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 Decemebr 1997 to March 2023 using the latest GSMaP standard algorithm (V08) and GSMaP Gauge NRT V8 algorithm.

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

The GSMaP has multi-satellite global precipitation map under the Global Precipitation Measurement (GPM) Mission, by using Dual-frequency Precipitation Radar (DPR) onboard GPM core satellites, other GPM constellation satellites, and Geostationary satellites. The GSMaP is developed by JAXA and the product is used worldwide.In FY2021, products using the latest GSMaP algorithm (V8) for the satellite observation period after 2000 was released and the latest algorithm is used for the real time operation.The algorithm of GSMaP will be up to date in FY2026 and it has been developping. In this year,JSS was used to process GSMaP using precipitation regimes and noise tables that are being developed by PI. The evaluation of GSMaP V8 suggests that there are issues in estimating precipitation in IR areas observed by geostationary satellites.Therefore, the noise table used for precipitation estimation in the IR region by PI has been improved, and the histogram matching and noise table adjustment, which are corrections to the IR region introduced in V8, have been implemented.The difference

between GSMaP MVK V8 and GSMaP MVK V8 with adjusted noise tables is shown in Figure 1.Focusing on the northern part of South America, the precipitaton with the developed noise table has been decreased. In the Southeast Asia region, it has been increased. In addition, processing was performed using an improved MML module that creates LookUpTable and a developed version of the precipitation regime.Other processing was also performed for SSMIS except for SSMIS F18, with the exception of snowfall determination.JSS3 accerelated development cycle because it had processing time short.

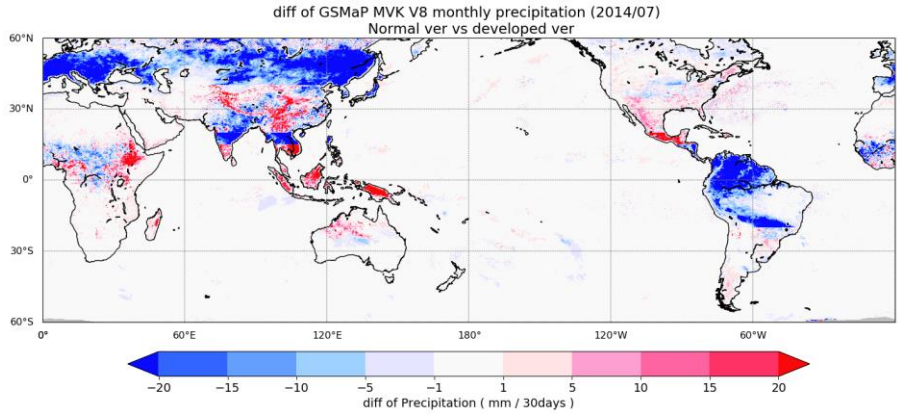

Fig. 1: The differece between GSMaP_MVK_V8 and GSMaP_MVK_V8 with adjusted noise table

Publications

- Peer-reviewed papers

Kubota, T., M. K. Yamamoto, M. Ito, T. Tashima, H. Hirose, T. Ushio, K. Aonashi, S. Shige, A. Hamada, M. Yamaji, N. Yoshida, and M. Kachi, 2025: Construction of a longer-term and more homogeneous GSMaP precipitation dataset. Radar Meteorology and its Applications, in press.

- Non peer-reviewed papers

Naoko Sugita, Naoko Matsuo, Takuji Kubota, and Misako Kachi, 2025: Earth Observation for Digital Twin: Fusion of Smart City and Satellite Data for Japan’s Energy Transition, The Energy Transition in Japan. Smart Cities and Smart Solutions, Chapter 13.

- Invited Presentations

T. Kubota et al., "Evaluation of Effects on Dual-Frequency Precipitation Radar Observations Due to the Orbit Boost of the GPM Core Observatory," Proc. IGARSS 2024, pp. 709-712, doi: 10.1109/IGARSS53475.2024.10641066.

- Oral Presentations

Kubota, T., Masaki, T., Kikuchi, G., Ito, M., Higashiuwatoko, T., Kanemaru, K., Takahashi, N., Yamamoto, K., Furukawa, K., and Nio, T.: Early evaluation of effects on Dual-frequency Precipitation Radar observations by the orbit boost of the GPM Core Observatory , EGU General Assembly 2024, Vienna, Austria, 14–19 Apr 2024, EGU24-4232, https://doi.org/10.5194/egusphere-egu24-4232, 2024.

- Web

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

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](%): 0.02

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	0.00	0.00
TOKI-ST	102,822.11	0.11
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
TOKI-TST	0.00	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	26.67	0.02
/data and /data2	90,353.33	0.43
/ssd	0.00	0.00

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	53.89	0.18

*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.