SELENE data archive and open to public

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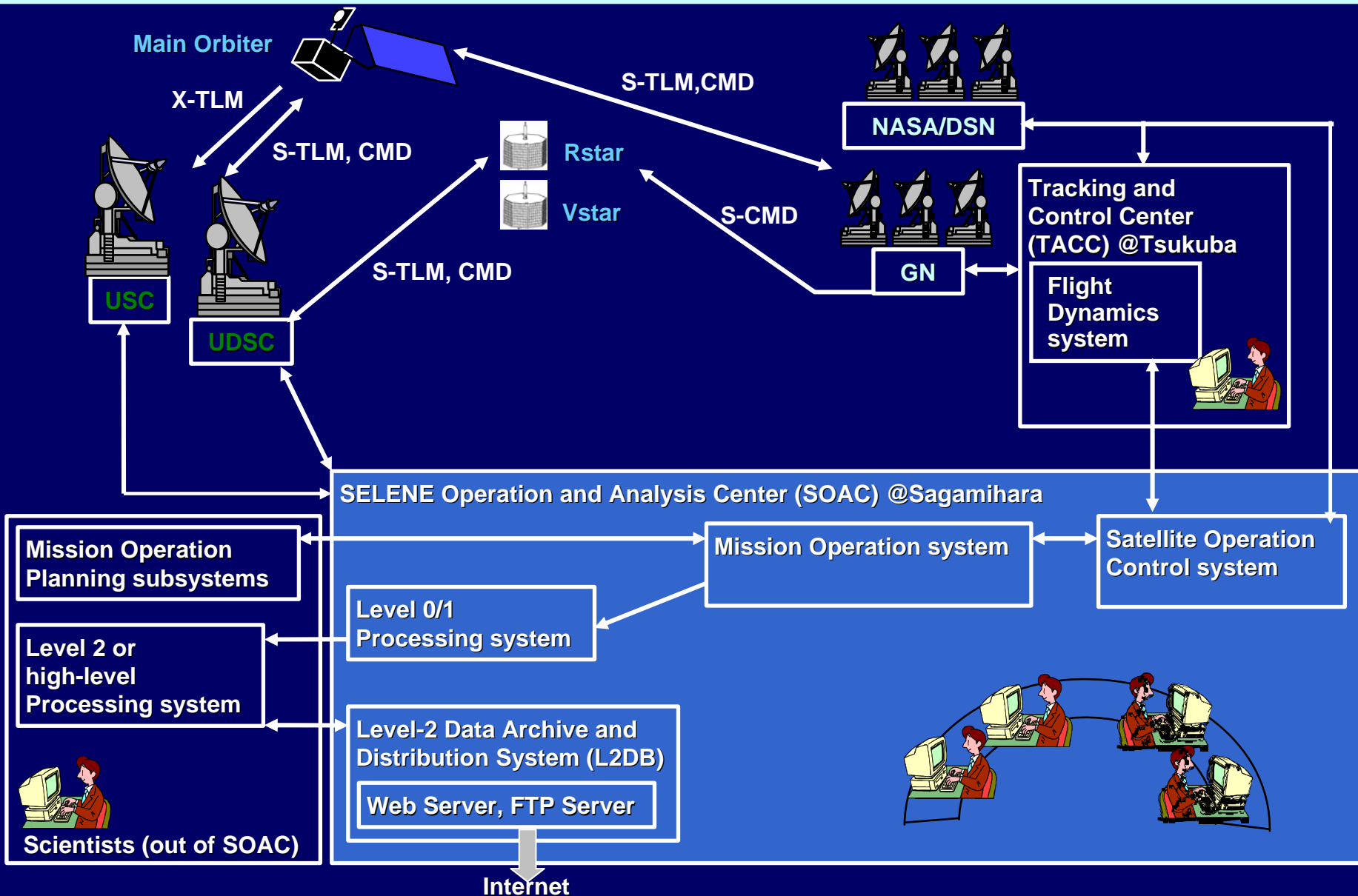+NS Solutions Corporation (NS-SOL)

[SELENE data archive and open to public]

1. Overview of the SELENE Ground System

2. SELENE Data Products, Format and open to public

3. Summary

[Contribution of SELENE data for the Exploration]

1. Overview of the SELENE Ground System

Usuda Deep Space Center (UDSC)

Uchinoura Space Center (USC)

(Sagamihara, SOAC)

