

Aerodynamic testing technology for reentering capsules

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● Abstract

To enhance hypersonic aerodynamic testing technology especially for reentering vehicles through developing understanding about the hypersonic wind tunnel nozzle flow which affects a lot estimation error to the flight characteristics and through defining the ability in predicting RCS jet interaction.

● Reasons and benefits of using JAXA Supercomputer System

Since it perfectly suits the requirement in calculating heavy RCS jet interaction flow field and the hypersonic nozzle flow. Useful tools such as FaSTAR is another.

● Achievements of the Year

Flow inside JAXA 1.27m hypersonic wind tunnel was numerically solved. The effects of grid and turbulence model were investigated. The result revealed that 1) the upstream nozzle geometry should be reproduced as much as possible, and 2) the effect of wall temperature variation in SA model may explain the experimental data of p_{02}/p_0 (p_0 :reservoir pressure, p_{02} :pitot pressure) at the nozzle exit, as shown Figs 1 and 2.

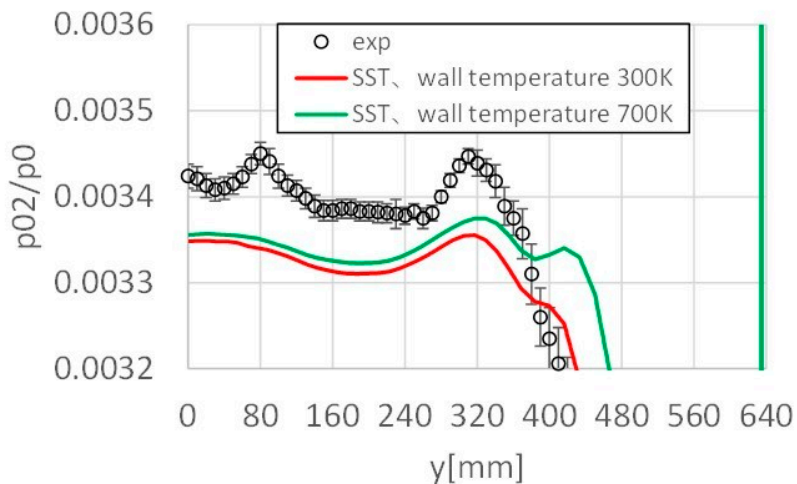


Fig. 1: p_{02}/p_0 at the nozzle exit in SST model

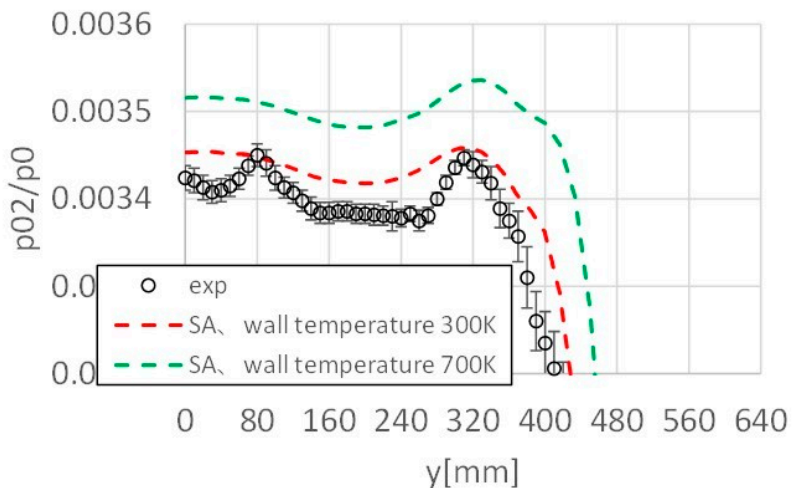


Fig. 2: p_{02}/p_0 at the nozzle exit in SA model

● **Publications**

N/A

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	32 - 480
Elapsed Time per Case	50 Hour(s)

- **Resources Used(JSS2)**

Fraction of Usage in Total Resources^{*1}(%): 0.10

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage ^{*2} (%)
SORA-MA	603,677.96	0.11
SORA-PP	2,732.05	0.02
SORA-LM	5.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage ^{*2} (%)
/home	8.34	0.01
/data	1,884.45	0.04
/tmp	1,611.33	0.14

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage ^{*2} (%)
J-SPACE	1.36	0.04

^{*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.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources*1(%): 0.20

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	1,084,101.36	0.23
TOKI-RURI	1,121.76	0.01
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	8.34	0.01
/data	1,884.45	0.03
/ssd	78.68	0.04

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	1.36	0.04

*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.