

## Chandrayaan-2 Orbiter Data Explorer and Visualization - A Webbased Application for Accessing Imaging Payload PDS Datasets

K Suresh, Ajay Kumar Prashar, Amitabh, High Resolution Data Processing Division, Signal and Image Processing Group, Space Applications Centre (ISRO), Ahmedabad-380058 (India);

[ksuresh@sac.isro.gov.in](mailto:ksuresh@sac.isro.gov.in)

**Introduction:** The India's second mission to moon Chandrayaan-2 was launched on 22 July 2019 and reached moon's orbit on 20 August 2019. Terrain Mapping Camera-2 (TMC-2), Imaging InfraRed Spectrometer (IIRS), Orbiter High Resolution Camera (OHRC) and Dual Frequency SAR (DF-SAR) are 04 of the 08 payloads onboard Chandrayaan-2 orbiter, which are imaging payloads. The objective of this paper is to (i) bring-out the functionalities and key features of the data browse web application, (ii) list of product types available for users to download and (iii) accuracy of the each product types. Chandrayaan-2 Orbiter instrument data are archived in PDS4 standard and are organized by PDS4 product types, which are raw, calibrated and derived products. Each PDS product is a collection of instrument data, ancillary information with supporting documents.

**Key Features and Functionalities:** The key features of Chandrayaan-2 Orbiter Data Explorer and Visualization (<https://ch2browse.issdc.gov.in>) are map-based and form based search across multiple instruments, visualization of instrument foot prints, PDS product meta data and browse image visualization, and changing map projection to equi-rectangular, north and south polar stereographic projection. It also supports area of interest based search based-on user provided coordinates with filtering of PDS product types. User has the option of downloading individual products or bundling multiple products together. It has graticule grid and geological features as overlays for each projection supported in the application. The following figure-1 shows the welcome page from which users are required to register or login using existing user account at ISSDC server.

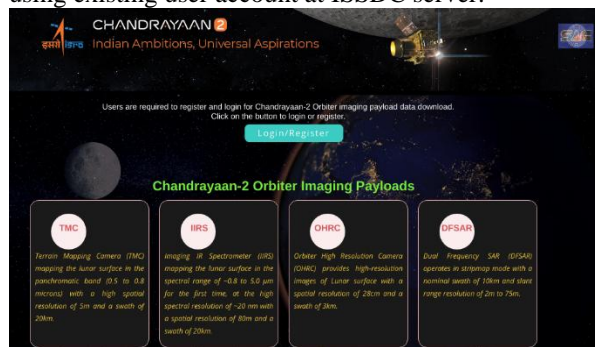


Figure-1: Data Browse Welcome Page

For browsing and downloading data from Chandrayaan-2 instruments, user required to have valid login credentials and the existing account holder of ISSDC can use

the same credentials for login without the need of registering again. The following figure-2 shows the Selene Terrain camera equatorial mosaic as base map with graticule overlay.

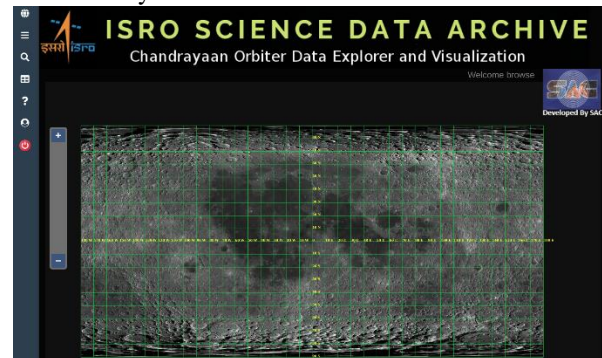


Figure-2: Equatorial base map with Graticule Overlay

Each instrument footprint can be overlaid as separate layers and user will be able to probe desired instrument footprint, view its metadata, visualize browse chip and has the option to download the dataset as shown in following figure-3. The probed footprint is highlighted in red colour.



Figure-3: Instrument Footprint Overlay with Probe Feature

The following figure-4 shows the North pole base map mosaic from LRO WAC instrument with graticule layer overlay. North pole mosaic is from 60°N to 90°N.

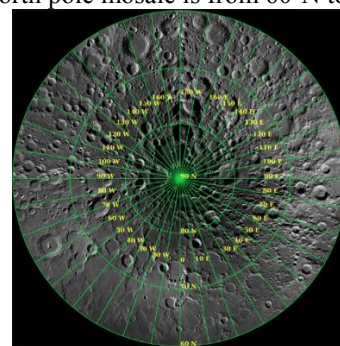


Figure-4 North Pole Mosaic base map with Graticule Overlay

The following figure-5 shows the South pole base map mosaic from LRO WAC instrument with graticule layer and IIRS instrument footprint overlay. South pole mosaic is from 60°S to 90°S.

