



Chang'e-3's Progress and Achievement

2/2014



Main content

1. Chinese Lunar Exploration Program
2. Chang'e-3's Progress
3. Chang'e-3's Achievement



Chinese Lunar Exploration Program

Phase I Orbital missions



2007
Chang'e-1



Phase III: Sample return



2017
Chang'e-5

2019
Chang'e-6



07 08 09 10 11 12 13 14 15 16 17 18 19 年

2010
Chang'e-2



2013
Chang'e-3



2016
Chang'e-4



Phase II Soft landers/rovers

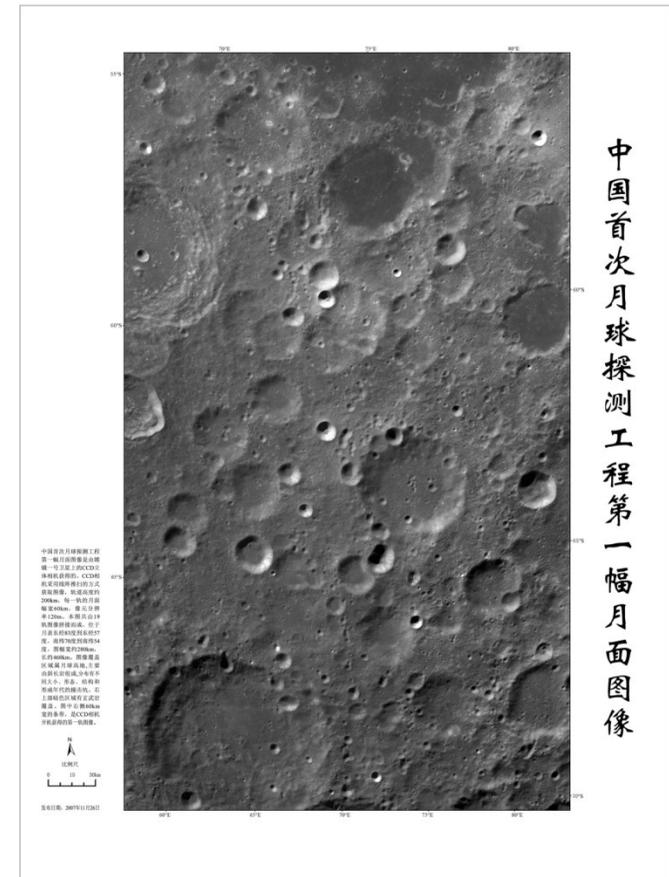
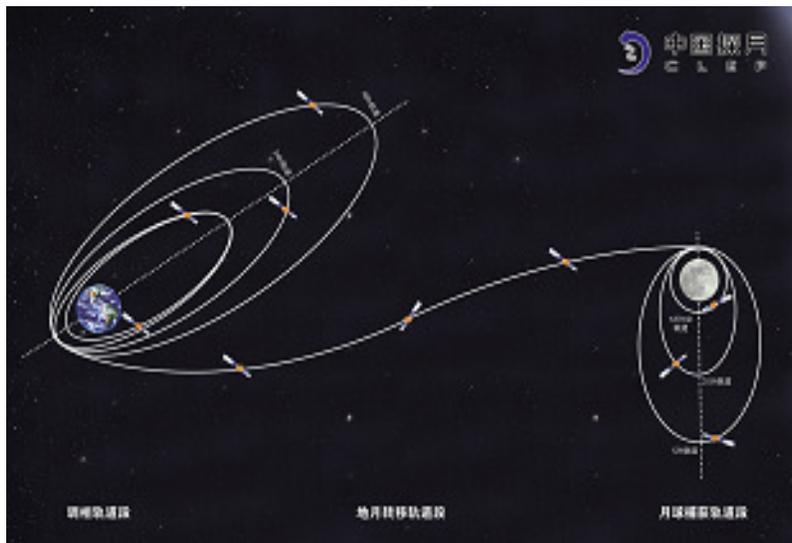


Chinese Lunar Exploration Program

Chang'e-1

Chang'e-1 was launched on 24/10/2007, scanned the Moon and generated a high definition 3D map. The probe also mapped the abundance and distribution of various chemical elements on the lunar.

The spacecraft operated until 1 March 2009, when it was intentionally crashed into the surface of the Moon.

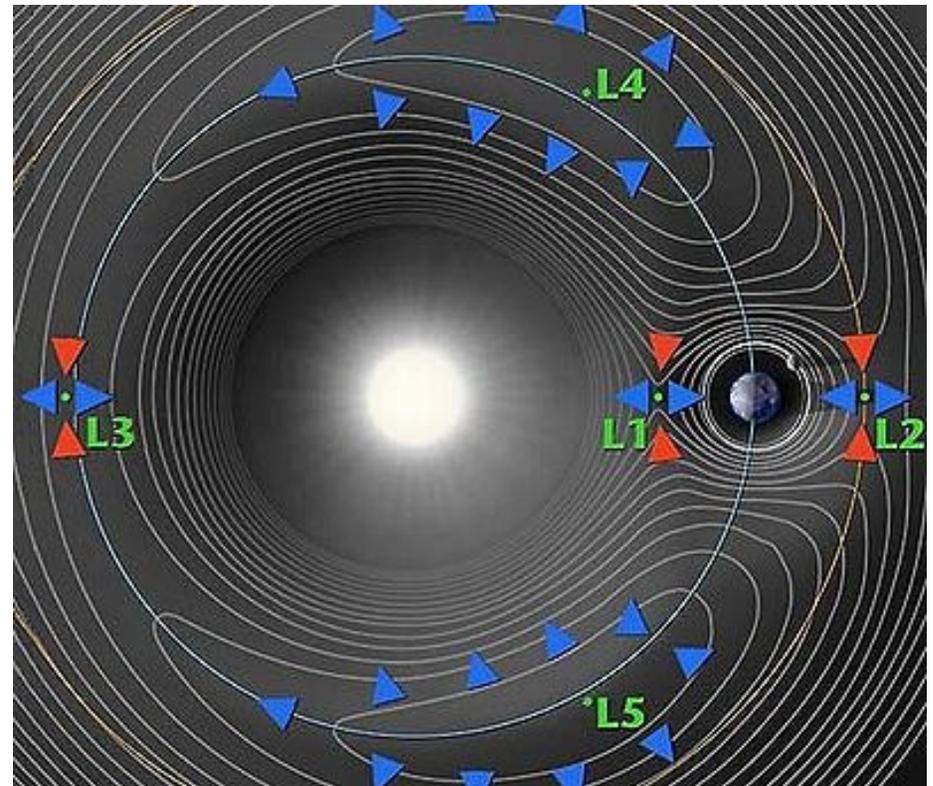
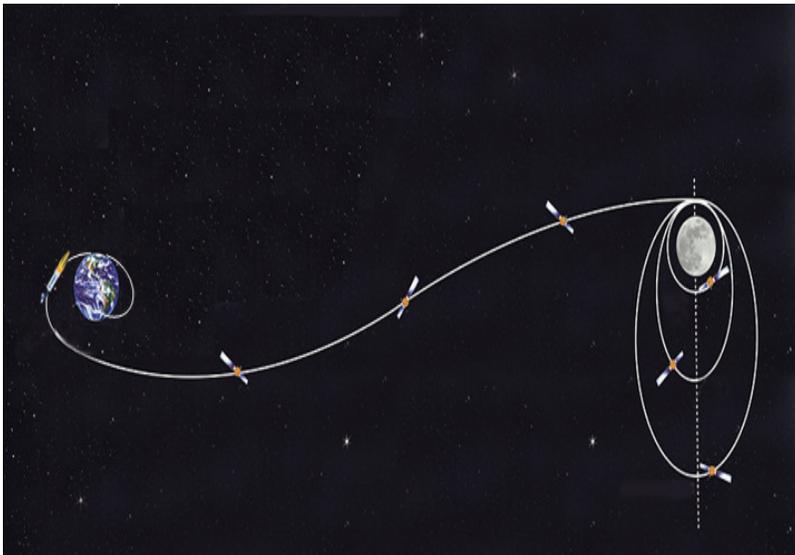




