Analysis Technology for Spacecraft Aerodynamic Characteristics

● **Responsible Representative**

Yuko Inatomi, Institute of Space and Astronautical Science, Department of Interdisciplinary Space Science

● **Contact Information**

takaki.ryoji@jaxa.jp(takaki.ryoji@jaxa.jp)

● **Members**

Yuriko Shiratsuchi

● **Abstract**

Research and development of analysis technology related to spacecraft aerodynamic design

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

Large-scale and large amount of analysis are possible if necessary.

● **Achievements of the Year**

Mars Ascent Vehicle used in Mars Sample Return mission will be launched from the Mars environment with low Reynolds number and high Mach number, which are not found in the Earth environment. I calculated with Computational Fluid Dynamics to clarify how the difference in Reynolds number and Mach number affects the aerodynamic performance of the rocket flying to Mars. For each Mach number=0.5,1.0,1.5, no difference was found in the generation of shock waves due to the Reynolds number. On the other hand, it was found that the area of generating shock waves on the surface of the object was more wider   in the Mars environment compared with the Earth environment.
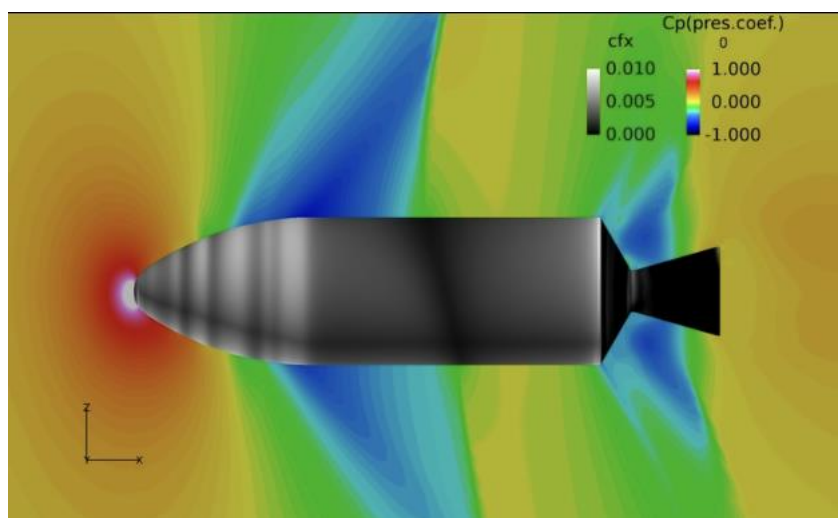
Fig. 1: The surface axial force coefficient distribution and the pressure
distribution at AoA=5 deg., Ma=0.95, and Re=300,000

● **Publications**

  N/A

● **Usage of JSS**

●   **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	Automatic Parallelization
Number of Processes	1 - 48
Elapsed Time per Case	3 Hour(s)

- **JSS3 Resources Used**

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

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage[*2](%)
TOKI-SORA	2,021.49	0.00
TOKI-ST	2,146.30	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	10.00	0.01
/data and /data2	30,720.00	0.24
/ssd	100.00	0.01

Archiver Resources		
Archiver 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.

- **ISV Software Licenses Used**

ISV Software Licenses Resources		
	ISV Software Licenses Used (Hours)	Fraction of Usage[2] (%)
ISV Software Licenses (Total)	86.40	0.06

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