Research of Precipitation Measuring Mission

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Abstract

Calculation of the global rainfall map derived from Tropical Rainfall Measuring Mission (TRMM) and the Global Precipitation Measurement (GPM) during a period from 2000 to 2014 using the GSMaP algorithm .

Checks of consistency between the TRMM Precipitation Radar (PR) algorithm and the GPM/DPR algorithm with long-term observation data.

Ref. URL: https://www.eorc.jaxa.jp/GPM/en/index.html

Reasons and benefits of using JAXA Supercomputer System

The JSS3 is necessary for calculation of the long-term data which consists of multiple satellites and sensors for the precipitation measurement with earlier computational times for algorithm evaluations, improvements, and long-term production. Because of the complexity of the processing algorithms, strict business progress management, emergency response, detailed user response by the operation side, etc. are required. When we do not use the JSS3, it can be said that reprocessing in a short period cannot be achieved.

Achievements of the Year

Several long-term test processes were conducted to develop algorithms for the GPM DPR V07 and GSMaP V05 major version update released in December 2021.

The results of the long-term statistical evaluation of precipitation showed that the GPM DPR was reasonable with no significant deviation from the existing product V06A, and that the GPM KuPR and TRMM PR, which are precipitation radars in Ku band, showed good continuity agreement

(Fig.1). As for the GSMaP, the results of the comparison confirmed that the RMSE is improved over the existing product V04 (Fig.2). In the evaluation of these analyses, the time required for long-term test processing was significantly reduced by conducting them in JSS3, leading to an accelerated development cycle and the release of a major version of those products.

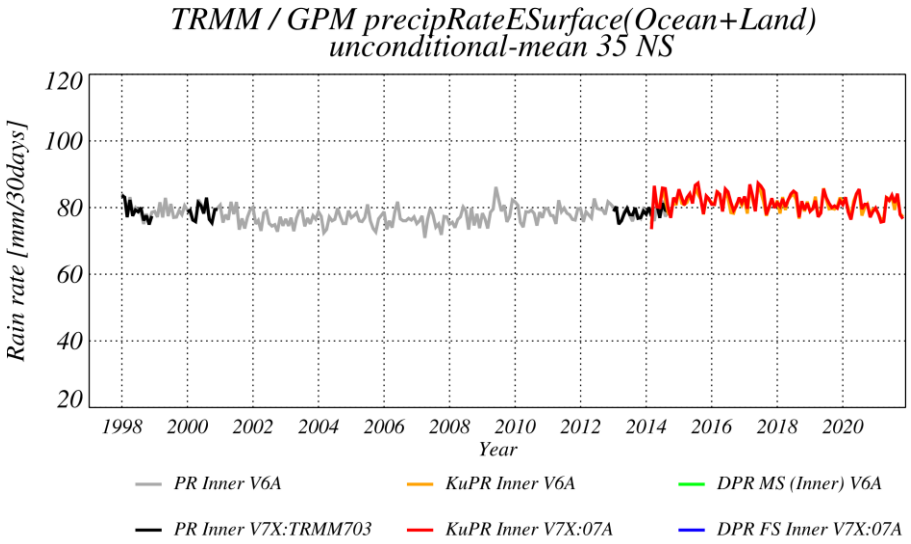

Fig. 1: A trend of the precipitation of TRMM PR and GPM DPR at surface. Monthly unconditional mean in tropical region (35N-35S). Black line: TRMM PR (V07), Gray line:TRMM PR (V06A), Red line: GPM KuPR single frequency product (V07), Orange line: GPM KuPR single frequency product (V06A)