(Tsukuba)
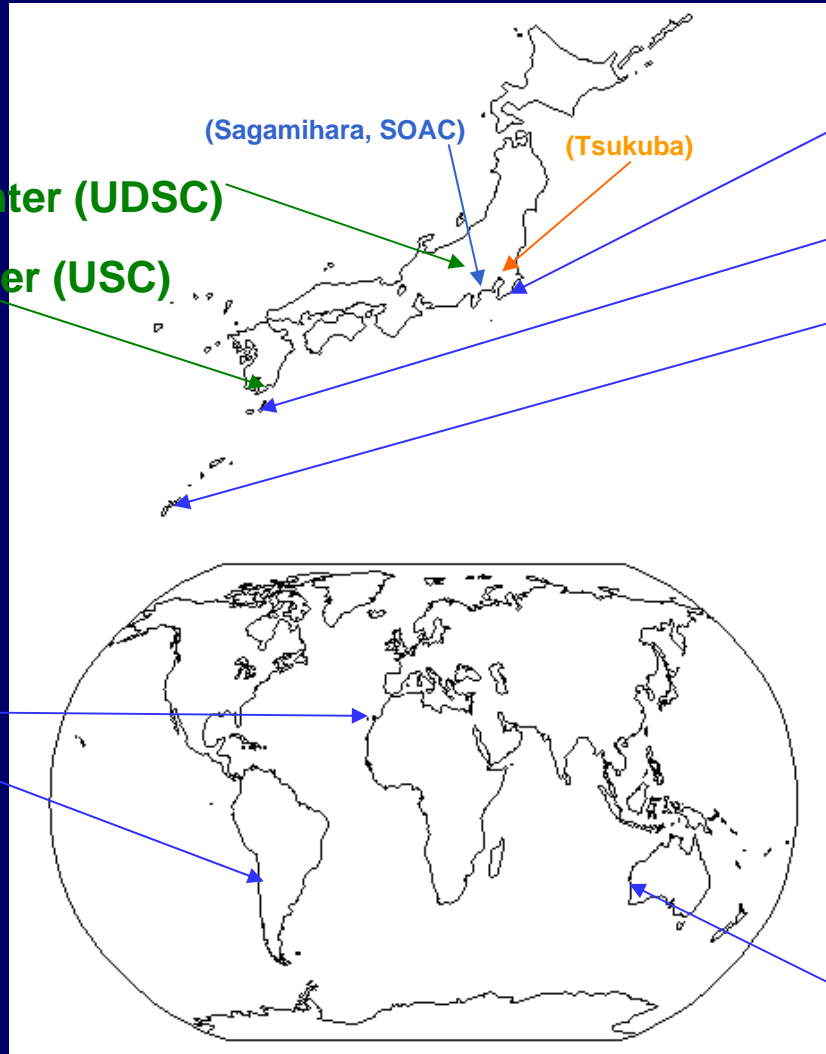
Katsuura

Masuda

Okinawa

Maspalomas
Santiago

Perth

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•Data processing level

Level	outline	format
0	RAW telemetry (VCDU extracted and separated by VCID)	VCDU
1	RAW data (packets depacketized by APID allotted to each instrument and simply calibrated data such as HK data)	CCSDS packet or Any
2	Standard calibrated data, high-level processed data	PDS-like*

*not fully compatible with PDS

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L0 / L1

Catalog info

Catalog Database

Search and Order

Users

PDS-like label

Data

Data Storage

L2 L2 L2

Data

L2DB

Catalog info is different from catalog attribute with value in PDS-like label.

•IMAGE, TABLE, SERIES; PDS objects

•STP (Solar-Terrestrial Physics) data; CDF (Common Data Format)
    ➤to keep a compatibility with other satellite data