Chinese Lunar Exploration Program

Chang'e-2

Chang'e-2 was launched on 1/10/2010. On 25/8/2011, It left lunar orbit and headed for the Earth–Sun L2 Lagrangian point in order to test the TT&C network.





Chinese Lunar Exploration Program

Chang'e-2

It completed a flyby of asteroid 4179 Toutatis on 13/12/2012, and obtained Optical image. Now, it is heading into deep space over 65 million kilometers.





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3. Chang'e-3's Achievement



Chang'e-3's Progress

Chang'e-3 was launched on 2/12/2013 aboard a Long March 3B rocket, successfully landed on the Moon on 14/12/2013.

It carried with it a 140 kg lunar rover named Yutu, which is designed to explore an area of 3 square kilometres.

Chang'e-3 mission objective is to achieve China's first soft-landing and roving exploration on the Moon.



Chang'e-3's Progress

Important event

•Launch

Chang'e-3 was launched at 17:30 UTC on 1 December 2013 (01:30 local time on 2 December) aboard a Long March 3B rocket

•lunar orbit

Chang'e-3 entered a 100 km-high circular lunar orbit on 6 December 2013.

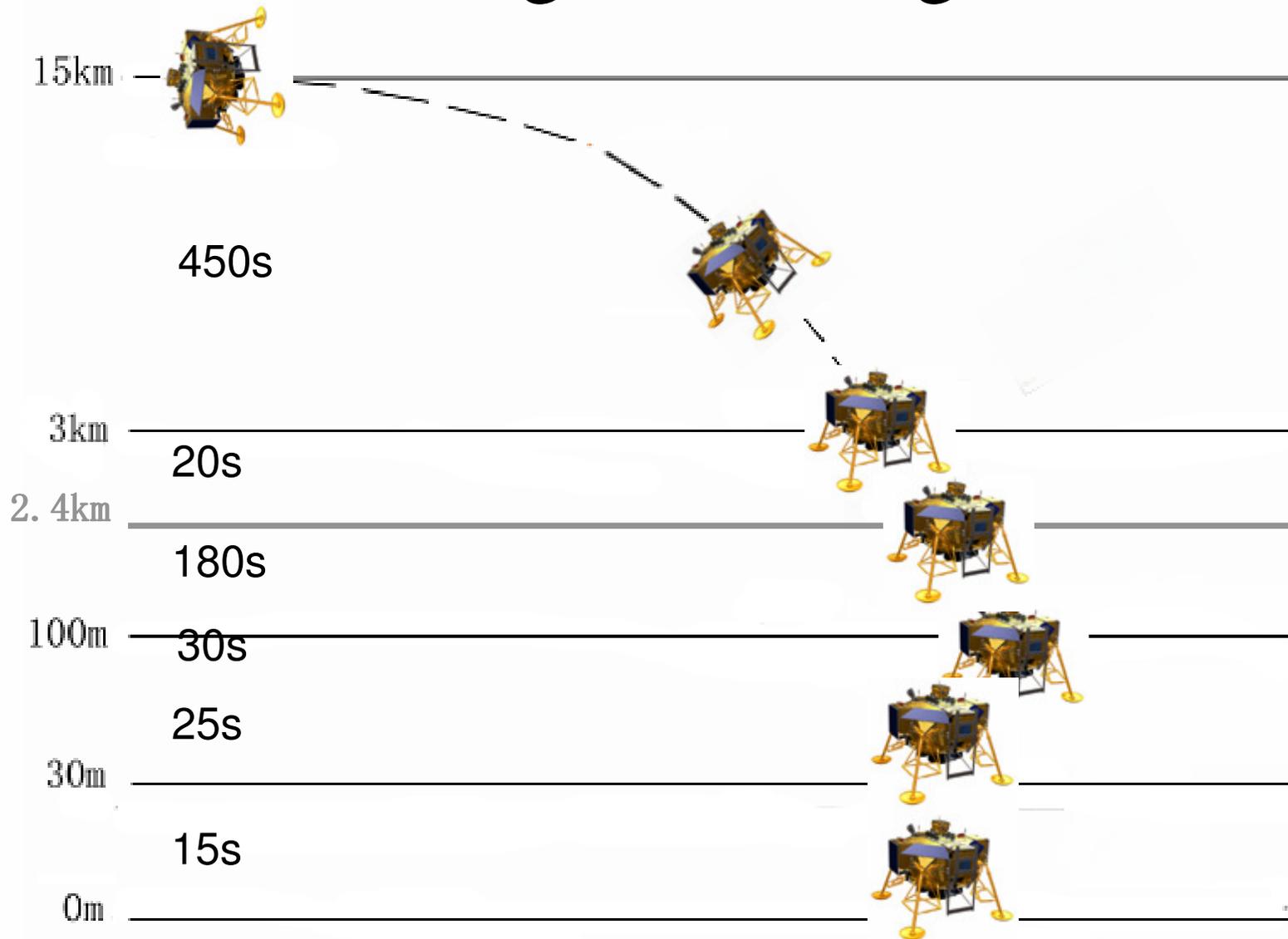
The spacecraft entered a 15 km \times 100 km elliptic orbit on 10 December 2013.

•Landing

The landing took place at periapsis on 14 December. The landing sequence took about 12 minutes to complete.