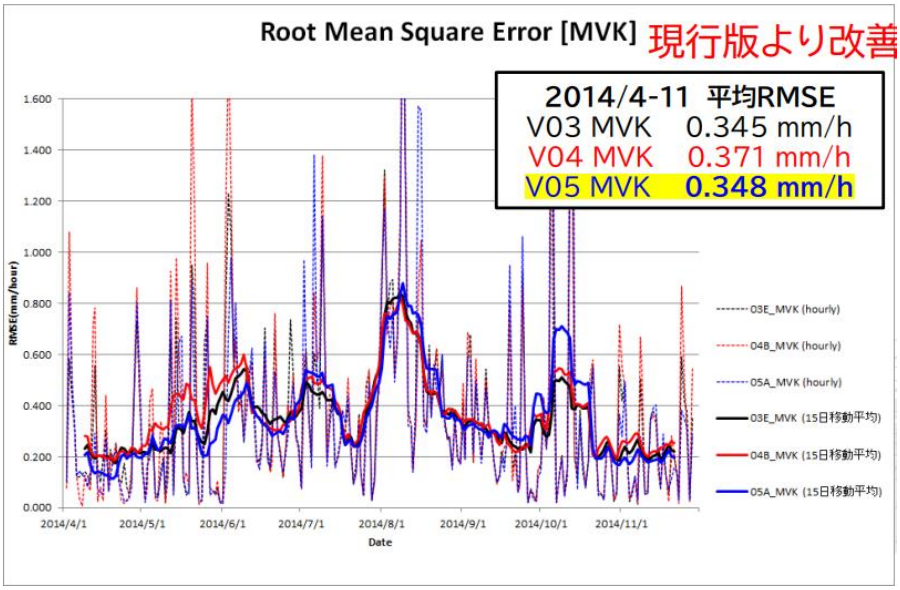

Fig. 2: RMSE of GSMaP MVK. Black line: 03E, Red line: 04B, Blue line: 05A. Dashed line: hourly mean, Solid line: 15 days running mean.

Publications

- Peer-reviewed papers

H. Hirose, T. Kubota, T. Tashima, T. Mega, and T. Ushio, 2021: Histogram Matching to Improve Homogeneity in Satellite Merged Precipitation Products, IEEE GRSL, accepted.

J. Awaka, M. Le, S. Brodzik, T. Kubota, T. Masaki, V. Chandrasekar and T. Iguchi, 2021: Development of precipitation type classification algorithms for a full scan mode of GPM Dual-Frequency Precipitation Radar, J. Meteor. Soc. Japan, https://doi.org/10.2151/jmsj.2021-061

T. Masaki, T. Iguchi, K. Kanemaru, K. Furukawa, N. Yoshida , T. Kubota, and R. Oki, 2021: Calibration of the Dual-frequency Precipitation Radar (DPR) Onboard the Global Precipitation Measurement (GPM) Core Observatory, IEEE Trans. Geosci. Remote Sens., https://doi.org/10.1109/TGRS.2020.3039978.

M. Yamaji, T. Kubota, and M. K, Yamamoto, 2021: An Approach to Reliability Characterization of GSMaP Near-Real-Time Precipitation Product, J. Meteor. Soc. Japan, https://doi.org/10.2151/jmsj.2021-033.

S. Seto, T. Iguchi, R. Meneghini, J. Awaka,T. Kubota, T. Masaki and N. Takahashi, 2021: The Precipitation Rate Retrieval Algoirthms for the GPM Dual-frequency Precipitation Radar, J. Meteor. Soc. Japan, https://doi.org/10.2151/jmsj.2021-011.

- Invited Presentations

Recent Progresses of the Global Precipitation Measurement (GPM) Mission in Japan, Takuji Kubota, ICSANE2021、November 2021.

- Oral Presentations

Recent Progresses of the Global Precipitation Measurement (GPM) Mission in Japan

T. Kubota, M. Yamaji, T. Tashima, K. Yamamoto, R. Oki, Nobuhiro TAKAHASHI and Yukari N. Takayabu, EGU2021, April 2021.

- Poster Presentations

Evolution of Global Satellite Mapping of Precipitation (GSMaP) Product version 05, T. Kubota, K. Aonashi, T. Ushio, S. Shige, T. Tashima, M. K. Yamamoto, M. Yamaji, H. Hirose, T. Mega, A. Hamada, Yukari Takayabu, JpGU2021, May 2021.

- Web

JAXA Global Rainfall watch

https://sharaku.eorc.jaxa.jp/GSMaP/index.htm

GPM EORC

https://www.eorc.jaxa.jp/GPM/en/index.html

- Other

JMSJ Award 2021 (Seto, S., T. Iguchi, R. Meneghini, J. Awaka, T. Kubota, T. Masaki, and N. Takahashi, 2021: The Precipitation rate retrieval algorithms for the GPM Dual-frequency Precipitation Radar. J. Meteor. Soc. Japan, 99, 205-237.)

Usage of JSS

Computational Information

Process Parallelization Methods	N/A
Thread Parallelization Methods	N/A
Number of Processes	1
Elapsed Time per Case	24 Hour(s)

JSS3 Resources Used

Fraction of Usage in Total Resources[*1](%): 0.09

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	0.00	0.00
TOKI-ST	640,830.25	0.79
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	144.43	0.00
TOKI-TGP	0.00	0.00
TOKI-TLM	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	58.33	0.06
/data and /data2	97,363.33	1.04
/ssd	183.33	0.05

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	71.08	0.48

*1: Fraction of Usage in Total Resources: Weighted average of three resource types (Computing, File System, and Archiver).

*2: Fraction of Usage：Percentage of usage relative to each resource used in one year.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage*2(%)
ISV Software Licenses (Total)	0.00	0.00

*2: Fraction of Usage：Percentage of usage relative to each resource used in one year.