

## Development of 3D CFD core-software of automotive engine combustor

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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.

[https://www.jst.go.jp/sip/event/k01\\_hinoca/index.html](https://www.jst.go.jp/sip/event/k01_hinoca/index.html)

### ● Reasons for using of JSS2

Massive parametric study, Massive-parallel large scale simulation

### ● Achievements of the Year

Reproduction of engine port shape difference effects in steady port flow simulation. Achievement of engine cycle simulation from intake to exhaust.

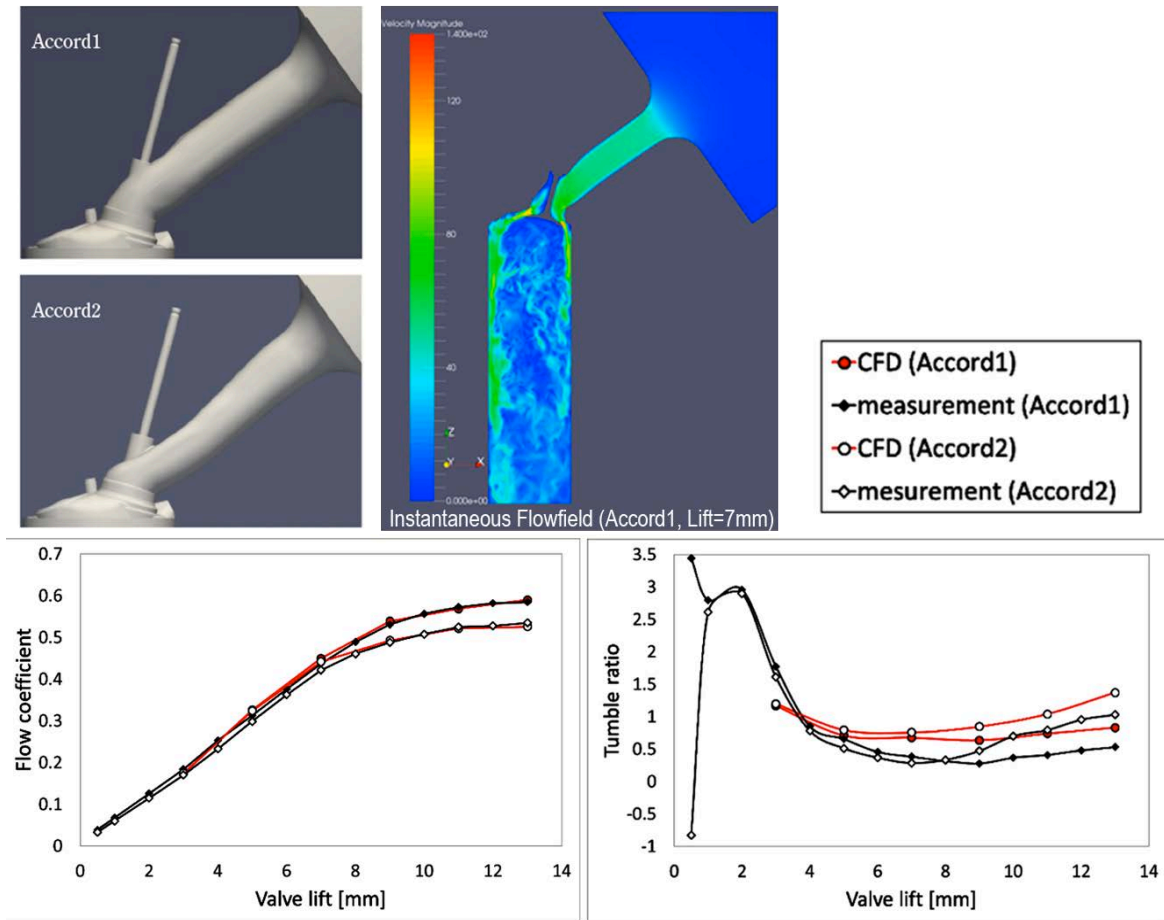


Fig.1 Effects of engine port configuration difference reproduced by HINOCA.

