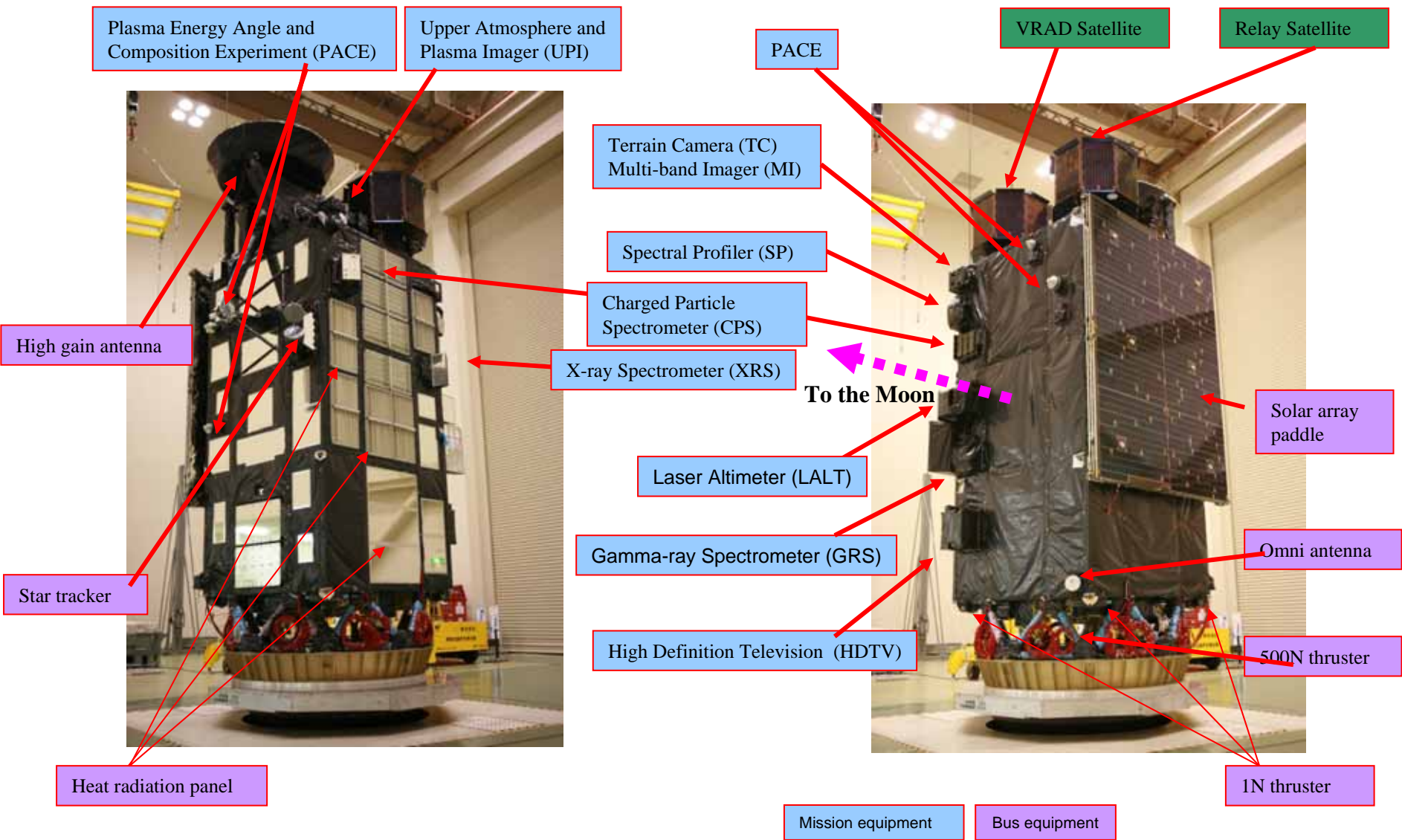


SELENE mission status & ISRU related activity in Japan

Kai Matsui

JAXA SELENE project

SELENE "Kaguya" overview

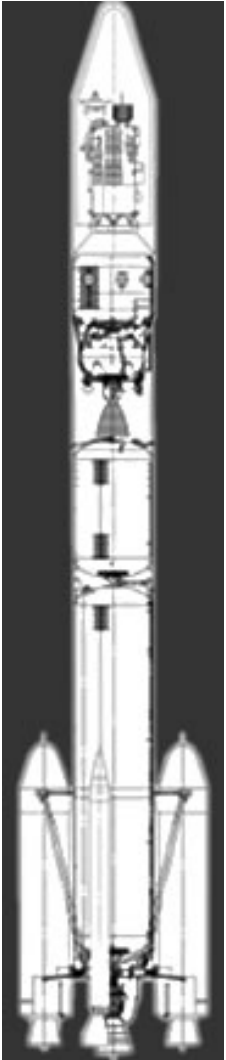




mated with the payload adapter fitting
(August 26)



encapsulated into 4S-shaped fairing
(September 3)