•Descriptions of data format and technical information in Japanese and English will be prepared.
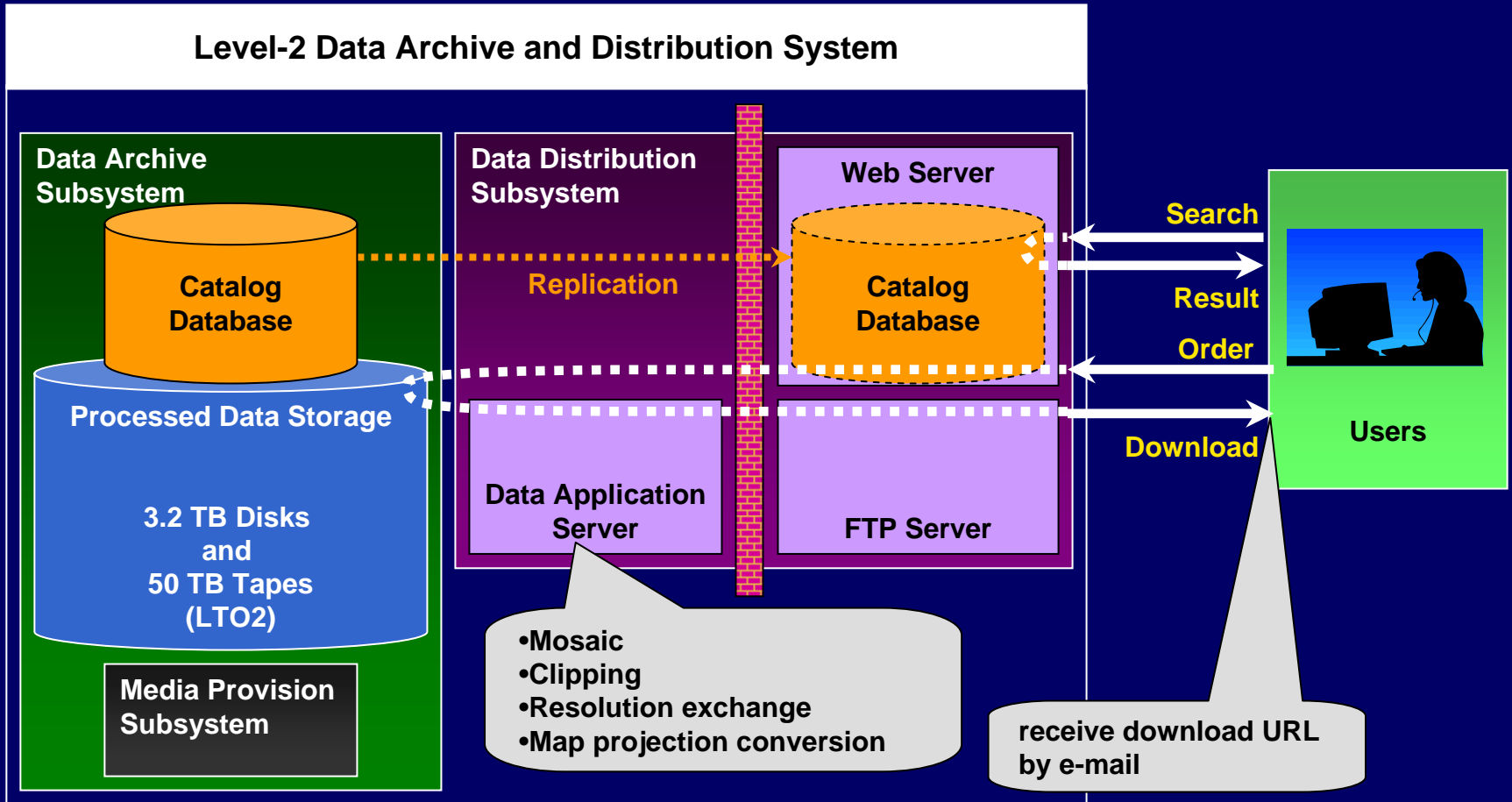
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- SELENE label; PDS-like label
  - ➢ Text file
  - ➢ Described in Object Definition Language (ODL)

- There are some differences in SELENE label from PDS label as below but the data can be understood by the descriptions of data format and technical information (such as descriptions involved in "VOLINFO.TXT" (data) and "CALINFO.TXT" (calibration)).

  - ➢ referred to "PDS Standards Reference" Ver.3.5 (not the latest Ver.3.7)

  - ➢ Required PDS label elements are not fully included.
    - e.g. PRODUCT_ID, INSTRUMENT_HOST_NAME etc.

  - ➢ Some unique words which are not registered into "PDS Data Dictionary" are adopted in SELENE PDS label to improve data accessibility.
    - e.g. ILLUMINATION_CONDITION etc.

Level-2 Data Archive and Distribution System

Data Archive Subsystem

Catalog Database

Processed Data Storage

3.2 TB Disks and 50 TB Tapes (LTO2)

Media Provision Subsystem

Data Distribution Subsystem

Replication

Web Server

Catalog Database

Data Application Server

FTP Server

•Mosaic
•Clipping
•Resolution exchange
•Map projection conversion

Search

Result

Order

Download

Users

receive download URL by e-mail

- SELENE Level-2 processed data will be archived in "Level-2 Data Archive and Distribution System" (L2DB) at SOAC.

