

Numerical calculation for electric propulsion

Report Number: R20EDU10500

Subject Category: Space and Astronautical Science

URL: <https://www.jss.jaxa.jp/en/ar/e2020/14333/>

● Responsible Representative

Kazutaka Nishiyama, Department of Space Flight Systems

● Contact Information

Kazutaka Nishiyama(nishiyama@ep.isas.jaxa.jp)

● Members

Yusuke Yamashita, Kazutaka Nishiyama, Takato Morishita

● Abstract

We analyze a neutralizer cathode plasma of the microwave discharge ion thruster, which is the main engine of the asteroid explorer Hayabusa and Hayabusa2.

We are conducting numerical analysis to investigate the degradation factors of the neutralizer in Hayabusa and develop the high-performance neutralizers for future missions.

● Reasons and benefits of using JAXA Supercomputer System

In general, the numerical calculation of plasma has a high calculation cost.

We conduct research efficiently with the JAXA supercomputer, which has one of the best calculation performance in Japan.

● Achievements of the Year

We analyzed the neutral particle flow inside the discharge chamber of a microwave discharge neutralizer. We investigated the distribution of neutral particle density in the discharge chamber by the DSMC method (Fig. 1). We designed a calculation model of the neutralizer of the Hayabusa2 flight model.

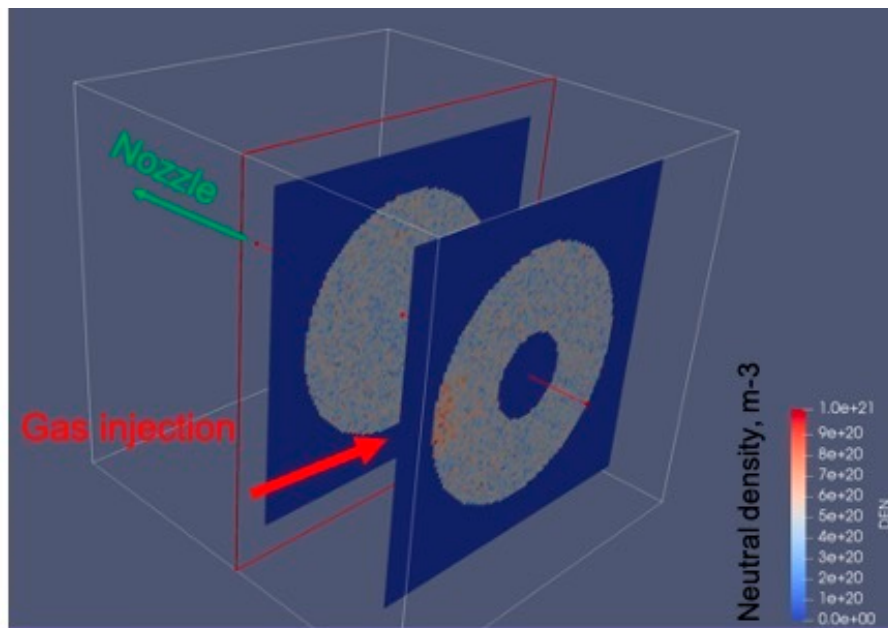


Fig. 1: Neutral particle density distribution in the discharge chamber

- **Publications**

N/A

- **Usage of JSS**

- **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	OpenMP
Number of Processes	2 - 12
Elapsed Time per Case	6 Hour(s)

- **Resources Used(JSS2)**

Fraction of Usage in Total Resources*1(%): 0.01

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
SORA-MA	9,060.69	0.00
SORA-PP	2,877.42	0.02
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	246.37	0.23
/data	4,962.29	0.10
/ltmp	2,604.17	0.22

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.

- **Resources Used(JSS3)**

Fraction of Usage in Total Resources*1(%): 0.01

Details

Computational Resources		
System Name	Amount of Core Time (core x hours)	Fraction of Usage*2(%)
TOKI-SORA	0.00	0.00
TOKI-RURI	0.00	0.00
TOKI-TRURI	0.00	0.00

File System Resources		
File System Name	Storage Assigned (GiB)	Fraction of Usage*2(%)
/home	491.14	0.34
/data	9,908.68	0.17
/ssd	238.42	0.12

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.