H-IIA Launch Vehicle No. 13 2022 model

- 2 SRB-A (Solid Rocket Booster-A)
- 2 SSB (solid strap-on boosters)

Launch time:
1:31:01 on September 14(UT)

Launch Site:
Yoshinobu Launch Complex
at JAXA's Tanegashima Space Center

Injection Orbit:
Perigee Altitude (km): 281
Apogee Altitude (km): 232,805
Inclination (deg): 29.9
Argument of
Perigee (deg): 243.6
Lunar Transfer Orbit

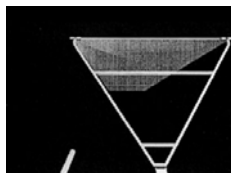
Mission profile

Event	Time after lift off	Date(UT)	GN	Note
Lift Off	0	2007/9/14 1:31		
Sat separation	0:45:34	2007/9/14 2:16	DSN Mad	
Sun Search	0:59:00	2007/9/14 2:30	DSN Mad	Auto
SAP deploy	1:13:59	2007/9/14 2:45	DSN Mad	Command
3 axis control	5:49:59	2007/9/14 7:21	DSN Mad	Command
HGA Deploy	9:01:59	2007/9/14 10:33	DSN Mad	Command
Com link	11:37:59	2007/9/14 13:09	DSN Goldstone	Command
Delta Vc1	18:40:59	2007/9/14 20:12	DSN Mad	Command
Delta Vp1	5 day	2007/9/19	USDC	Command
Delta Vp2	15 day	2007/9/29	USC	Command
LOI1	19 day	2007/10/3	USDC	Command
Relay sat separation	25 day	2007/10/9	USDC	Command
Vrad sat separation	28 day	2007/10/12	USDC	Command
Observation orbit	36 day	2007/10/20	USC	Command

Solar array paddle deployment (by onboard camera)



2:44 on September 14 (UT)



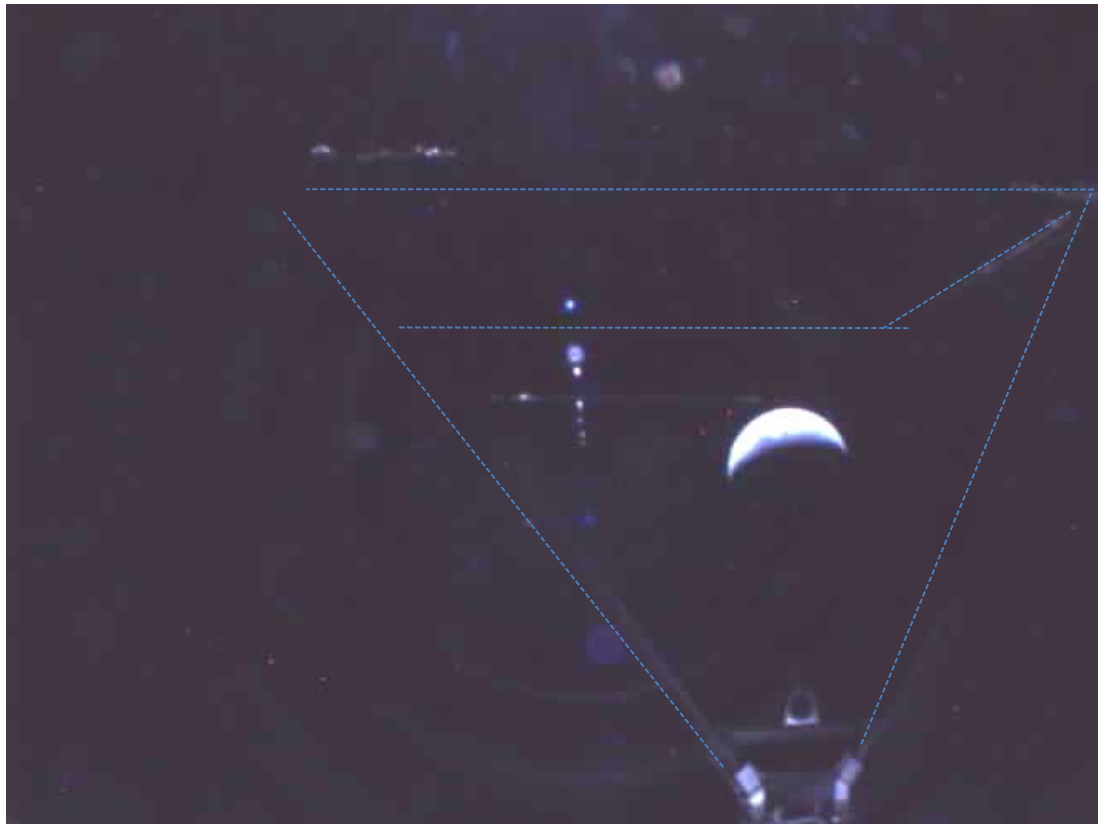
Explanatory drawing

High-gain antenna deployment (by onboard camera)