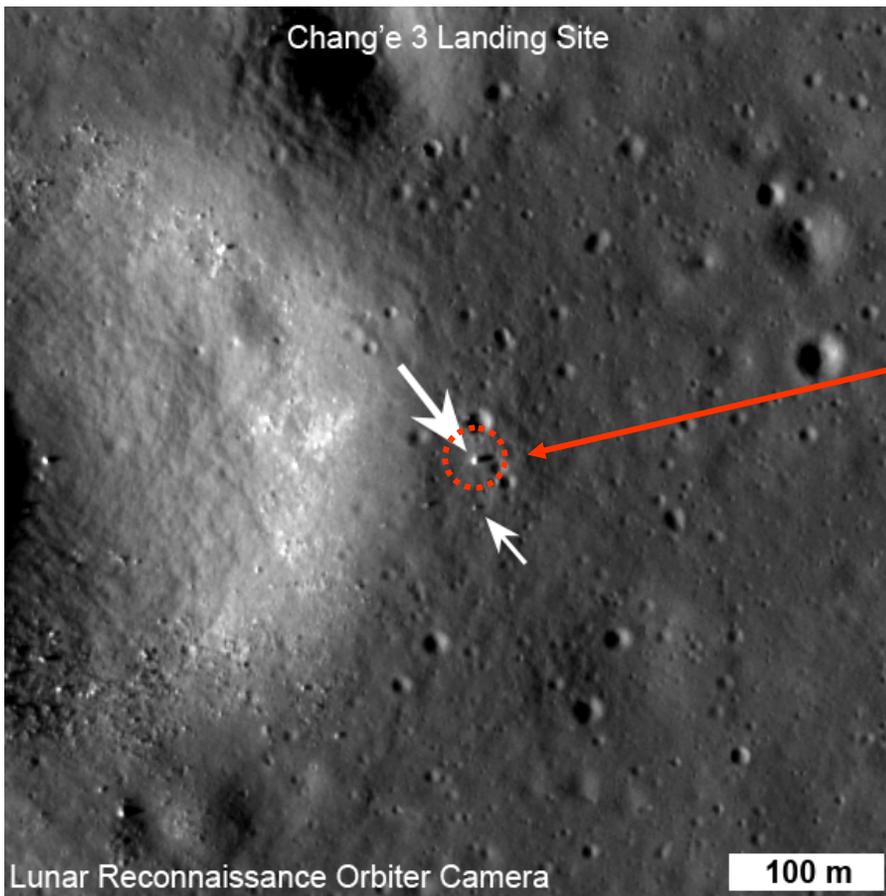
Chang'e-3's Progress





Chang'e-3's Progress

The landing site: $N44.12^{\circ}$, $W19.51^{\circ}$





Chang'e-3's Progress

Important event

- separate

lunar rover move to the moon surface from the lander on 15/12/2013.



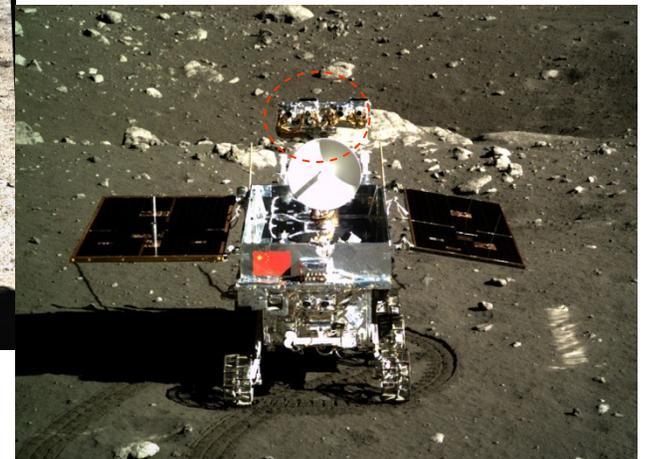
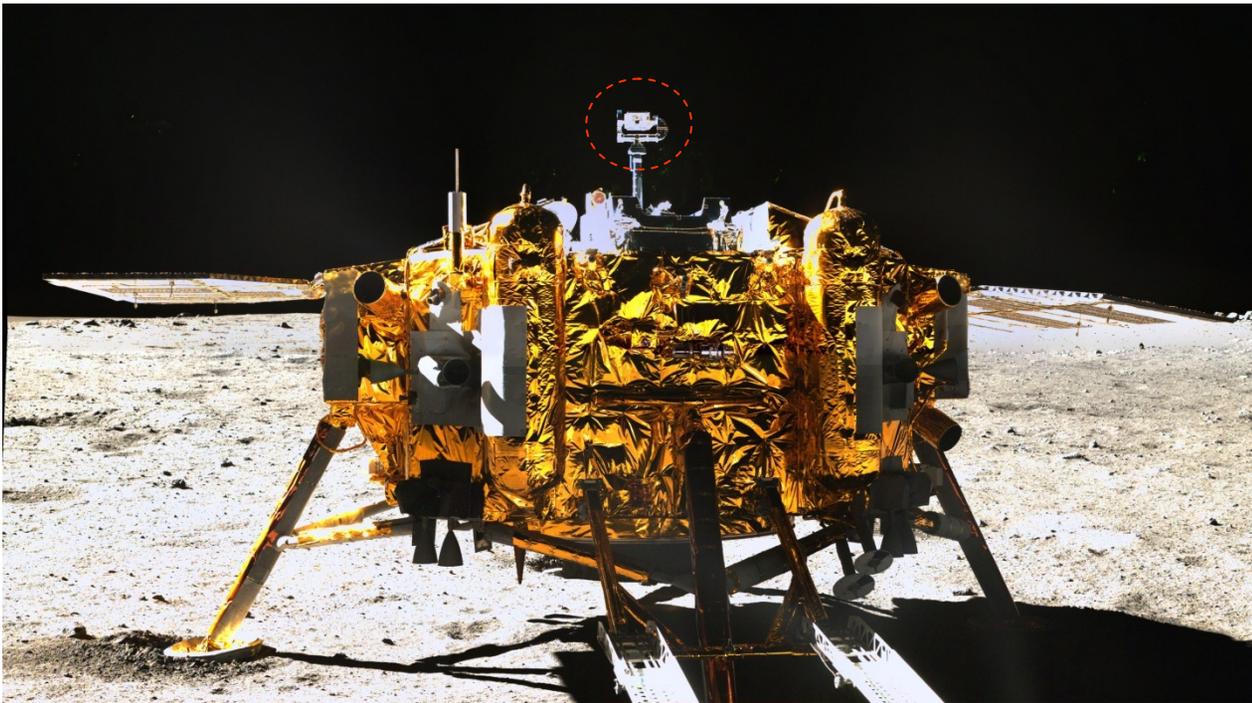


Chang'e-3's Progress

Important event

- Photograph

The lander and rover photographed each other on 15/12/2013.





