

Production of the Hapke parameter maps and the multi-band color mosaic of lunar polar regions

Report Number: R22EB0101

Subject Category: Space Exploration

URL: <https://www.jss.jaxa.jp/en/ar/e2022/20772/>

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● Abstract

Using existing multiband image data, we calculate the Hapke parameter map for the lunar polar region (over 60 degrees in latitude for both north and south poles) and use it to calculate the photometrically normalized color mosaic maps. These data products are necessary to study landing sites and route plannings for JAXA's up coming lunar polar missions.

Ref. URL: https://jlpeda.jaxa.jp/index_e.html

● Reasons and benefits of using JAXA Supercomputer System

To process large amounts of planetary remote-sensing data ranging from terabytes to petabytes and to obtain high-resolution results in a relatively short time scale, a parallel computer with a very large number of cores, such as JSS3, is very effective.

● Achievements of the Year

A color mosaic map of the north and south polar regions of the Moon was created using data from the Wide Angle Camera (WAC) onboard NASA's Lunar Reconnaissance Orbiter (LRO) and the Multi-Band Imager onboard JAXA's lunar explorer SELENE. With the topographic data in higher precision and resolution, improvement of calculation algorithm of the Hapke parameter, and precise removal of shadow regions by ray tracing calculations, we succeeded in creating a product with fewer false colors and higher precision than ever before. Based on the new high-resolution polar maps, space weathering and iron content maps have been produced, contributing to our understanding of the latitudinal dependence of space weathering and crustal growth mechanisms on the Moon.

● **Publications**

- Oral Presentations

Sato H., WAC Polar Product Updates, LROC science team meeting, Oct. 18, 2022.

- Poster Presentations

Sato H., Ohtake M., Latitudinal trend of the lunar south pole, 54th Lunar Planet. Sci. Conf., Abst #1824, 2023.

● **Usage of JSS**

● **Computational Information**

Process Parallelization Methods	MPI
Thread Parallelization Methods	Manual parallelization by own script
Number of Processes	12 - 36
Elapsed Time per Case	1 Hour(s)

● **JSS3 Resources Used**

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

Details

Computational Resources		
System Name	CPU Resources Used (core x hours)	Fraction of Usage *2(%)
TOKI-SORA	0.00	0.00
TOKI-ST	72,395.40	0.07
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	212.37	0.19
/data and /data2	59,885.15	0.46
/ssd	30,848.33	4.27

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.