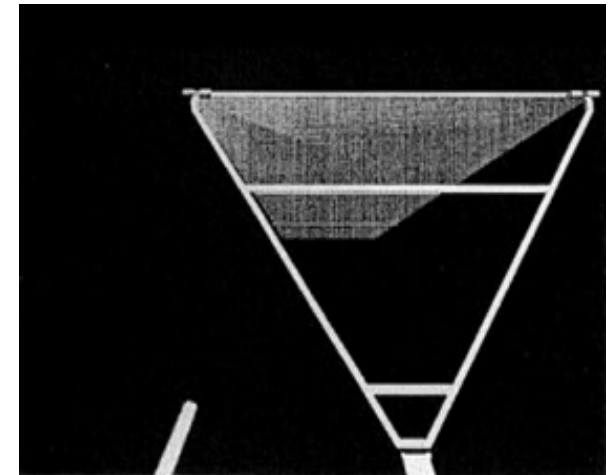
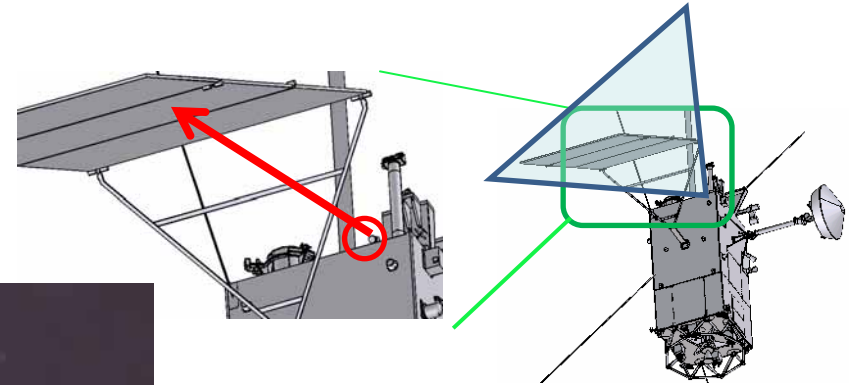


9:52 on September 14 (UT)

Earth & Solar paddle



8:30 on September 29 (UT)

