

Research on three-dimensional cavity flow

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● Abstract

It is well known that rectangular-shaped cavities, such as those found in aircraft landing gear storage areas, can cause noise due to self-excited oscillation caused by an unsteady fluid phenomenon. In this study, the phenomenon of self-excited oscillation inside cavities was investigated by numerical fluid simulations

● Reasons and benefits of using JAXA Supercomputer System

Numerical simulation of unsteady flow fields is computationally expensive

● Achievements of the Year

The spatio-temporal structure of the cavity flow with a Mach number of 1.4 is visualized as shown in Figures 1 and 2 using dynamic mode decomposition. The visualization results show that the sidewalls change the spanwise velocity structure. It is also suggested that the sidewalls affect the pressure fluctuations that cause aerodynamic noise.

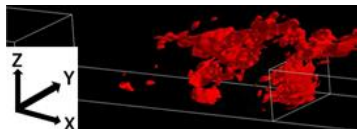


Fig. 1: Spatial structure of spanwise velocity without sidewalls ($St=0.1$)

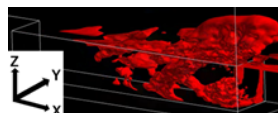


Fig. 2: Spatial structure of spanwise velocity with sidewalls ($St=0.1$)

- **Publications**

N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	256
Elapsed Time per Case	50 Hour(s)

- **JSS3 Resources Used**

Fraction of Usage in Total Resources*1(%): 0.11

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	2,091,789.19	0.10
TOKI-ST	85,995.40	0.11
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	13,463.57	1.00
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	600.00	0.60
/data and /data2	102,048.00	1.09
/ssd	5,140.00	1.33

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2(%)
J-SPACE	6.32	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.

● **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage*2(%)
ISV Software Licenses (Total)	2,028.79	1.42

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