

## Development and application of multiphase flow solver for moving object using Cartesian grid

Report Number: R18EACA10

Subject Category: JSS2 Inter-University Research

URL: <https://www.jss.jaxa.jp/en/ar/e2018/9090/>

### ● Responsible Representative

Shun Takahashi, Tokai University

### ● Contact Information

Shun Takahashi, Tokai University (takahasi@tokai-u.jp)

### ● Members

Shun Takahashi, Taku Nonomura

### ● Abstract

The particulate flow is solved by the direct numerical simulation using Euler-Euler approach method. The objective is to investigate the interaction between the flow and particles and to develop the particulate model for the large scale compressible multiphase flow simulation.

### ● Reasons for using JSS2

The particulate flow becomes expensive in order to investigate the interaction between the flow and particles using Cartesian grid and the immersed boundary method. Also, the number of the time integrations becomes large due to obtain the equilibrium state of the particulate flow.

### ● Achievements of the Year

The interaction between the flow and particles was investigated by direct numerical simulation of the supersonic and low Reynolds number flow around the two particles using the immersed boundary method.

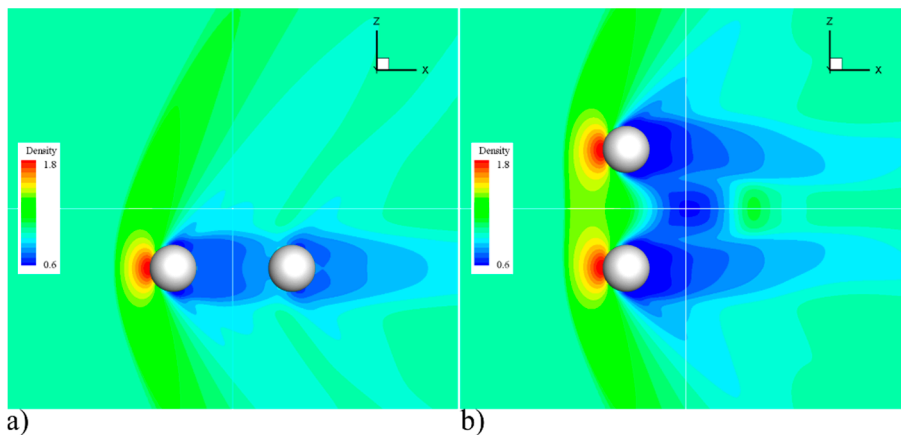


Fig. 1: Density distributions in supersonic flows around two particles;  
 a) in-line, b) side-by-side

● **Publications**

N/A

● **Usage of JSS2**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	128
Elapsed Time per Case	140 Hour (s)

● **Resources Used**

Fraction of Usage in Total Resources\*1 (%): 0.27

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2 (%)
SORA-MA	2,444,788.60	0.30
SORA-PP	0.00	0.00
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	37.59	0.04
/data	10,340.08	0.18
/ltmp	2,068.02	0.18

Archiver Resources		
Archiver Name	Storage Used (TiB)	Fraction of Usage*2 (%)
J-SPACE	14.06	0.49

\*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.