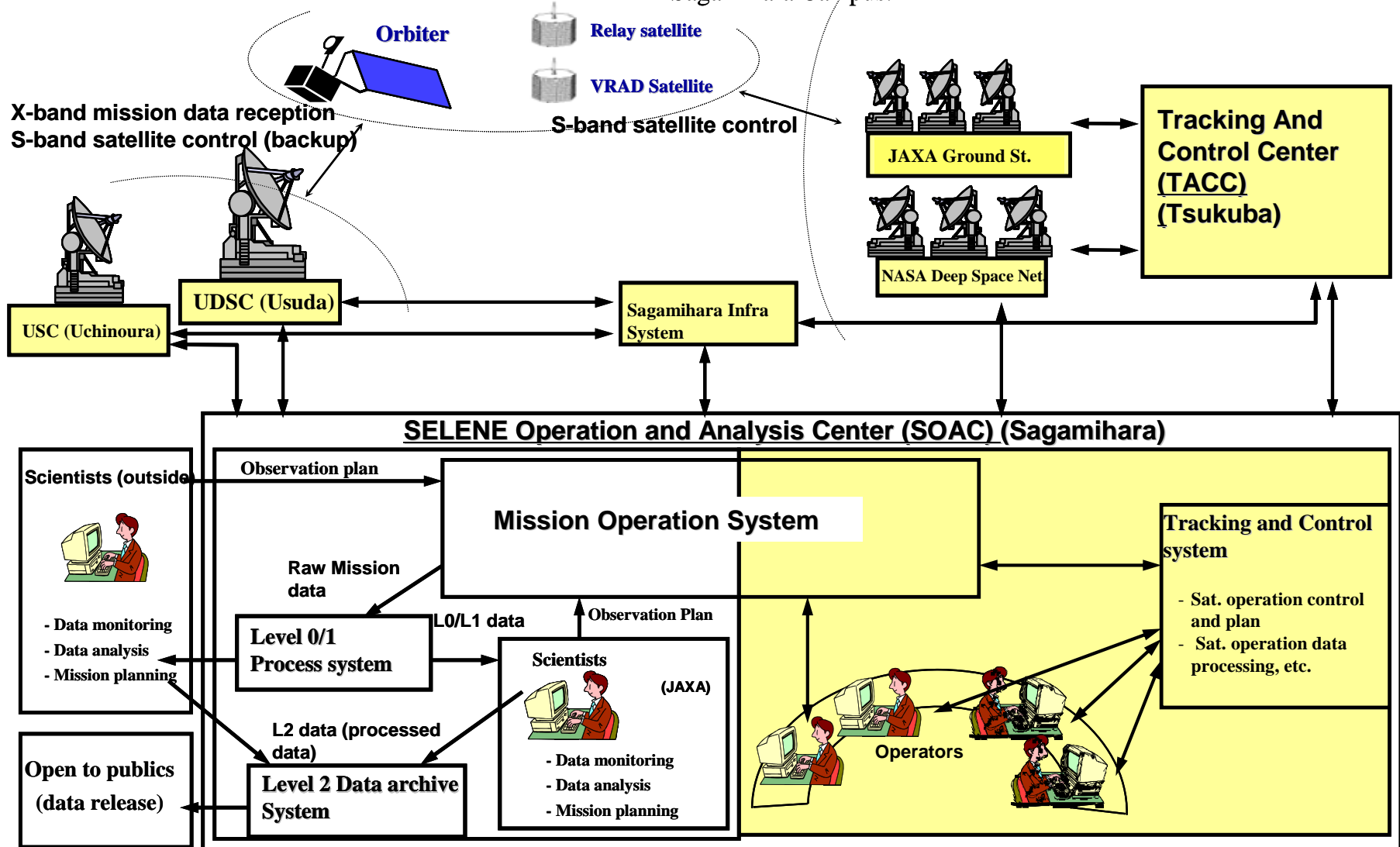


Explanatory drawing

SELENE end to end system

SELENE (KAGUYA) Ground System

SELENE operations are performed at SELENE Operation and Analysis Center (SOAC) at the JAXA Sagamihara Campus.



SELENE ground stations



Usuda Deep Space Center

Sagamihara Campus
SELENE Operation and
Analysis Center

Tsukuba Space Center,
Tracking and Control Center

Katsuura Tracking
and Communication
Station

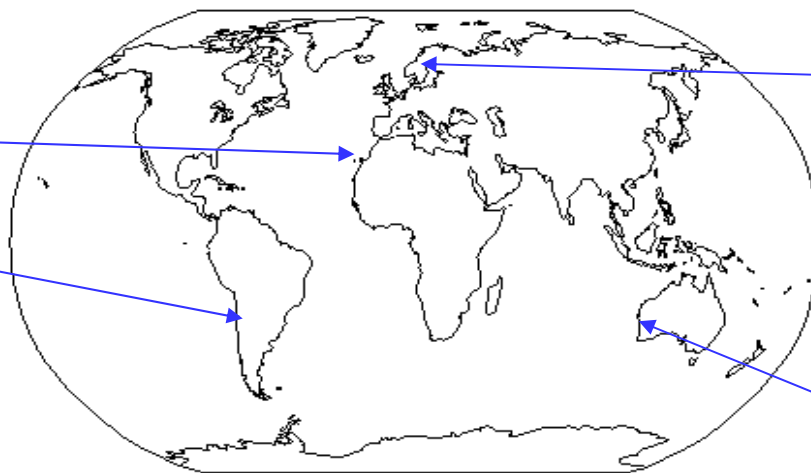
Masuda Tracking and
Communication
Station



Uchinoura Space Center



Okinawa Tracking
and Communication Station



Kiruna Station (Sweden)

Maspalomas Tracking Station
(Spanish territory)

Santiago Station (Chile)



Perth Station (Australia)

•During SELENE critical phase, NASA Deep Space Network (DSN) including Goldstone, Canberra, and Madrid Stations are used.