- RAW data are not archived into L2DB.

- Users can
  - Search and Download Level-2 processed data via Web browser.

- SELENE data will be open to public through the internet
  - 1 year after the nominal mission phase
    (about 2 years after the SELENE launch).
  - The Web site will be linked to the SELENE HP. (under construction)

| Instrument name |
| Processing level; Standard or Higher-level |
| Product name |
| Date and Time |
| Area of the Moon surface; Latitude, Longitude |
| Version; 2 version (CURRENT and PREVIOUS*) *except LISM |
| other parameters |

Data Search

Basic Search Condition

Product

Product Selection

LISM/L2A/M-NIR_Level2A
LISM/L2A/M-NIR_SPsupport_Level2A
LISM/L2A/M-VIS_Level2A
LISM/L2A/M-VIS_SPsupport_Level2A
LISM/L2A/SP_Level2A
LISM/L2A/TC_SPsupport_Level2A

Product Deletion   Product Explanation

Time Range (UT)

Data Range: 2005/03/02 00:00:00 – 2012/12/28 04:00:00

YYYY / MM / DD   hh : mm : ss.sss

Start   /   /   :   :

End   /   /   :   :

Observation Range

Data Range: SN-90.0/90.0 WE:0.0/360.0 (deg)

North

West   Degree   East

            Degree   Setup Observation Range   Degree

            Degree

South

Location Flag ALL

Version   CURRENT

Search Options

Sort Key   File Name   ● Ascending ○ Descending

Number of Display   10

Setup of Advanced Search Options   Advanced Search Options

Search Execution   Reset

2. SELENE Data Products, Format and open to public
-- open to public --

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- SELENE data
  - ➢ are used for studying "lunar origin and evolution" and "exploration" of the Moon.

  - ➢ will be archived in PDS-like format with the descriptions of data format and technical information.

  - ➢ will be released 1 year after the nominal mission phase.

• The following SELENE Data Products will be used for the lunar exploration.

(1) Maps of water ice

(2) Maps of permanent polar shadow/sunshine areas

(3) Polar DEM

(4) Maps of surface composition (ex. ilmenite-rich region)

- Hydrogen will be detected by GRS (Gamma-Ray Spectrometer).
  - Hydrogen existence is higher than 0.1 [wt %] within 10 cm in depth
    - more than 10 hours of accumulation time

	Product name
GRS	Gamma Ray Intensity Map (H)
	Nuclide Map (H)

[GRS]
- Spatial resolution: ~120 km
- 0.1 - 12 MeV
- Energy resolution:
  3 keV @ 1.33 MeV

Direct evidence of hydrogen

Al (2210.4[keV])
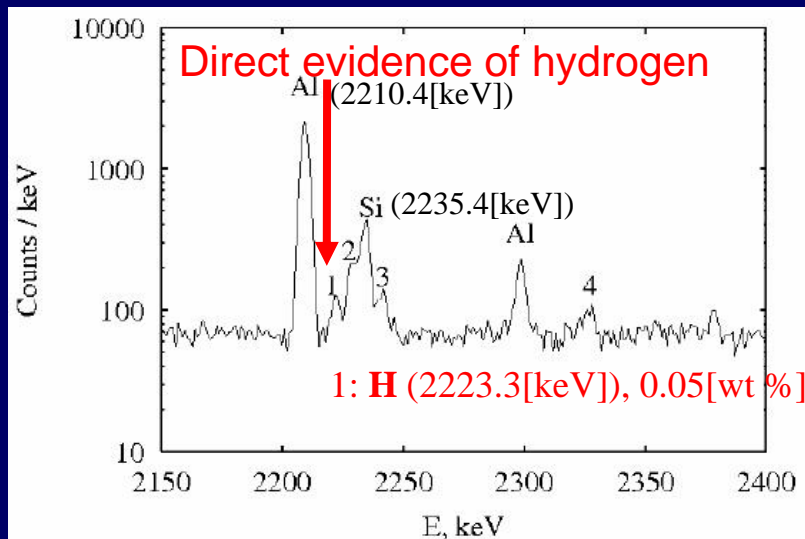
Si (2235.4[keV])

Al

1: H (2223.3[keV]), 0.05[wt %]

Figure : Expected energy resolution of SELENE GRS by numerical simulation [6]. No.1 show H peak, No.2 for S and single peak of O and No.3 for Mg.

