Development and maintenance of AMSR3 research application system

● **Responsible Representative**

Riko Oki, Director, Earth Observation Research Center, Space Technology Directorate I

● **Contact Information**

Misako Kachi, JAXA/EORC(kachi.misako@jaxa.jp)

● **Members**

Misako Kachi, Yuji Taniguchi

● **Abstract**

We develop parameters to be used in resampling process for homogenization of spatial resolution and center position of footprints, which are different to each channel, within Level 1 processing of the Advanced Microwave Scanning Radiometer 3 (AMSR3) to be onboard the Global Observation SATellite for Greenhouse gases and Water cycle (GOSAT-GW).

Ref. URL: https://www.eorc.jaxa.jp/AMSR/index_en.html

● **Reasons and benefits of using JAXA Supercomputer System**

Significant reduction of processing time needed to develop parameters by using parallel processes of JSS3. These parameters are constant ones in Level 1 operational processing, but a large number of CPUs is temporarily needed to produce them. Therefore, it takes extremely long time to produce them if we do same calculation in usual computer environment.

● **Achievements of the Year**

In Level 1 processing of the Advanced Microwave Scanning Radiometer 3 (AMSR3), resampling processing to modify spatial resolution is done to produce resampling products, called Level 1R, Level 1H, and Level 1C products. Resampling processing is to calculate weights of input brightness temperatures to change their spatial resolutions and observed positions to those of output targets by using the Backus-Gilbert method.

These weighting parameters must be calculated for each combination of the spatial resolution of the input brightness temperatures and the spatial resolutions of the output targets. Since the microwave radiometer scans conically the Earth's surface while sensor unit is rotating, relationships of the observation positions will be changed during one scan (from start to end position of an observation scan). Therefore, it is necessary to calculate each weighting considering relationship of spatial resolution between the input data and output target, and that between the differences in observation position. For this reason, the number of weighting points, which are needed to be

calculated, becomes approximately 100,000 points in AMSR3 Level 1 processing.

This fiscal year, we tried to calculate the optimal parameters among ~30 sets of parameters (30 cases) by changing the allowable value of the amount of change when calculating the weight for each relationship between observation positions. Please note that we had used only one parameter case until JFY2023.

Since the last fiscal year, we have optimized the algorithm and introduced automatic parallelization using the Intel compiler to speed up the process. Since it takes 12 hours to process each point to calculate weighting, it will take more than 135 years to process the approximately 100,000 observation points if processing is done sequentially. However, by using parallel processing with JSS3, we were able to calculate the weightings of all observation points in about 140 days.

● **Publications**

N/A

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	Parallelization was performed using the automatic parallelization (-parallel) option of the Intel compiler.
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	8
Elapsed Time per Case	12 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 0.56

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	0.00	0.00
TOKI-ST	4,973,825.21	5.11
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	0.00	0.00
/data and /data2	100.00	0.00
/ssd	0.00	0.00

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2] (%)
J-SPACE	0.00	0.00

[*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.