Chang'e-3's Progress

- **Work on lunar**

The first lunar day, 14 Dec. 2013 to 25 Dec. 2013

The first lunar night, 25 Dec. 2013 to 12 Jan. 2014

The second lunar day, 12 Jan. 2014 to 23 Jan. 2014

The second lunar night, 23 Jan. 2014 to 12 Feb. 2014



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Chang'e-3's Achievement

Project achievement

- Achieve China's first soft-landing and roving exploration on the Moon
- Achieve teleoperation of the lunar rover
- Achieve multiwindow and narrow-breadth launch, high precision injection technology
- Develop deep space station, and establish measurement and control network in deep space
- Carry out various scientific exploration
- Develop a series of high-level experimental equipment, form a series of experimental method
- Use radioisotope heater units to realize survival of the rover during a lunar night



Chang'e-3's Achievement

Scientific achievement:

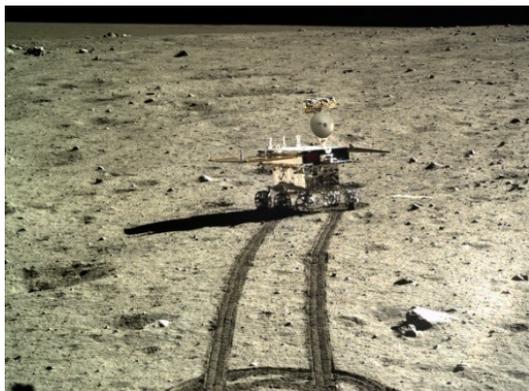
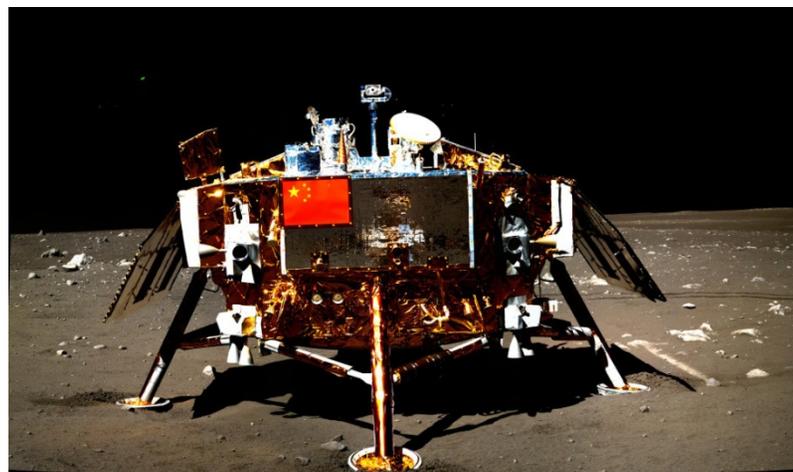
There are 4 scientific equipments in lander, including landform camera, landing camera, Lunar Ultraviolet Telescope and Extreme Ultraviolet Camera.

There are also 4 scientific equipments in rover, including panoramic camera, lunar-penetrating radar, alpha particle X-ray spectrometer and an infrared spectrometer. Until now, all of them are working in order, and obtain some preliminary scientific results.

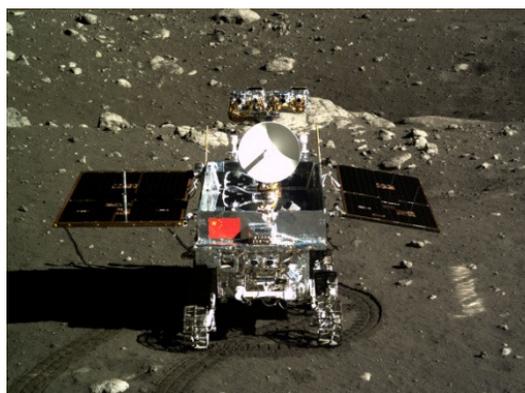


Chang'e-3's Achievement

Those pictures were taken by
landform camera and panoramic
camera



Yutu's footprint



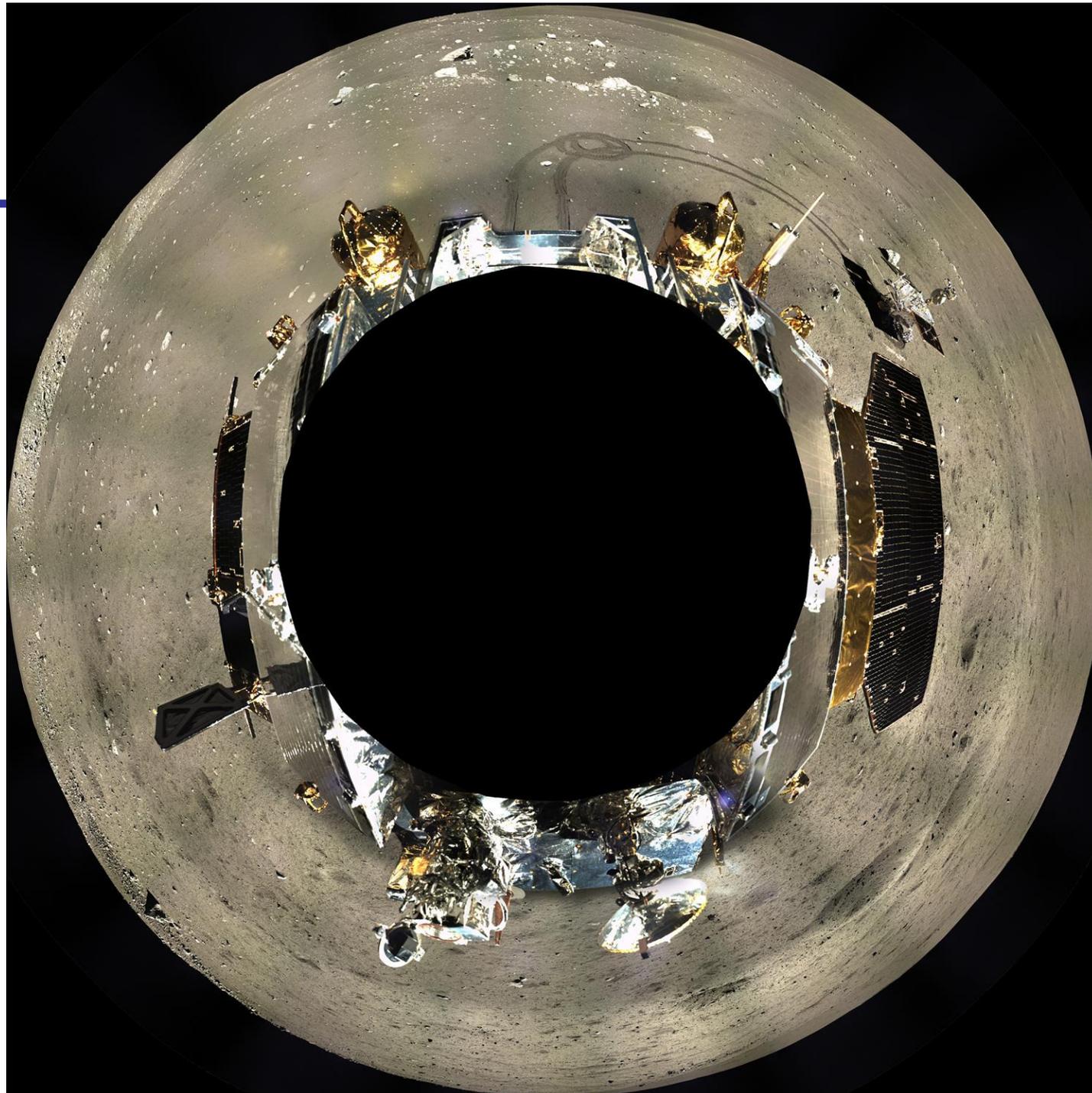
welcome



Earth, Merry Christmas !



