

Satellite thermal simulation

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● Responsible Representative

Seiji Tsutsumi, Research and Development Directorate, Research Unit III

● Contact Information

Seiji Tsutsumi(tsutsumi.seiji@jaxa.jp)

● Members

Masaharu Abe, Seiji Tsutsumi

● Abstract

High fidelity non-equilibrium thermal model of a heat storage device with phase change material is studied.

● Reasons and benefits of using JAXA Supercomputer System

In this study, the Enthalpy-Porosity method was employed with ANSYS Fluent whose licenses JSS3 had. In addition, parallel supercomputers of JSS3 was used to obtain the result.

● Achievements of the Year

Numerical analysis to the experiment conducted by JAXA was performed. In this experiment, the heat storage device was made by a 3D printer using Al-Si10-Mg as a material, and octadecane was used for the phase change material (PCM). It was heated for 18 minutes with an average heat input of 76.6W. CFD was conducted using the Enthalpy-Porosity method and ANSYS fluent was used for the solver. Reasonable agreement with experimental result was obtained. However, since the present model assumed that the phase change proceeds linearly, the temperature change with melting was not accurately simulated. We plan to improve the accuracy of the phase change model by using a user defined function of Fluent.

● Publications

N/A

● Usage of JSS

● Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	8
Elapsed Time per Case	71.2 Hour(s)

● JSS3 Resources Used

Fraction of Usage in Total Resources*1(%): 0.00

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage *2(%)
TOKI-SORA	0.00	0.00
TOKI-ST	1,492.20	0.00
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	47.08	0.04
/data and /data2	4,012.47	0.03
/ssd	11.69	0.00

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	93.85	0.42

*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)	84.50	0.06

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