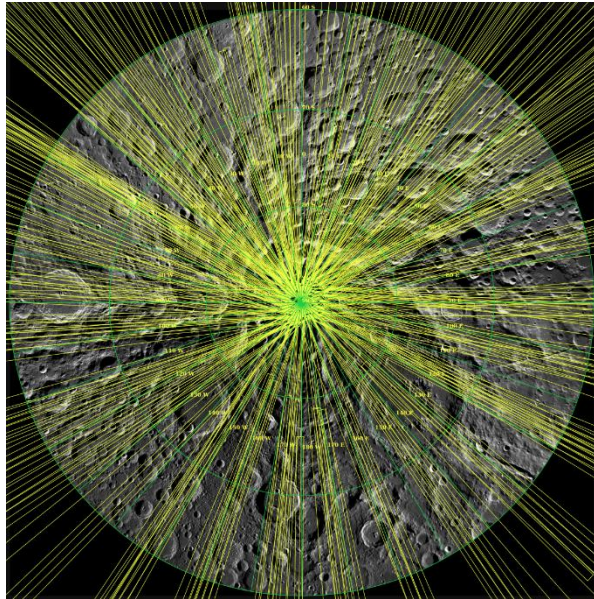


Figure-5 South Pole Mosaic base map with IIRS Overlay

Instrument footprints on north and south pole base map will be overlaid using polar stereographic projection, however user will be able to perform AOI based search using Seleno-graphic coordinates. The following figure-6 shows the form based data products search.

Step-1: Select Instrument(Required)

- ☒ TMC 2
- ☐ OHRC
- ☐ IIRS
- ☐ SAR

Step-2: Select PDS Product Type(Required)

- ☒ Raw
- ☐ Calibrated
- ☐ Derived DTM
- ☐ Derived Ortho

Step-3: Select Area of Interest(Required)

Min Lat: (-90 to 90)

Min Lon: (-180 to 180)      Max Lon: (-180 to 180)

Max Lat: (-90 to 90)

Step-4: Observation Date Range(Optional)

Observation start date: mm/dd/yyyy ☐

Observation end date: mm/dd/yyyy ☐

(OR)

Search by PDS Product ID

PDS Data Product has a unique product id, which can be found with an exact match by inputting product id. e.g.  
ch2\_tmc\_ncn\_20200207T0716469418\_d\_img\_d18

PDS Product Id: \_\_\_\_\_

Figure-6 Form based Search Tool

By following easy four steps user will be able to perform data products search across multiple instruments and product types. Steps 1 to 3 is mandatory selection and area of interest based search is restricted to 5° by 5°. User will also be able to retrieve his earlier downloaded product by using PDS product.

#### Data Products Available for Download:

The following table-1 shows the type of data products available from each instrument. Datasets acquired from 2019 to 2022 are available for download.

Table-1 List of Data Products

| S. No. | Instrument | RAW | Calibrated | Derived |
|--------|------------|-----|------------|---------|
| 1.     | TMC        | √   | √          | √       |
| 2.     | IIRS       | √   | √          | X       |
| 3.     | OHRC       | √   | √          | X       |
| 4.     | DFSAR      | √   | √          | X       |

The RAW data products are corrected for transmission losses and seleno-tagged. The seleno-tagged coordinates are using system level knowledge which may be inaccurate with the max mean position error of 2.4km. The Calibrated products are with radiometric correction along with seleno-tagged coordinates corrected using Lunar Control Point, which will bring down the max mean position error to <200m. The Derived products for TMC instrument are DEM and Ortho images with a best positional accuracy of <100m and height accuracy of <50m. However, there are cases where control point couldn't be identified reliably due to illumination differences lead to position error of ~1km and height error of ~100m.

**Help and Support:** For each instrument, PDS4 DPSIS document, detailed user guide and supporting tools are provided for user to download. At each tool option in the browse application has brief usage help to navigate. At application startup, user will be provided with guided application tour for briefly introducing each tool and menu options.

**Future Work:** The data products available for browse and download are from Chandrayaan-2 mission with PDS4 standard. The data products from Chandrayaan-1 mission are in PDS3 standard and efforts are put to migrate Chandrayaan-1 datasets from PDS3 to 4 and will be integrated as part this web application. Currently search by geological features like crater names are not supported and will be developed in due course. SPICE archive download also will be integrated as part of payload data download for easy usage by users. User search and download history will be added for reviewing already downloaded products.