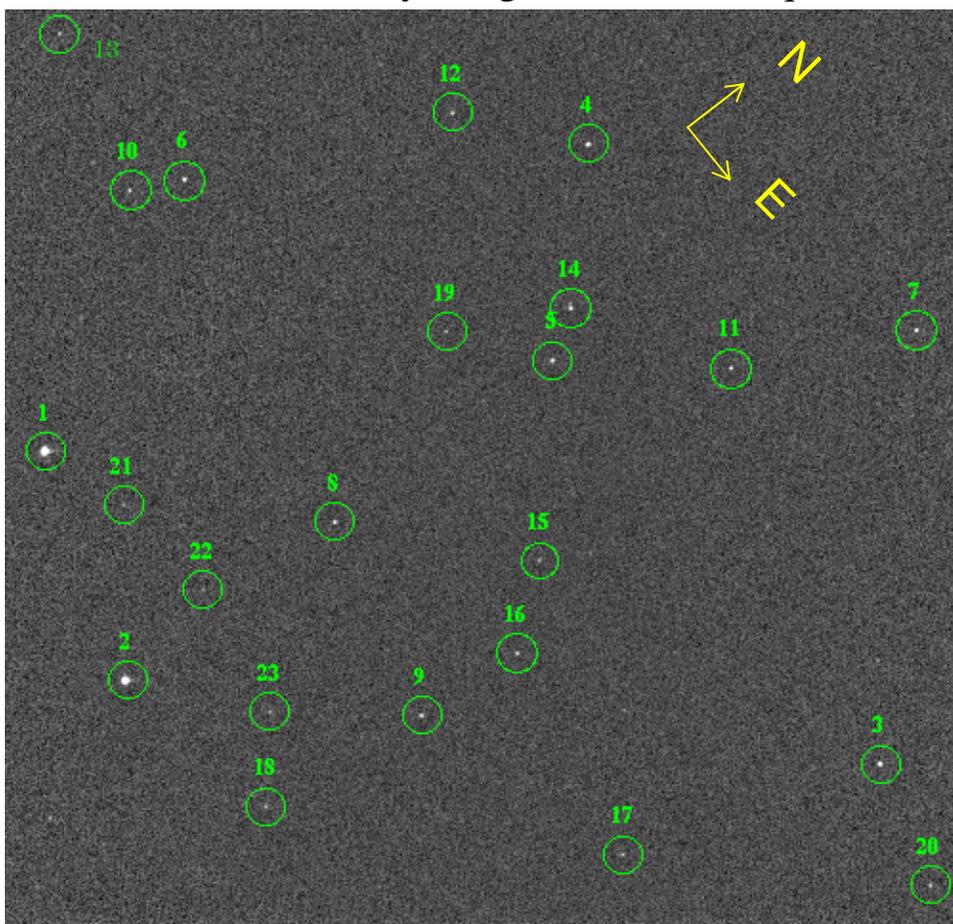
Landform
camera





Chang'e-3's Achievement

The Lunar Ultraviolet Telescope (LUT) observe brightness and change of celestial body in near UV. In the first observational run, three sky images had been acquired in Draco.



there are 23 identified stars marked by the green circles

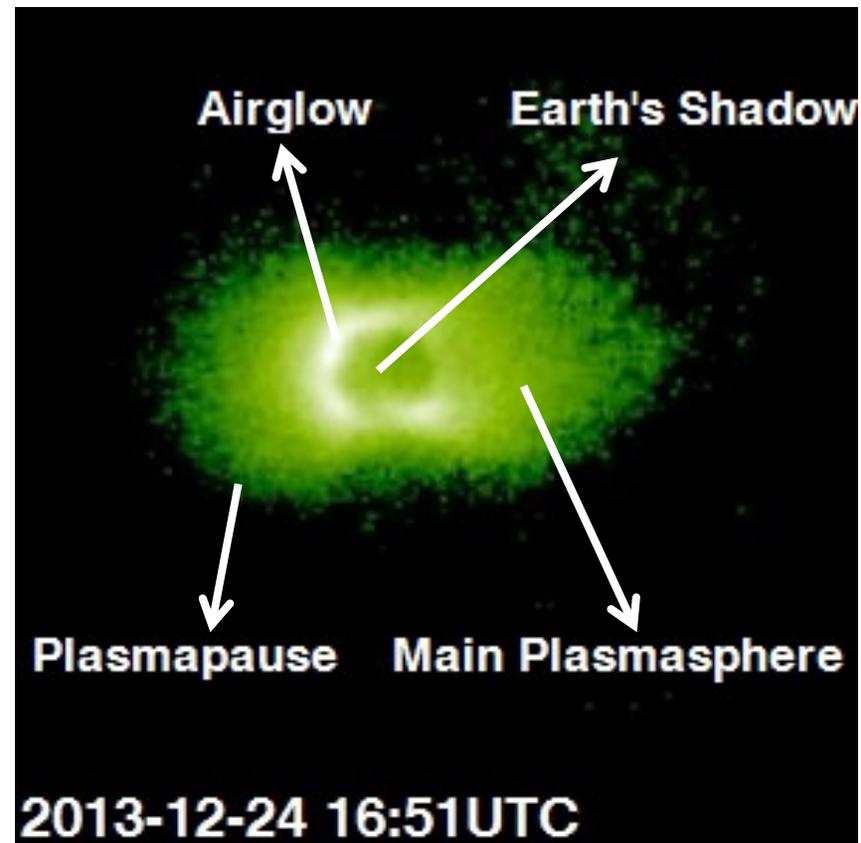
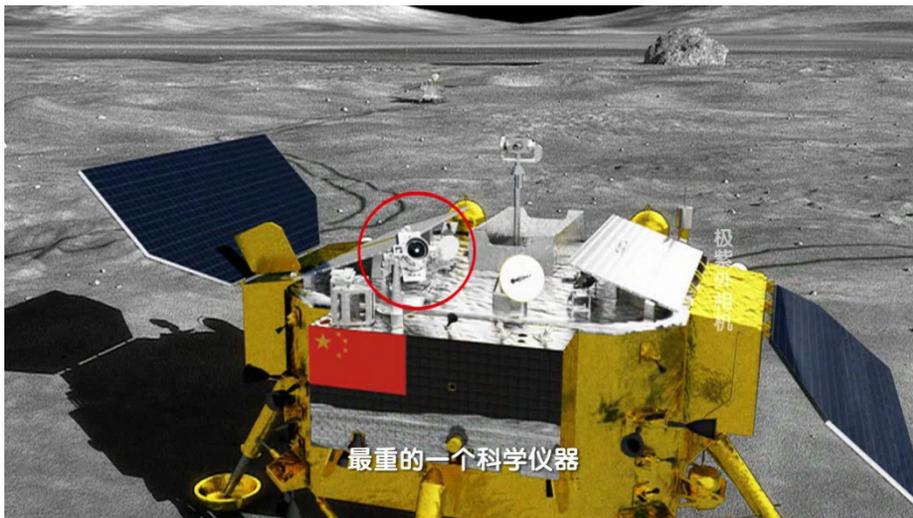
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2	HD 151387	14	HD 234341
3	HD 234351	15	IDS 16429+5037
4	TYC 3505-184-1	16	HD 234344
5	HD 234343	17	HD 234349
6	HD 234331	18	TYC 3503-567-1
7	TYC 3506-1864-1	19	TYC 3505-650-1
8	TYC 3505-398-1	20	TYC 3506-1008-1
9	TYC 3506-1196-1	21	TYC 3502-795-1
10	TYC 3505-138-1	22	TYC 3506-1242-1
11	HD 151444	23	TYC 3505-329-1
12	TYC 3505-328-1		