SOAC (SELENE Operation & Analysis Center) in Sagamihara



Tracking and Operation system



Data archive system



Data analysis system

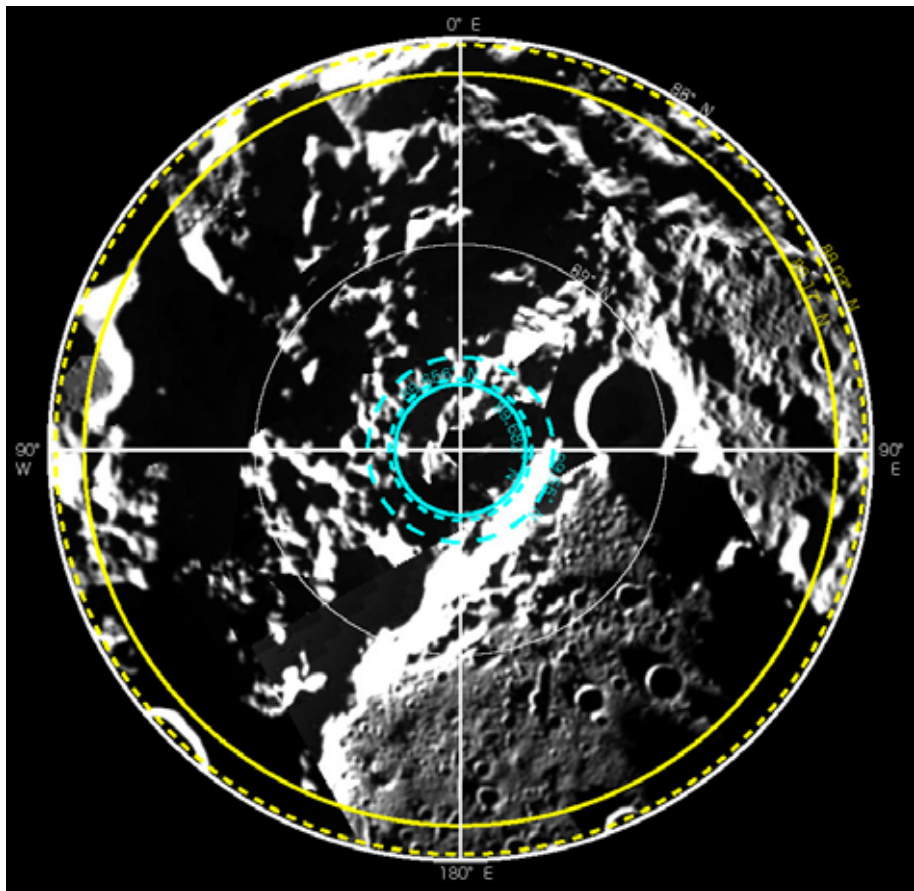


Data processing system

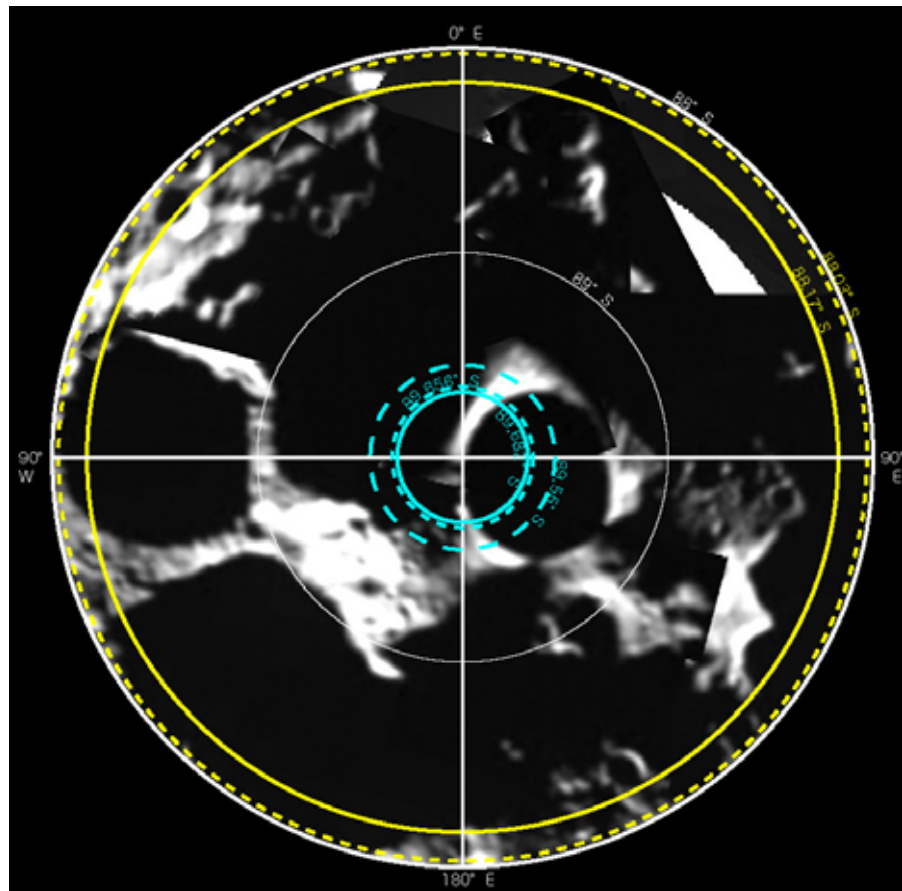
Rate of sunshine map

North Pole

South Pole



(Clementine)



(Clementine)

Expected observation frequency line

- 100%
- 75%
- - - - - 50%

Observation frequency =
 $\frac{\text{Number of observation passes}}{\text{Num of all passes}}$

Blue: KAGUYA MI
 Yellow: LRO WAC

KAGUYA science product:

- Standard product (67)
- Higher level product (59)
- Research product

Education & Public Outreach product:

