Numerical Study on Combustible Flow in Supersonic Flight Engines and Rocket Engines

● **Responsible Representative**

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● **Abstract**

Fundamental studies on nozzles and combustors for Japanese rocket engines and supersonic engines are performed by using numerical simulations.

Ref. URL: http://www.mech.kyutech.ac.jp/rfd/eng-theme.html

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

Academic and applicative researches on fluid dynamics and combustion mechanism, and development of effective numerical methods are carried out in order to develop Japanese rocket engines and supersonic engines.

● **Achievements of the Year**

To validate the analysis code for the jet mixing in the supersonic crossflow, ILES/RANS hybrid simulation on the round helium jet is performed. As a result, the shock waves and vortex structure near the jet exit are observed, as shown in Figs. 1 and 2. We confirmed that the analysis code can simulate the jet mixing in the supersonic flow.
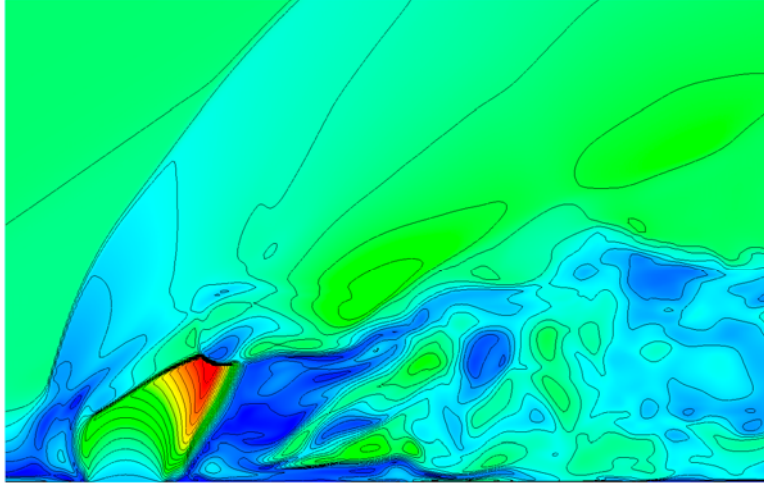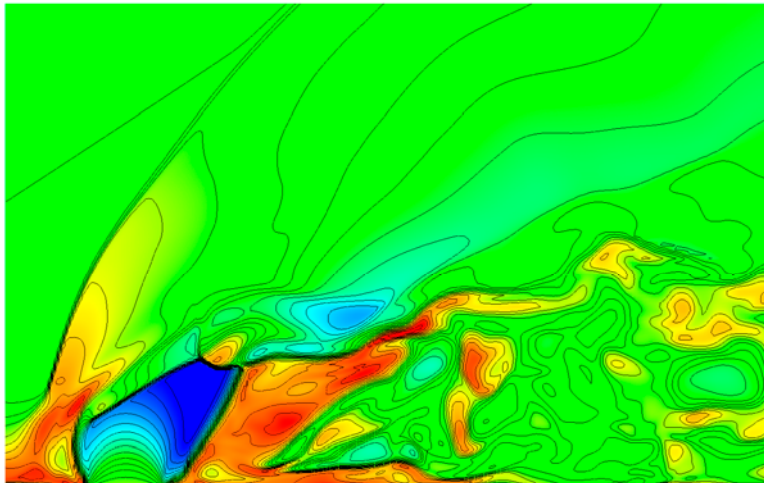
Fig. 1: Instantaneous Mach number contours.

Fig. 2: Instantaneous static temperature contours.

● **Publications**

N/A

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	8
Elapsed Time per Case	840 Hour(s)

● **Resources Used(JSS2)**

Fraction of Usage in Total Resources[*1](%): 0.02

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
SORA-MA	38,876.80	0.01
SORA-PP	0.00	0.00
SORA-LM	0.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	123.98	0.11
/data	1,239.78	0.02
/ltmp	25,390.64	2.16

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.

● **Resources Used(JSS3)**

Fraction of Usage in Total Resources[*1](%): 0.01

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	0.00	0.00
TOKI-RURI	0.00	0.00
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	38.15	0.03
/data	381.47	0.01
/ssd	381.47	0.20

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.