The corresponding identifications in catalogs are listed in the table



Chang'e-3's Achievement

The Extreme Ultraviolet Camera (EUVC) can track the Earth and detect the plasmaspheric 30.4 nm emission to monitor the evolution of the plasmaspheric distribution and structure and then to investigate the plasmaspheric responses to solar and geomagnetic activities.

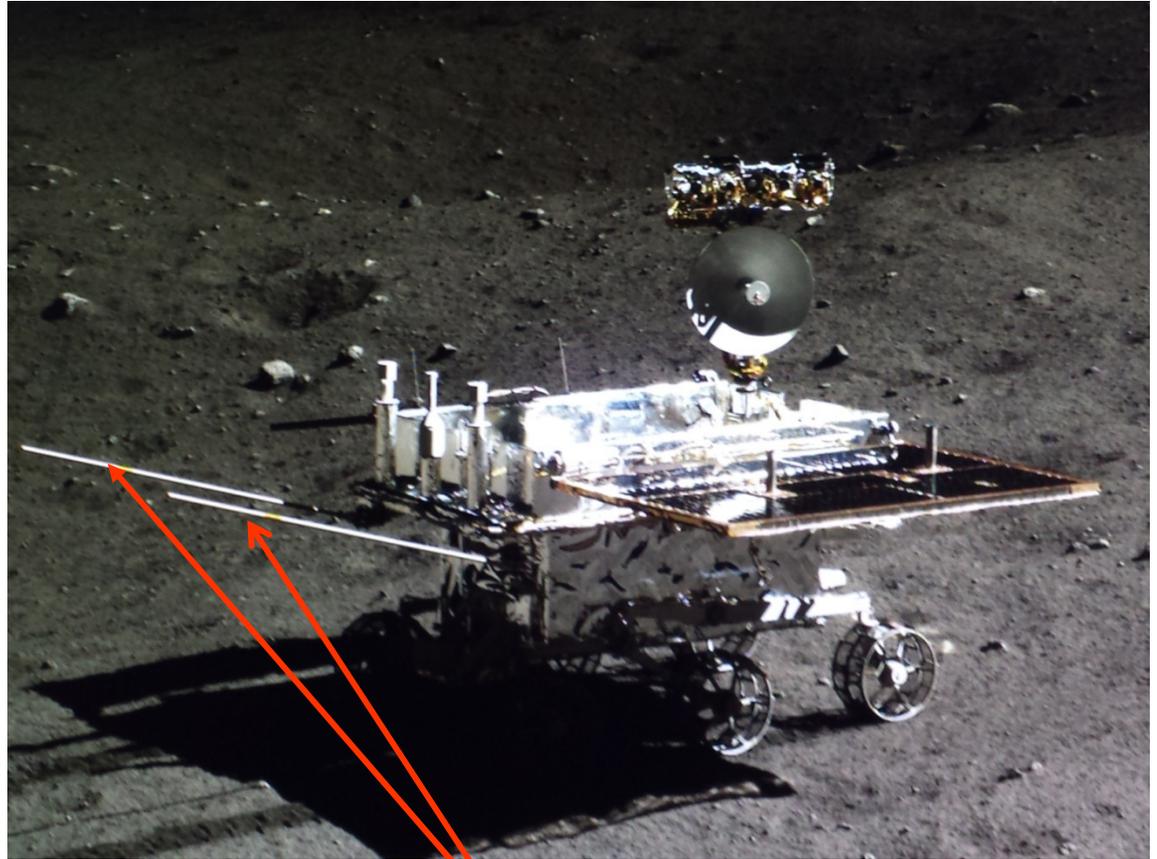


Earth plasmaspheric image detected by EUVC at 30.4 nm



Chang'e-3's Achievement

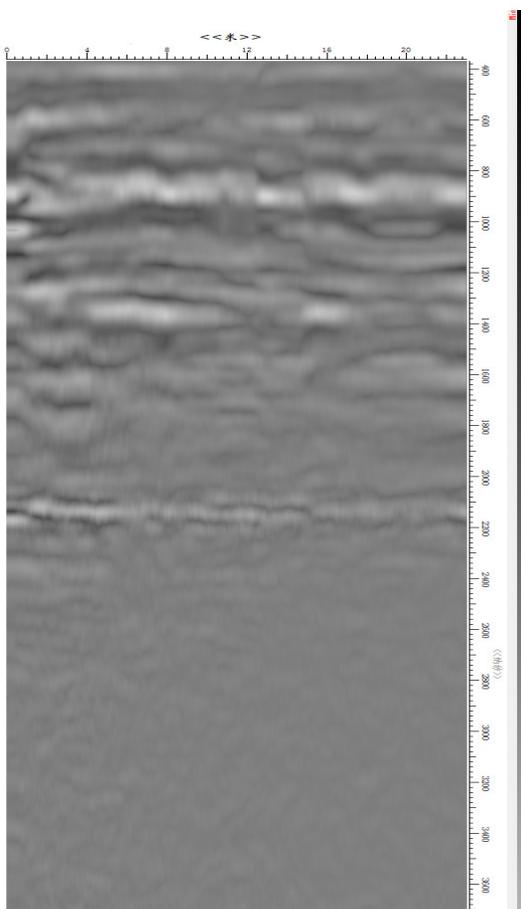
CE-3 lunar-penetrating radar is a kind of rover-based lunar surface penetrating radar. It's a kind of time domain carrier-free pulse radar.