- First light
- HDTV movie
- Visualized images

KAGUYA next step

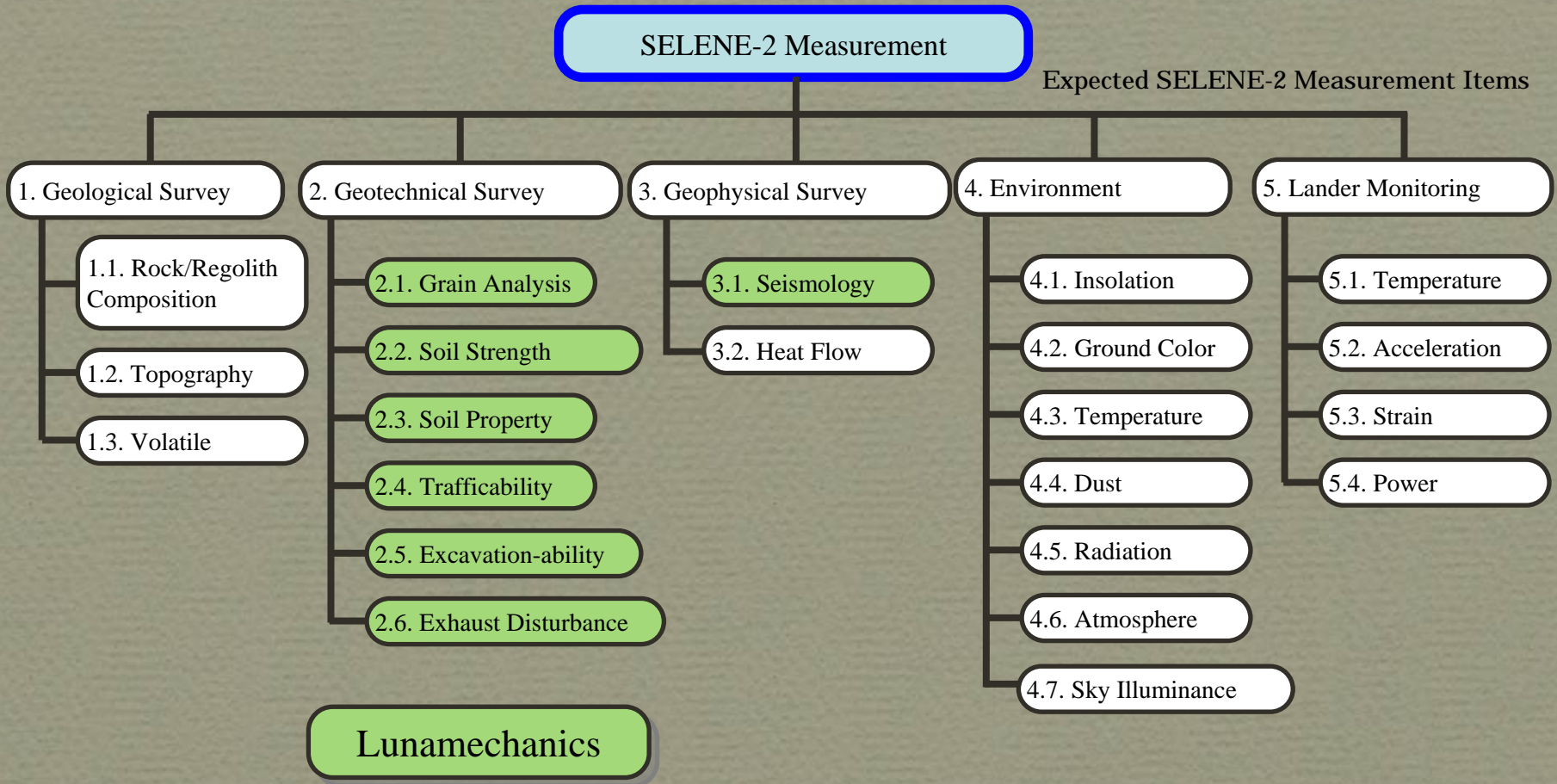
KAGUYA Event	2007				2008												2009														
	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12	1	2	3	4	5	6	7	8	9	10	11	12			
Launch	△																														
Bus check out	■																														
Injection into the nominal orbit		■																													
Mission instrument check out			■																												
Nominal observation					■																										
Extended Observation																					■ (TBD)										
First Light																															
Lunar solstice			△						△																						
Product release																													△		
KAGUYA Workshop																															
Project assessment				△																											

