

Study of combustion instability

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● Abstract

In this study, LS-FLOW-HO was used to conduct a two-dimensional LES analysis of Continuously Variable Resonant CoContinuously Variable (CVRC) with varying inlet oxidizer temperature. Then, the database with and without combustion instability was generated. We will develop a reduced order model that can predict combustion conditions to predict combustion instability by integrating model-based analysis and machine learning approach.

● Reasons and benefits of using JAXA Supercomputer System

Even in two-dimensional LES analysis, the computational time is so long that results can not be obtained without the use of a large-scale supercomputer.

● Achievements of the Year

Two-dimensional LES analysis was carried out for Continuously Variable Resonant CoContinuously Variable (CVRC) by using LS-FLOW-HO. In this simulation, the temperature of the oxidizer in the inlet duct was gradually changed from 680 K. And, the database with and without combustion instability is being prepared. We aim to develop a model to predict the occurrence of combustion instability in CVRC.

● Publications

N/A

● Usage of JSS

● Computational Information

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	48
Elapsed Time per Case	400 Hour(s)

● JSS3 Resources Used

Fraction of Usage in Total Resources*1(%): 0.04

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage *2(%)
TOKI-SORA	1,031,012.40	0.04
TOKI-ST	2,563.27	0.00
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.00	0.00
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	82.57	0.07
/data and /data2	13,656.69	0.11
/ssd	51.45	0.01

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage* ² (%)
J-SPACE	99.16	0.44

*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)	74.25	0.05

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