/GPM SLH V06A, 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/GPM SLH V06A 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 V05 for mid-latitude and TRMM SLH V7A for tropics, respectively, because of the change in input PR/KuPR Level 2 data (2APR/2AKu), TRMM/GPM SLH V06A products differ from TRMM SLH V7A and GPM SLH V05 products, respectively.

Table 1. description for rainTypeSLH

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

It was found that the change of the input KuPR level 2 data from V05 to V06 increased the bias between the KuPR near-surface precipitation and vertically integrated latent heating of SLH V06A. Moreover, some unnatural heating profiles were found associated with precipitation in tropical cyclones. To fix these problems, we revise the algorithm and release the SLH V06B product. Note that the SLH V06B product is available for GPM era since February 2014.

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

SLH values are not estimated.

(ii) Release note for tropical algorithm ($0 < \text{rainTypeSLH} < 10$)

Analysis showed consistency among GPM SLH V04, V05, V06 and TRMM SLH V7A, V06 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 V04.
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 0°C level.
5. The tropical algorithm is sometimes applied at high latitudes in summer. In such cases, pixels to which the tropical algorithm are applied and those to which the mid-latitude algorithm are applied are distributed disorderly. This problem will be fixed in future version.

(iii) Release Note for Mid-latitude algorithm ($\text{rainTypeSLH} > 100$)

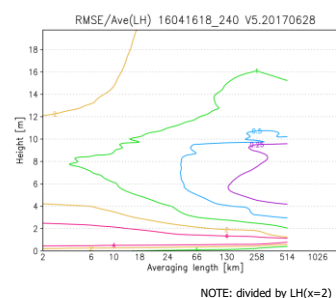
A. In look up table ranges where sampling numbers did not satisfy the criteria, values are discarded or extrapolated from nearest neighbor bins, depending on the precipitation type. Sampling number criterion is basically 30, but 60 is chosen for deep stratiform LUT with precipitation maximum at the near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

convective LUT is $PTH > 10.5\text{km}$.

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 $100\text{km} \times 100\text{km}$. Therefore, it is recommended to average horizontally in this spatial scale to utilize Q1R or Q2.

B2. Horizontal averaging of about $50\text{km} \times 50\text{km}$, 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 $\sim 5.5\text{km}$ (for Case 1).



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

From the TRMM/GPM SLH V06A 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.

[Note about the missing value for conditional mean]

Note that there are two reasons for missing values for conditional mean (LHCndMean, Q1RCndMean, Q2CndMean), which can be discriminated by 'allPix' values as follows.

1. conditional mean is not defined because there is no precipitation in the grid ($\text{precipPix}=0$), when $\text{allPix} \neq 0$.
2. missing value is given because the grid value is masked out related to the topography, when $\text{allPix} = 0$.