Numerical analysis on atomization and spray combustion

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● **Abstract**

A numerical study is performed to clarify phenomena on atomization and spray combustion.

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

Phenomena on atomization and spray combustion require a high calculation load, and the use of super computer is necessary.

● **Achievements of the Year**

Numerical simulations were performed to investigate combustion instabilities on a coaxially-staged lean-burn fuel injector.

The dominant oscillation frequency obtained by the CFD was in good agreement with that by the corresponding experiment.
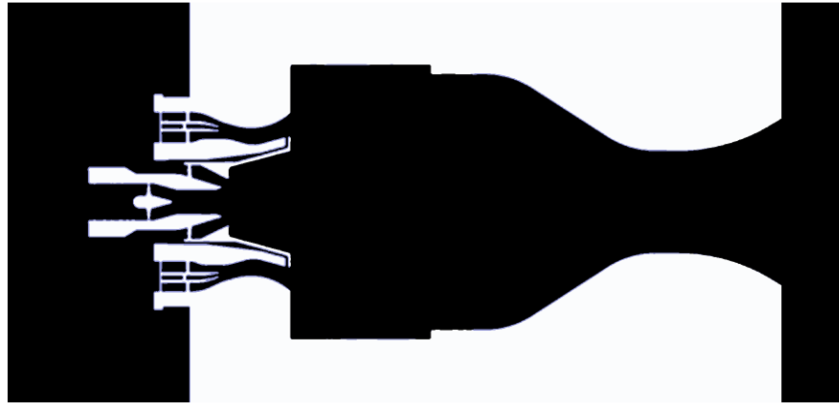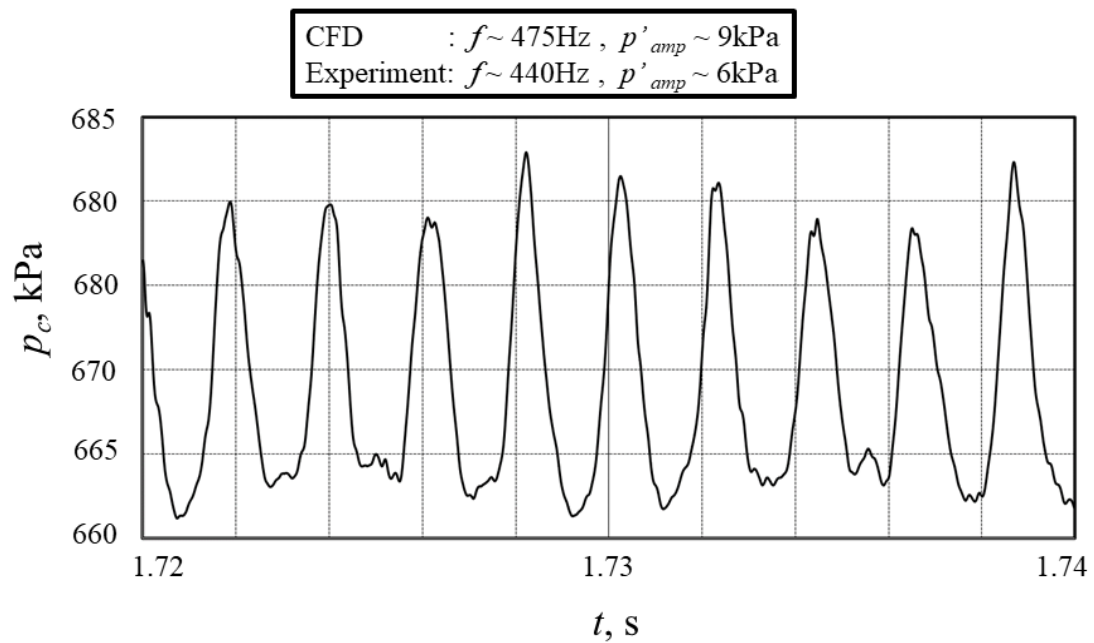
Fig. 1: Major part of numerical mesh for the combustor.

CFD : $f \sim 475\text{Hz}$, $p'_{amp} \sim 9\text{kPa}$
Experiment: $f \sim 440\text{Hz}$, $p'_{amp} \sim 6\text{kPa}$

Courtesy of Prof. Kurose of Kyoto Univ. for technical advice on CFD method

Fig. 2: Time evolution of pressure at a monitoring position in the combustion chamber.

🔵 **Publications**

N/A

🔵 **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	N/A
Number of Processes	512
Elapsed Time per Case	120 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources[*1](%): 1.31

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	35,673,471.92	1.56
TOKI-ST	48,200.33	0.05
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	2,246.29	0.15
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	246.15	0.22
/data and /data2	23,517.33	0.18
/ssd	99.17	0.01

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage[*2] (%)
J-SPACE	0.09	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.