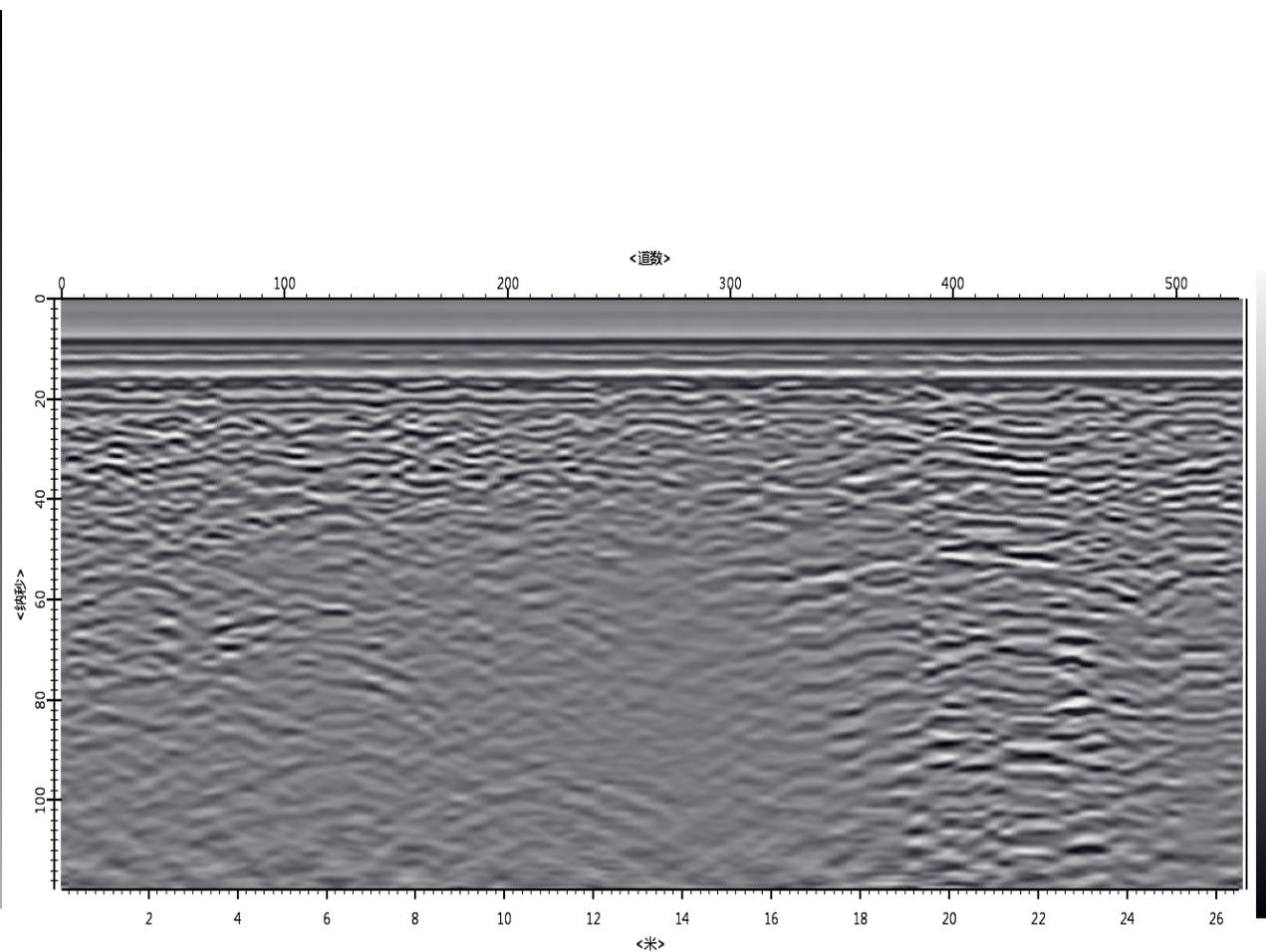
The antennas mounted on lunar rover



Chang'e-3's Achievement



Primary Test Result
of Lunar Regolith

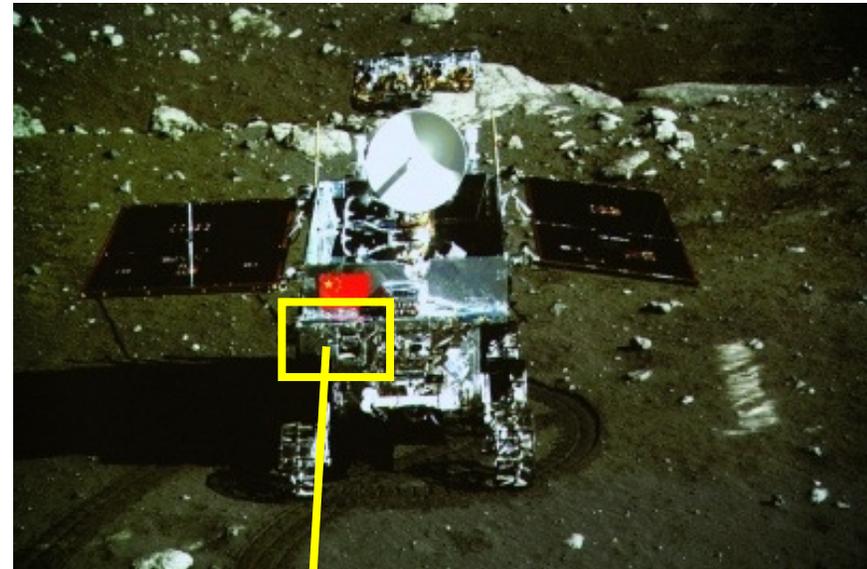


Primary Test Result of Geological Structure



Chang'e-3's Achievement

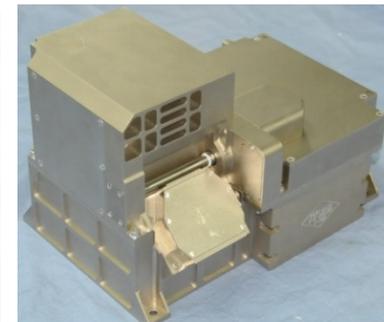
VNIS is one of the payloads equipped on the rover of Chinese first time lunar soft landing and investigating mission. It is equipped with spectral imaging function in VNIR band ($0.45\sim 0.95\ \mu\text{m}$) and spectral detecting function in SWIR band ($0.9\sim 2.4\ \mu\text{m}$).



