Earth observation satellite data processing for GPM/DPR

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Abstract

In recent years, worldwide interest has been increasing about the necessity of grasping the global environmental change. To deal with such problems, various approaches using observation technology from space have been carried out by satellites.

Global Precipitation Measurement (GPM) mission, as follow-on and expansion of Tropical Rainfall Measurement Mission (TRMM) satellite, is an international mission to achieve highly accurate and frequent global rainfall observation. it is carried with multiple satellite, GPM core satellite with Dual-frequency Precipitation Radar (DPR) jointly developed by JAXA and NICT, and with GPM Microwave Imager (GMI) developed by NASA, and another constellation satellites with Microwave Imager. In addition, GSMaP (Global Satellite Mapping of Precipitation), which estimates global precipitation distribution based on data acquired by these GPM core satellites and constellation satellites, is available.

Long-term data accumulation is important to understand global environmental changes, and it is necessary to ensure continuity of data from the TRMM, which operated from 1997 to 2015, the GPM, which is currently in operation.

Ref. URL: http://global.jaxa.jp/projects/sat/gpm/

Reasons and benefits of using JAXA Supercomputer System

Processing of earth observation data includes "operational processing" performed routinely and "re-processing" performed once a year or so for several year data. The purpose of re-processing is to correspond with version-up of computing model and algorithm performed periodically. The amount

of observation data grows year by year. Then, we need more and more time to complete reprocessing of all archived observation data. By using supercomputers, the calculation time is greatly shortened, and it is possible to provide products quickly to users.

In addition, the frequency of re-processing is about once every one to two years, so the necessary period of computer resource for re-processing is limited. If this computer resource is prepared on ourselves, it is inefficient in terms of the computer utilization. The use of JSS3 is advantageous in that it can relatively flexibly secure computer resources when we needed.

In this project, the total re-processing time is reduced by increasing the number of concurrently executing processes using MPI parallel processing called "workflow control".

Achievements of the Year

In FY2021, reprocessing of KuPR L1B and KaPR L1B was performed in response to the major version upgrade (V07) in December 2021. The overview of GPM reprocessing is as follows.

<GPM KuPR L1B and KaPR L1B>

period of observation : 2014/03/08 - 2021/11/30

CPU usage time : KuPR L1B Approx. 2123.9 hours

KaPR L1B Approx. 2159.9 hours

Number of output files : KuPR L1B 44,089 files

KaPR L1B 44,083 files

Total output file capacity : KuPR L1B 6.2 TB

KaPR L1B 4.7 TB

In FY2022, the GPM/DPR L2 and L3, TRMM L1B, L2 and L3, and GSMaP will be reprocessed in order to support the major upgrade(V07) .

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	N/A
Thread Parallelization Methods	N/A
Number of Processes	1
Elapsed Time per Case	176 Second(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	416,018.25	0.51
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	350.06	0.35
/data and /data2	1,171,089.67	12.52
/ssd	1,951.67	0.50

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	99.44	0.67

[*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.