Recommendation from Lunar Resources Utilization Study

group ISRU Priority for SELENE-2

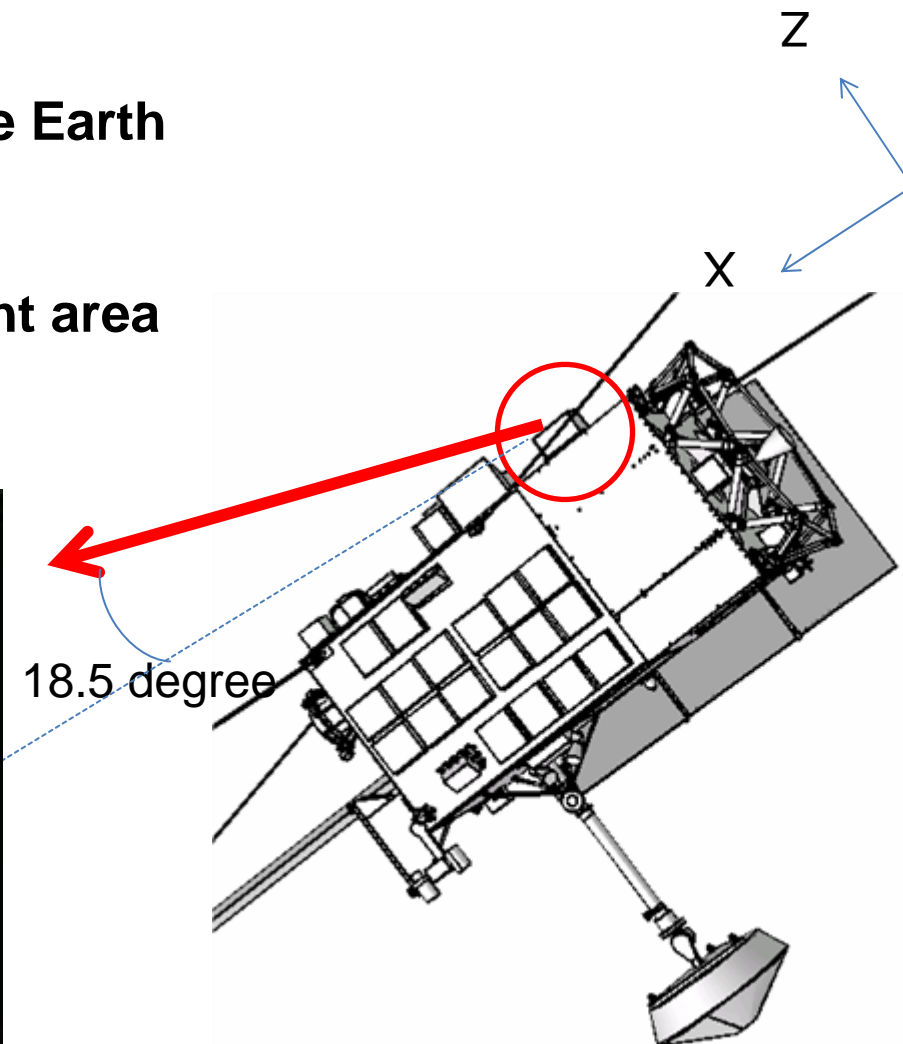
PRIORITY	MISSION	No.	RELATED AREA
Very High	Horizontal mineral distribution	1.1	Geology
	Volatile measurement	2.1	
	Vertical mineral distribution	1.2	Geology
	Regolith grain properties	3.2	
	Regolith excavation / transportation	6.1	Lunamechanics
	Solar concentration	4.4	
	Insolation / Temperature	4.1	Environment
	Regolith bulk properties	3.1	Lunamechanics
	Regolith chemical properties	5.1	
	Evaporate emission measurement	2.2	
	Regolith thermal / electrical properties	5.2	
	Oxygen production demonstration	6.6	
	Regolith feeding / ejection	6.2	
	Thermal processing technology	6.4	
	Terrain measurement	4.3	Environment
	Dust measurement	4.2	environment
Moderate	Regolith radiation shielding	4.5	
	Beneficiation	6.3	
	Production storage	6.5	

