Investigation of internal flow of aircraft combustor for En-Core Project

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Abstract

In the development process of aircraft combustors, air mass flow distribution between fuel nozzles and cooling air holes on the liner effects performances of combustors. In this research, we conduct combustion simulations of internal flow inside the combustor which faithfully simulates the configuration of practical combustor. Then their results are applied as initial conditions for the acoustic calculation which are conducted to predict combustion oscillation.

Reasons and benefits of using JAXA Supercomputer System

It is important to do parametric case study with slightly different geometry, and each case needs large scale simulation. To conduct such simulation effectively, we need the super computer with high parallelization efficiency.

Achievements of the Year

In this fiscal year, we made numerical grids which faithfully simulates the configuration of practical combustor, then conducted internal simulations by a commercial code. These results were applied as initial conditions for the acoustic calculation by a commercial code. Then we investigated the oscillation mode.

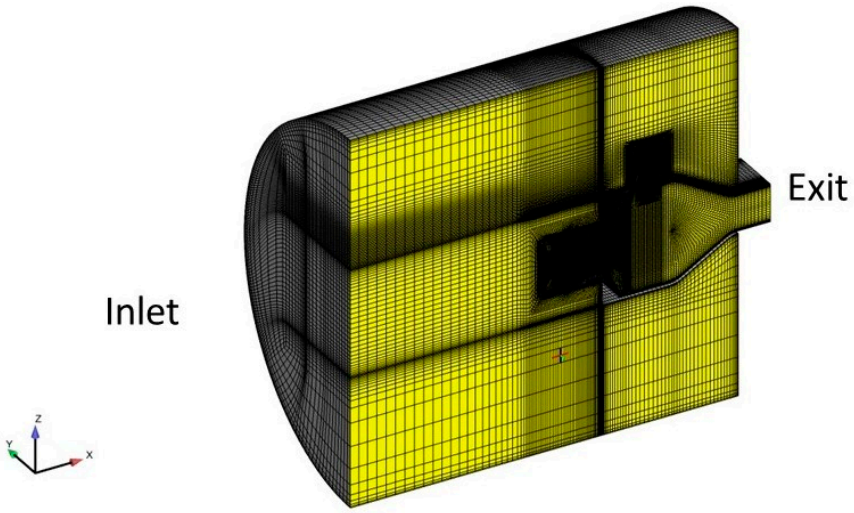

Fig. 1: Numerical grid for combustion calculation

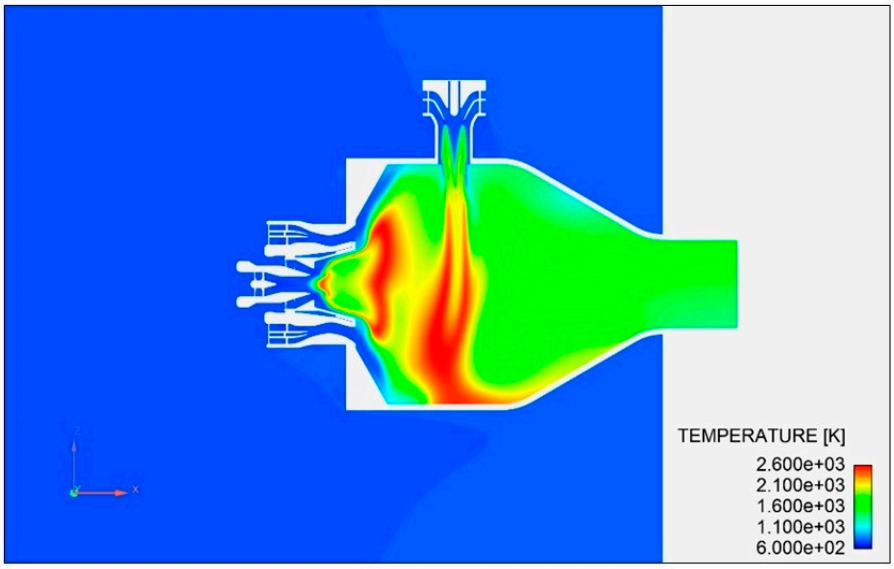

Fig. 2: Contour of temperature

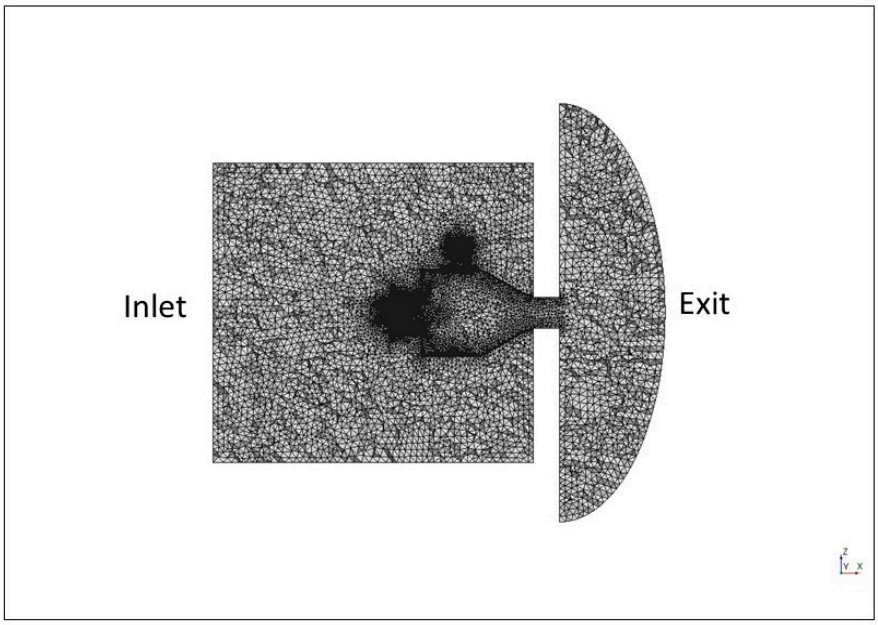

Fig. 3: Numerical grid for accousticc calculation

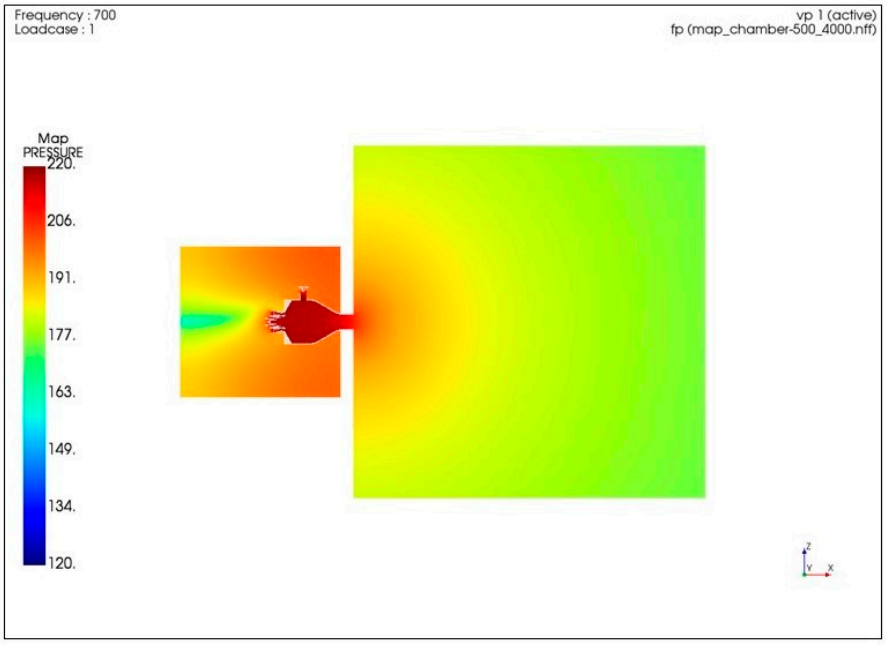

Fig. 4: Contour of acoustic preseure

Publications

N/A

Usage of JSS

Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	16
Elapsed Time per Case	50 Hour(s)

Resources Used(JSS2)

Fraction of Usage in Total Resources[*1](%): 0.08

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
SORA-MA	280,661.72	0.05
SORA-PP	42,553.17	0.33
SORA-LM	3.73	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	73.15	0.07
/data	7,106.24	0.14
/ltmp	1,351.76	0.12

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	1.59	0.05

[*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](%): 0.07

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	151,231.36	0.03
TOKI-RURI	53,015.07	0.30
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage[*2](%)
/home	80.02	0.05
/data	7,416.65	0.12
/ssd	42.23	0.02

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2](%)
J-SPACE	1.59	0.05

[*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.