Adbanced Numerical Simulation of Compressible Two-phase Flow of diesel atomization

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Abstract

Atomization of fuel of aeronautical engines is focused in because of fuel consumption and environmental issues. Information from CFD results is very helpful for solutions of them. The research of numerical simulation of compressible muti fluid flow is conducted to apply for these problems.

Reasons for using of JSS2

Super computer system can be used from simple problems for the validation of basic method to relatively large application for unsteady and multi dimensional problems. It is convenient for the speed up of development of numerical cord.

This kinds of simulation deal with unsteady problems and in order for the reduction of computational time, the ability of handling of parallel computing is indispensable.

Achievements of the Year

Two main approach to the simulation of compressible multiphase flow are investigated; diffuse interface approach which treats the interface as mixture of both fluids and sharp interface approach with levelset method.

In the development of diffuse interface approach, basic equations are extended to six equation model and by considering the chemical equilibrium it became to possible to treat phase change such as cavitation. Atomization of fuel from 2D nozzle is simurated by this chords.

In the development of sharp interface approach, new HLLC scheme which is extended to treat phase change models at the interface and it was confirmed that the problem of the cavitation collapse are simulated accurately and the methods to inprove the mass prezervation was investigated.

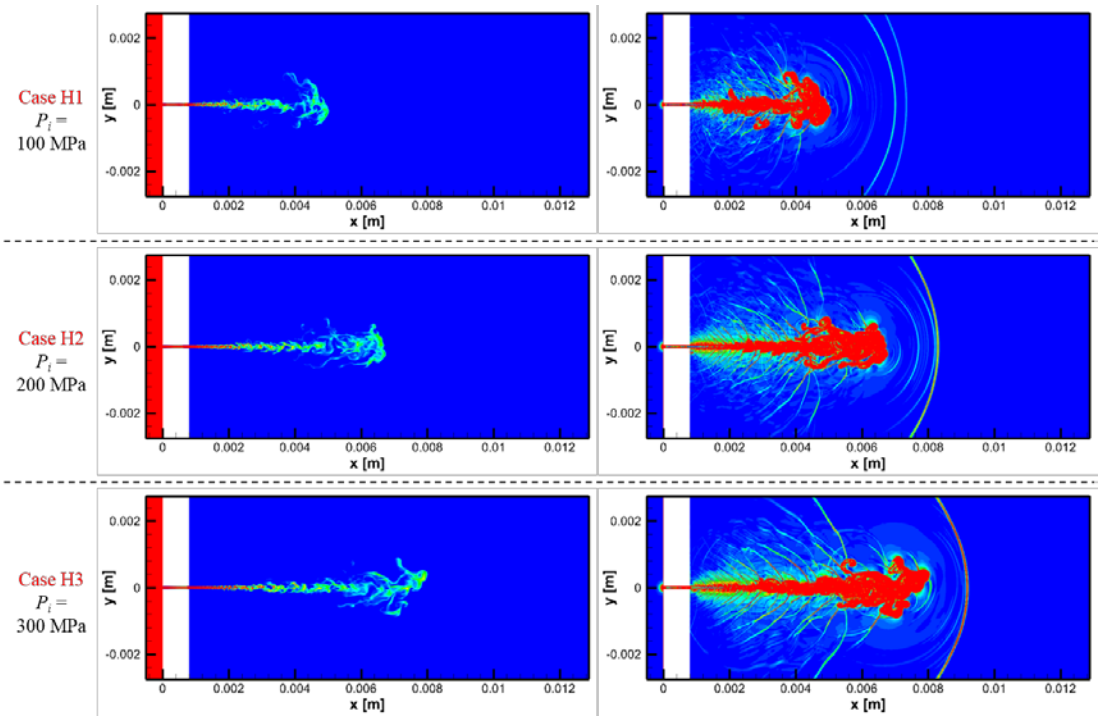

Fig.1 Volume fraction of fuel and numerical Schlieren

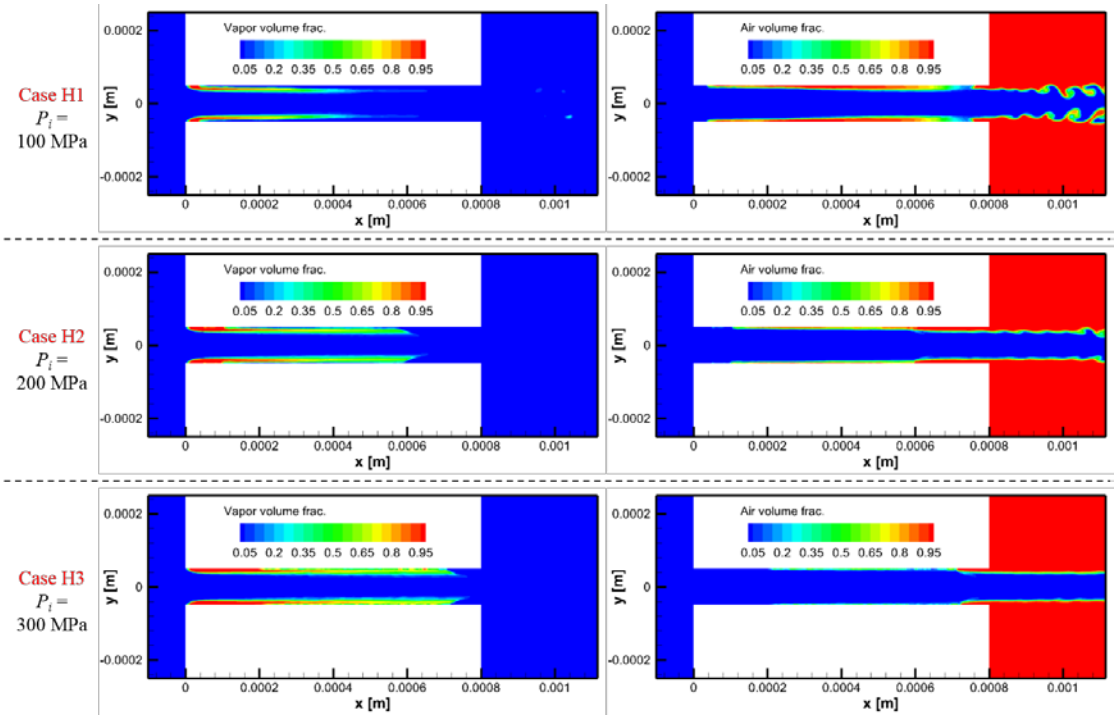

Fig.2 Volume fraction of vapor of fuel and air

Publications

- Presentations

1) Sumi, Kurotaki,' Ubsteady Numerical Simulation of Compressible Gas-Liquid Two-Phase Flow for Ultra-High-Pressure Fuel Injection,'The 28th Internal Conbustion Symposium (2017), 13.

Usage of JSS2

Computational Information

Parallelization Methods	N/A
Thread Parallelization Methods	OpenMP
Number of Processes	1
Elapsed Time per Case	10.00 hours

Resources Used

Fraction of Usage in Total Resources*1 (%): 0.00

Details

Computing Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	0.00	0.00
SORA-PP	4,466.74	0.06
SORA-LM	0.00	0.00
SORA-TPP	0.00	0.00

File System Resources		
File System Name	Storage assigned(GiB)	Fraction of Usage*2 (%)
/home	005.09	0.00
/data	078.01	0.00
/ltmp	1,041.67	0.08

Archiver Resources		
Archiver System Name	Storage used(TiB)	Fraction of Usage*2 (%)
J-SPACE	0.00	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