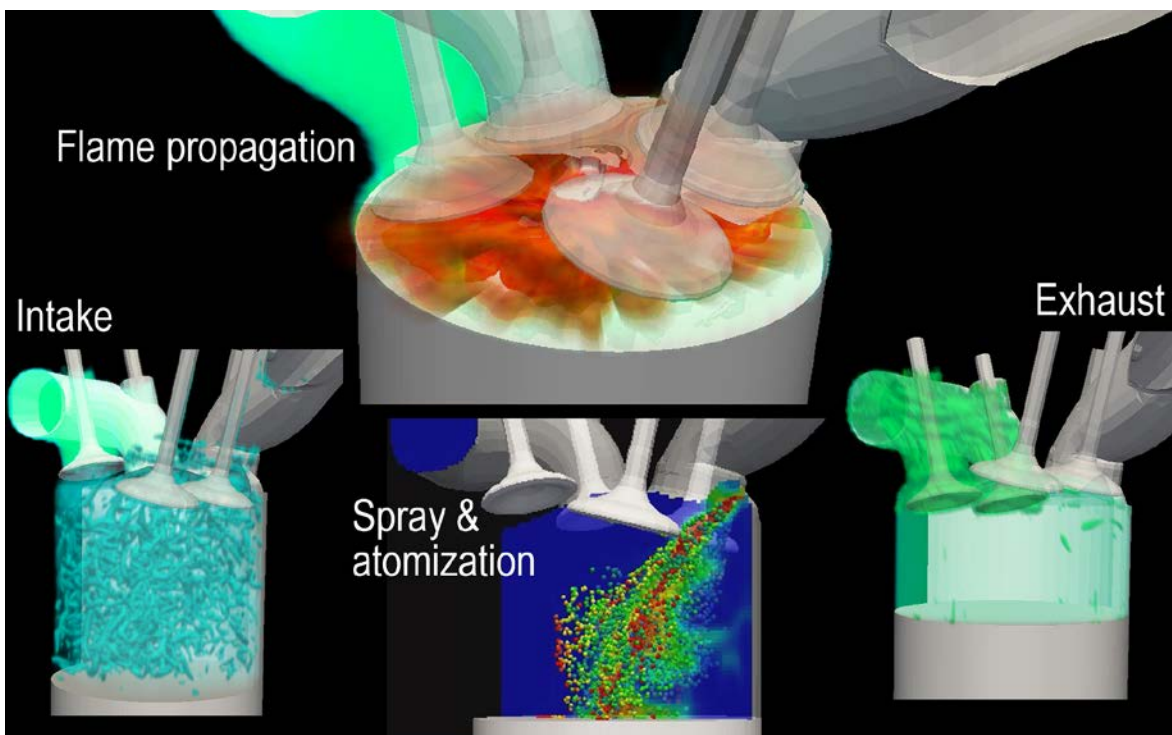


Fig.2 Engine cycle simulation from intake to exhaust.

## ● Publications

### ● Presentations

- 1) A. Kikusato et al., "Numerical Analysis on Flame Propagation in an Automobile Engine," 49th Fluid Dynamics Conference/35th Aerospace Numerical Simulation Symposium, Jun. 28, 2017.
- 2) D. Miyai et al., "Wall Reflection/Deposition Model of Spray in Immersed Boundary Model," 49th Fluid Dynamics Conference/35th Aerospace Numerical Simulation Symposium, Jun. 28, 2017.
- 3) Y. Matsuo et al., "Application of an adaptive mesh refinement method to the analysis of flow inside an engine cylinder," 49th Fluid Dynamics Conference/35th Aerospace Numerical Simulation Symposium, Jun. 28, 2017.
- 4) T. Nambu et al., "Validation of LES flow solver using immersed boundary method through analyses of curved duct flow," 49th Fluid Dynamics Conference/35th Aerospace Numerical Simulation Symposium, Jun. 28, 2017.
- 5) T. Hori, Y. Mizobuchi, "Spark Ignition Model for 3D Spark-Ignition Engine with Spark Channel Elongation," 49th Fluid Dynamics Conference/35th Aerospace Numerical Simulation Symposium, Jun. 28, 2017.
- 6) Y. Mizobuchi, "Development of engine combustion simulation software HINOCA," JSME RC276 2nd meeting, Sept. 21, 2017.
- 7) D. Miyai et al., "Steady State Port Flow Calculation with RANS HINOCA," 28th Internal Combustion Engine Symposium, Dec. 6, 2017.
- 8) R. Kaminaga et al., "Steady State Port Flow Calculation with LES HINOCA," 28th Internal Combustion Engine Symposium, Dec. 6, 2017.
- 9) Y. Mizobuchi, "Goals and functions of engine combustion simulation software HINOCA," JSME workshop, Jan. 19, 2018.

### ● URLs for the Research Results on the Web

- 1) [https://www.jst.go.jp/sip/event/k01\\_hinoca/index.html](https://www.jst.go.jp/sip/event/k01_hinoca/index.html)

● Usage of JSS2

● Computational Information

Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	2 - 600
Elapsed Time per Case	500.00 hours

● Resources Used

Fraction of Usage in Total Resources\*1 (%): 9.75

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	74,935,495.13	9.80
SORA-PP	1,007,804.54	12.62
SORA-LM	178.52	0.09
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage assigned(GiB)	Fraction of Usage*2 (%)
/home	1,392.84	0.97
/data	488,976.63	9.04
/ltmp	45,143.32	3.40

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	38.17	1.64

\*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