Mounting position of VNIS



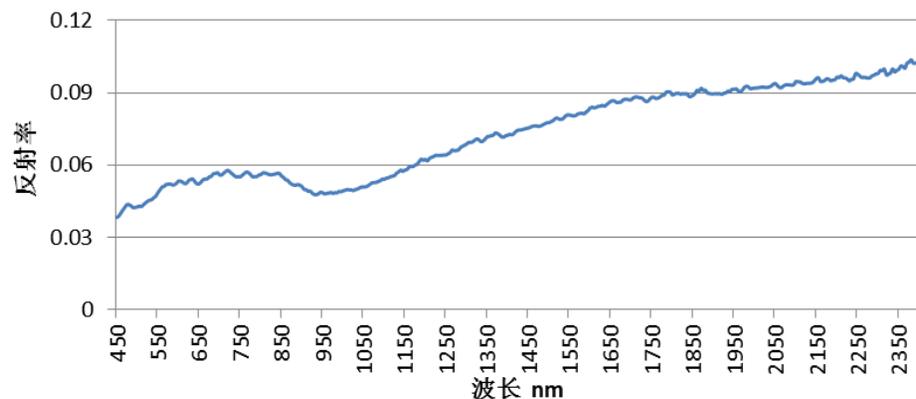
Probe of VNIS



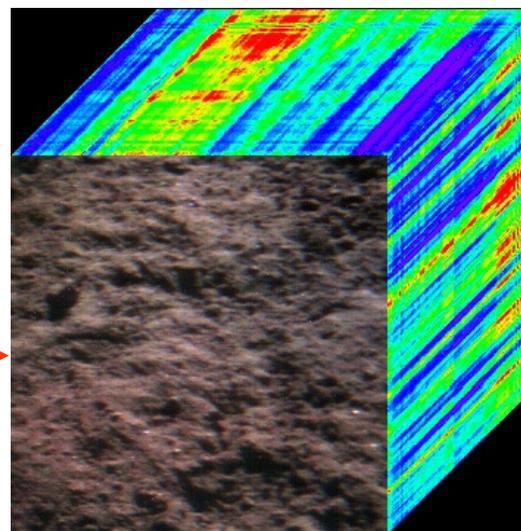
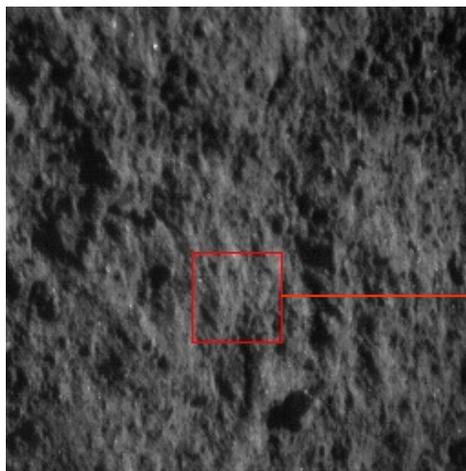


Chang'e-3's Achievement

红外成像光谱仪20131223月面探测区全波段反射率



Reflectivity curve of VNIS's premiere lunar surface detection

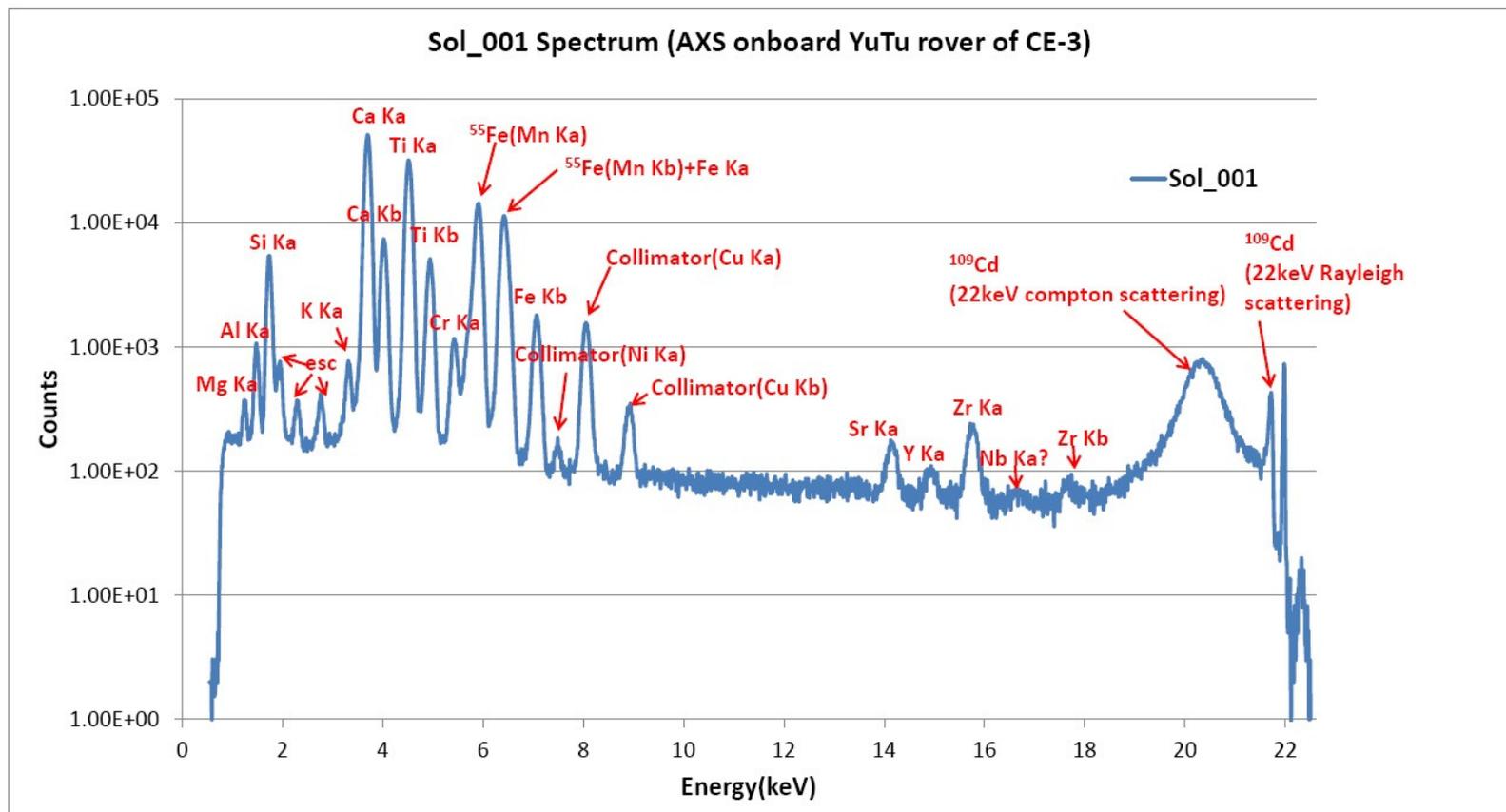


Single band image and its cube of VNIS's premiere lunar surface detection



Chang'e-3's Achievement

The Active Particle-induced X-ray Spectrometer (APXS), intended to analyze the chemical element composition of lunar samples. An initial analysis indicated that major rock-forming elements of the Moon can be identified in this spectrum.





Thank you!