GRS

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M. -N. Kobayashi *et al.*, *LPS XXXIV*, **#2092**, 2005.

# (2) Maps of permanent polar shadow/sunshine areas

•TC (Terrain Camera) will identify the permanent shadow/sunshine areas around the polar region by monitoring the seasonal illuminated variation of the lunar surface in the condition of low solar elevation angle (morning, evening) and single-eyed observation.

	Contents of products
TC	TC (morning, evening) reflectance map at the low solar elevation angle (single-eyed observation)

[TC]
•B/H ~ 0.57
•Spatial resolution: 10 m/pixel @100 km

TC

(inside part)
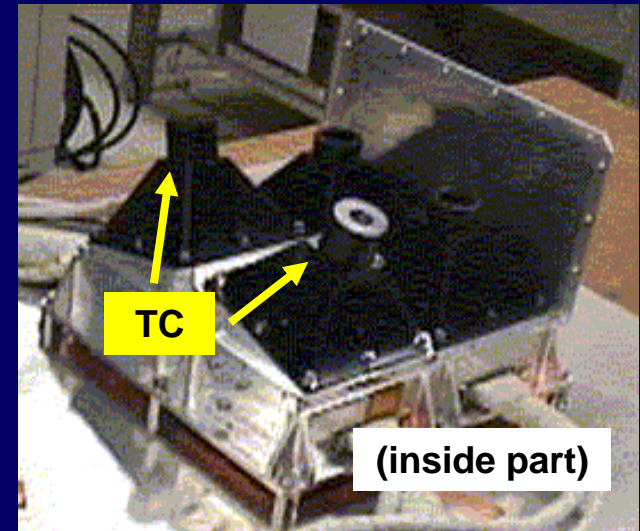
(3) Polar DEM (Digital Elevation Model)

- Polar DEM will be produced by processing TC stereoscopic data.

- "Grid Topographic Data and Topographic Image of the Lunar North/South Pole" will be made by LALT (Laser ALTimeter) data.
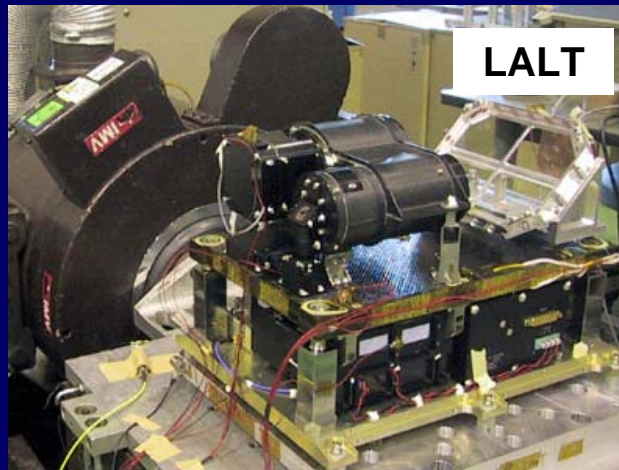
	Contents of Products
TC	TC stereoscopic vision data
LALT	Grid Topographic Data of the Lunar North/South Pole (5 degrees in radius)
LALT	Topographic Image of the Lunar North/South Pole (5 degrees in radius)

[TC]
- Height resolution: 20 - 30 m

[LALT]
- frequency: 1 Hz
- Spatial resolution: 1600 m
- range accuracy: 5 m (nadir)
- footprint: 30 m

LALT

(4) Maps of surface composition (ilmenite-rich region)

• Ilmenite-rich region will be identified from the data set of Fe and Ti.

> $FeTiO_3$ is one of the candidates for oxygen production using H_2, F_2, CH_4, etc.

	Contents of Products
XRS	Fe map (except polar regions) [wt %]
XRS	Fe/Si ratio
GRS	global map of gamma ray intensity for Fe, Ti
GRS	global map of the relative abundance for Fe, Ti
MI	VIS Reflectance map
MI	NIR Reflectance map

Ilmenite map will be produced by integrating these MI products.

[XRS]

• Spatial resolution: 20 km

• 0.7 - 8 keV

• Energy resolution:

140 eV @ Al - K

[MI]

<VIS> 415, 750, 900, 950, 1000 nm (Si-CCD)

• Spatial resolution: 20 m/pixel

<NIR> 1000, 1050, 1250, 1550 nm (InGaAs)

• Spatial resolution: 62 m/pixel

XRS