

## Development of 3D CFD core-software of automotive engine combustion chamber

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### ● Abstract

Enhancement of CAE utilization in automotive engine research by developing an engine combustion simulation software that is sharable in Japan automotive research community.

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

Massive-parallel large scale simulation, Large number of simulations for software validation

### ● Achievements of the Year

In order to make HINOCA a more practical software, the following five themes have been set to further improve its functions as a platform. "Improvement of conservation", "Addition of geometry definition function", "Addition of coupled calculation function", "Addition of reaction function", "Improvement of I/O function".

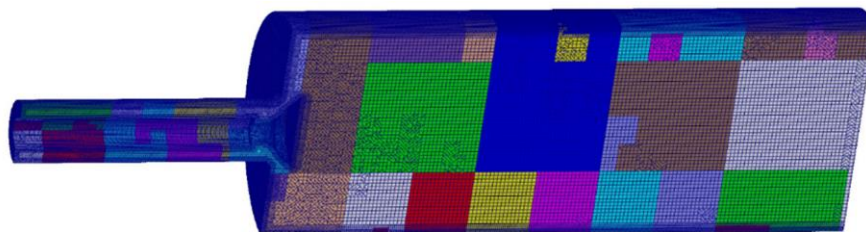


Fig. 1: Development of a Cell-based AMR version of HINOCA with the aim of improving conservation. This figure shows computational grids.

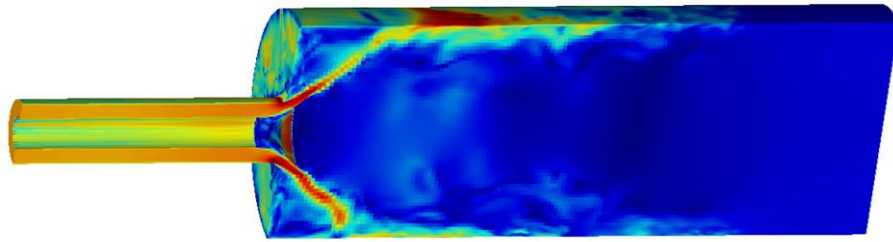


Fig. 2: Development of a Cell-based AMR version of HINOCA with the aim of improving conservation. This figure shows a example of computational result.

● **Publications**

- Oral Presentations

Practical Research on HINOCA, an Internal Engine Combustion Analysis Software Accelerating Green Innovation, JSAE Forum 2023

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	1 - 2048
Elapsed Time per Case	168 Hour(s)

● **JSS3 Resources Used**

Fraction of Usage in Total Resources\*1(%): 1.21

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	32,784,648.61	1.48
TOKI-ST	53,416.20	0.06
TOKI-GP	0.00	0.00
TOKI-XM	0.00	0.00
TOKI-LM	0.10	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	398.00	0.33
/data and /data2	497,125.64	3.07
/ssd	2,556.34	0.24

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	35.05	0.13

\*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 <sup>*2</sup> (%)
ISV Software Licenses (Total)	196.88	0.09

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