Recommendation from Lunamechanics Study Group



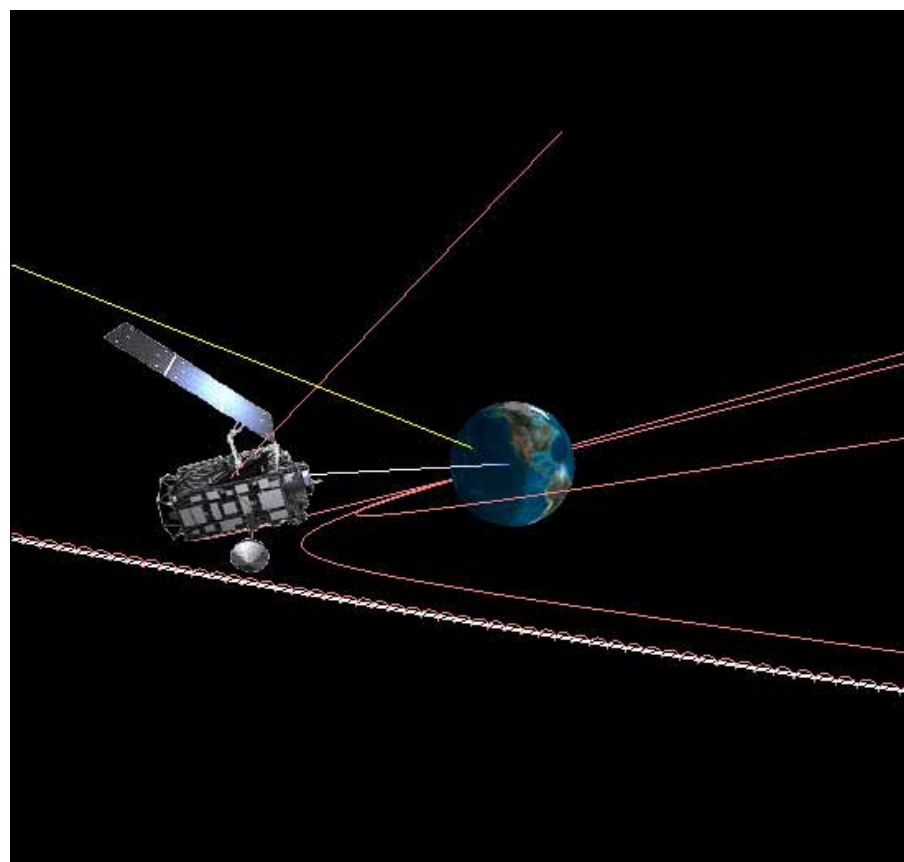
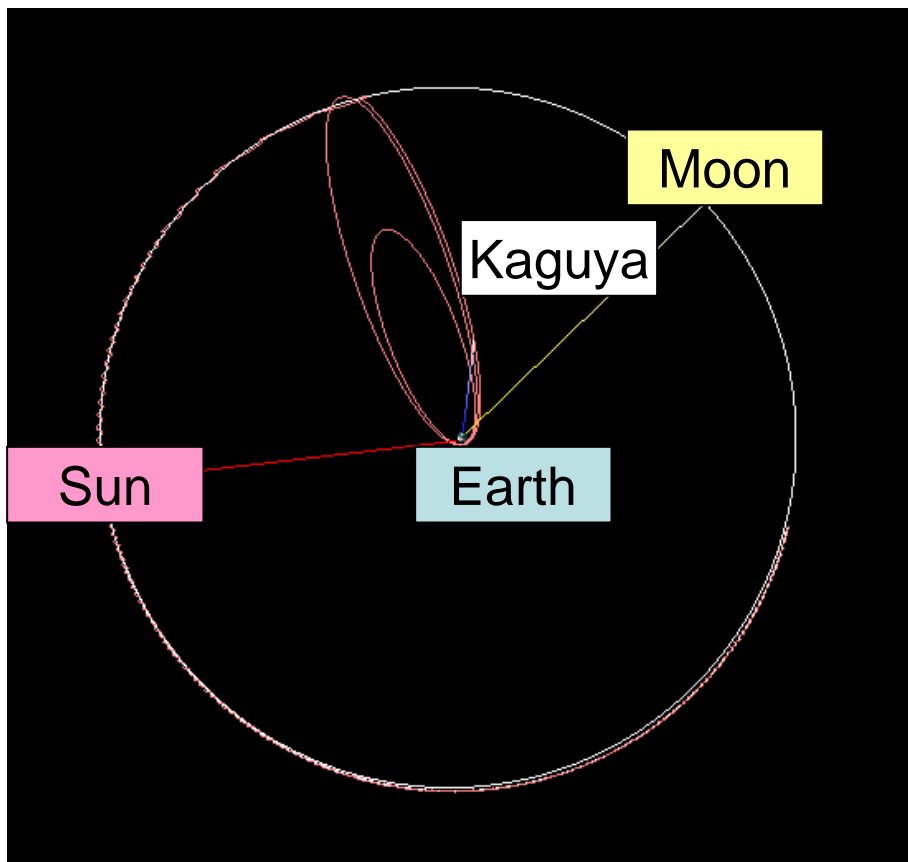
About 110,000 km away from the Earth

Observation location :
America continental as day light area



6 degree / FOV 8 degree (tele HDTV camera)

Location Map at HDTV observation



Observation date : 2007.9.29 about 9:46 (UT)

Reception date (@ UDSC) : 2007.9.30 about 0:40 (UT)

- **SELENE launch was success in Sep14 in Tanegashima space center**
- **Total 5 maneuvers were all nominal**
- **No issue and No trouble in SELENE bus system**

- **The day after tomorrow, LOI (Lunar orbit injection) maneuver is planed**
- **Critical phase will be finished at end of Oct**
- **Mission check out will be finished at end of Nov**
- **Observation will start in Dec and complete Oct next year**

- **Data delivery through SELENE L2 DB system to public free of charge one year after the end of nominal operation**

<http://www.kaguya.jaxa.jp/en>