

Study on understanding regolith scattering phenomena by thruster plume

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● Abstract

As observed during the touchdown of Hayabusa2 and OSIRIS-REx, regolith is scattered by thruster operation during takeoff on low-gravity objects. Understanding the phenomenon is important first because it will affect mission and spacecraft design for future space science and exploration. Microgravity experiments using a drop tower have been conducted for this study, but there are strong constraints on the duration of microgravity and the size of the experimental setup that can be used. Numerical calculations are therefore needed.

● Reasons and benefits of using JAXA Supercomputer System

A coupled CFD and DEM analysis is effective for understanding this phenomenon, but the cost of this calculation is generally significant. Therefore, a super computer such as JSS3 is important tool for this study.

● Achievements of the Year

The CFD-DEM analysis software, scFLOW, was tested. The license server was provided by ourselves and was referenced from JSS3 to run the analysis. A parallelization test analysis was also conducted using simple test analysis data to confirm the parallelization efficiency.

● Publications

N/A

● Usage of JSS

● Computational Information

| | |
|---------------------------------|-------------|
| Process Parallelization Methods | MPI |
| Thread Parallelization Methods | OpenMP |
| Number of Processes | 16 - 36 |
| Elapsed Time per Case | 5 Minute(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 | 2.93 | 0.00 |
| TOKI-ST | 271.99 | 0.00 |
| TOKI-GP | 0.00 | 0.00 |
| TOKI-XM | 0.00 | 0.00 |
| TOKI-LM | 0.00 | 0.00 |
| TOKI-TST | 864.02 | 0.02 |
| 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 | 50.00 | 0.05 |
| /data and /data2 | 250.00 | 0.00 |
| /ssd | 250.00 | 0.06 |

| 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) | 0.00 | 0.00 |

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