# 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**

Long-term test processing was conducted to confirm the latest products of TRMM PR and GSMaP. For TRMM PR, a long-term test was conducted from 1998 to 2014 to confirm the continuity of precipitation with its successor, GPM KuPR, which is the same Ku-band precipitation radar. The results of the evaluation of the latest product (V07A) showed good agreement between TRMM PR (Figure 1: black line) and GPM KuPR (Figure 1: red line) in terms of surface precipitation rate. For GSMaP, several long-term tests were conducted in July 2014 to confirm the effect of algorithm improvement. Figure 2 shows the monthly average global map and the zonal mean. It can be seen that the latest product of V05 (Figure 2: red line) agrees well with the GPM DPR (Figure 2: black line) in the zonal mean. In the area where some deviations are observed at high latitudes, improvement is expected in future versions of the GSMaP. In addition to the long-term study, JSS3 was also used to create long-term dataset

for model input based on the latest GPM DPR and TRMM PR products. The utilization of JSS3 has reduced processing time and accelerated the development cycle, which in turn has led to the practical use of GPM products.

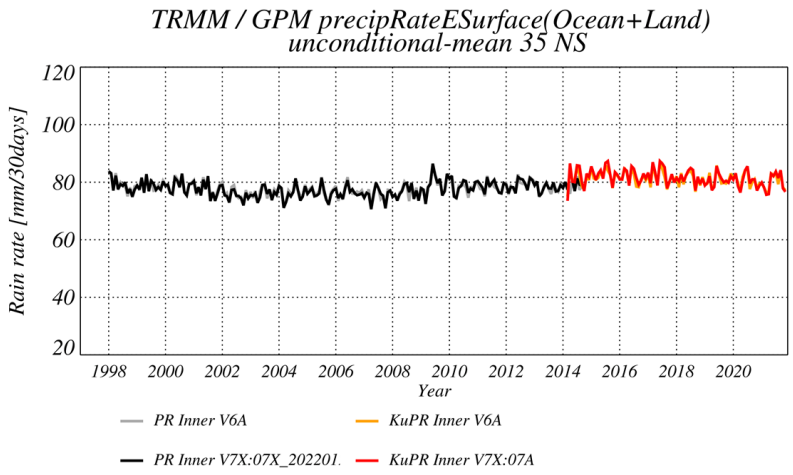


Fig. 1: A trend of the precipitation of TRMM PR and GPM DPR at 2km height. Monthly unconditional mean in tropical region (35N-35S). Gray line: TRMM PR V06A, Black line: TRMM PR V07A, Orange line: GPM KuPR V06A, Red line: GPM KuPR V07A.

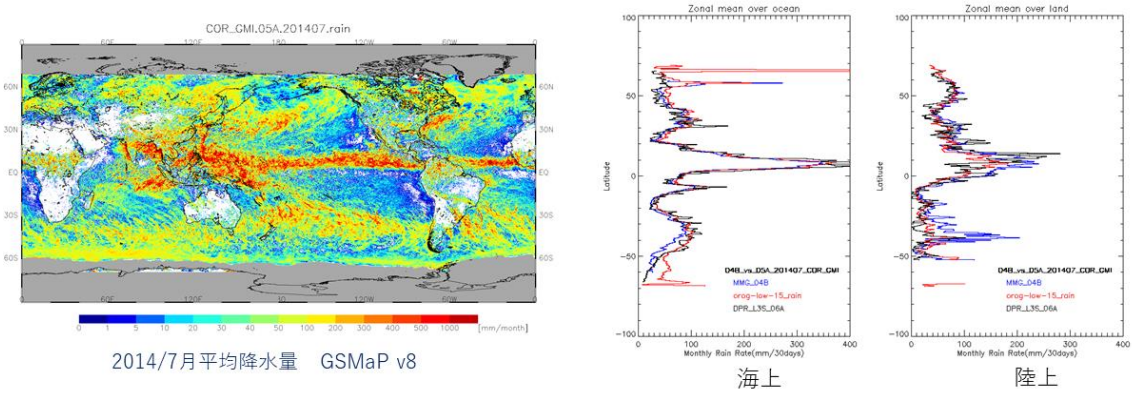


Fig. 2: GSMaP monthly precipitation in July 2014 for global map and zonal mean. Blue line: GSMaP V04, Red line: GSMaP V05, Black line: GPM DPR.

## Publications

- Peer-reviewed papers

1. Kumar, P., Varma, A. K., Kubota, T., Yamaji, M., Tashima, T., Mega, T., & Ushio, T. (2022). Long-term high-resolution gauge adjusted satellite rainfall product over India. Earth and Space Science, 9, e2022EA002595. https://doi.org/10.1029/2022EA002595

2. M. K. Yamamoto, T. Kubota, 2022: Implementation of a Rainfall Normalization Module for GSMaP Microwave Imagers and Sounders. Remote Sensing. 14(18), 4445. https://doi.org/10.3390/rs14184445

3. 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.

- Oral Presentations

Masaki, T., Furukawa, K., Iguchi, T., Kubota, T., & Takahashi, N. (2022). Beam Matching of the Dual-Frequency Precipitation Radar Onboard the Global Precipitation Measurement Core Observatory. In IGARSS 2022-2022 IEEE International Geoscience and Remote Sensing Symposium..

- Web

JAXA Global Rainfall watch

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

GPM EORC

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](%): 0.06

Details

| Computational Resources | | |
|---|---|---|
| System Name | CPU Resources Used (core x hours) | Fraction of Usage[*2](%) |
| TOKI-SORA | 0.00 | 0.00 |
| TOKI-ST | 464,267.70 | 0.46 |
| TOKI-GP | 0.00 | 0.00 |
| TOKI-XM | 0.00 | 0.00 |
| TOKI-LM | 0.00 | 0.00 |
| TOKI-TST | 303.37 | 0.01 |
| 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 | 42.50 | 0.04 |
| /data and /data2 | 90,511.67 | 0.70 |
| /ssd | 158.33 | 0.02 |

| Archiver Resources | | |
|---|---|---|
| Archiver Name | Storage Used (TiB) | Fraction of Usage[*2] (%) |
| J-SPACE | 49.50 | 0.22 |

[*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.