

Lunar scientific database of Chinese Chang’e missions

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Abstract

This paper describes a lunar scientific facility constructed under the Chang’e-1, Chang’e-2 and Chang’e-3 lunar exploration missions, which acting as an import supplement to the world lunar exploration data source. The dataflow, data types and data retrieve of the database are also introduced.

1. Introduction

Scientific exploration data is the critical footstone of planetary science research. Since its launch of Chinese Lunar Exploration Program (CLEP) in 2007, China successfully carried out the Chang’e-1, Chang’e-2 and Chang’e-3 missions to the Moon, and acquired abundant lunar exploration data. By constructing the lunar scientific database infrastructure (<http://moon.bao.ac.cn>), the Ground Research and Application System (GRAS) of CLEP made a progressive provision of its lunar exploration data to planetary science community, being an import supplement to the world lunar exploration data source.

2. Data flow of the database

Unlike the geographically distributed nature of the NASA’s planetary data system, all procedures of data processing, archiving, management and distribution are proceeded in the headquarter of GRAS in a centralized manner. As seen in Figure 1, the RAW data transferred by Operation Management Subsystem (OMS) and all PDS-compliant Level 0 to Level 2 data products generated by data preprocessing subsystem (DPS) are all forwarded to Data Management Subsystem (DMS) for centralized archiving and management in a scheduled task. After a strict validation for PDS compliance and quality inspection, the qualified lunar scientific data will be pushed to the lunar scientific database to public.

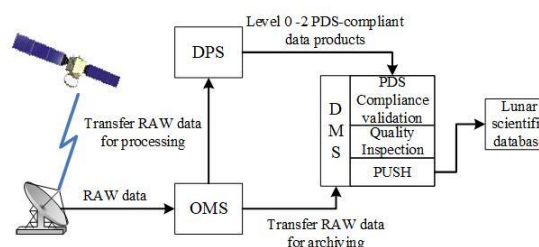


Figure 1: The data flow of lunar scientific database.

3. Data types

The lunar scientific database host main scientific data products from CE-1, CE-2 and CE-3, the data volume from each mission can be seen in Table 1.

Table 1: Data volume of each mission

Mission	Volume (GB)
CE-1	1009.63
CE-2	4352.34
CE-3	2004.12

In terms of data type, the image data, element abundant data, multispectral image data, microwave radiation brightness temperature data, and lunar space environment data of CE-1 and CE-2 can be retrieved from the database [1]. As to CE-3 mission, data products derived from all the 8 payloads [2] are included, as seen in Table 2.

Table 2: Data type and its volume of CE-3

Payload	Data Level	Volume (GB)
PCAM	2A, 2B, 2C	10.03
PIXS	2A, 2B	0.09
VNIS	2A, 2B	0.34
LPR	2A, 2B, 2C	1.81
LCAM	2A, 2B	9.57
TCAM	2A, 2B, 2C	13.28

EUVC	2A, 2B	0.036
MUVT	2A, 2B	1968.96

4. Data retrieve

We provide three granularity of data retrieve:

(1) For specific data files. users can search by mission, payload, data level/type and date range to retrieve specific data files and download them directly; (2) For plenty of data files within specific range, considering the inconvenience of http-based download of multi-files, the database will generate a text file include all data files' download links to be used in some download tools. (3) For the complete dataset, the database provides the corresponding dataset volume to get in bulk. Also, a WebGIS-based interactive interface is provided for browsing the lunar map, mineral spectral data, localized gazetteer, and navigation points of Yutu rover.

5. Future works

Future works of lunar scientific database is concentrated on 3 aspects: 1) progressively incorporate data products from the upcoming CE-4 and CE-5, and the planned Mars Exploration mission of China; 2) Improve the map-based data retrieve function; 3) Adopt the Planetary Data Access Protocol for inter-institute data exchange and interoperability.

References

[1] Zuo, W., Li, C.L., and Zhang, Z.B.: Scientific data and their release of Chang'E-1 and Chang'E-2, *Chin. J. Geochem*, Vol. 33, pp. 24-44, 2014.

[2] Tan, X. et al.: Scientific data products and the data pre-processing subsystem of the Chang'e-3 mission, *RAA (Research in Astronomy and Astrophysics)*, Vol. 14 (12), pp. 1682-1694, 2014.