JAXA Activities & Cooperation with Italy

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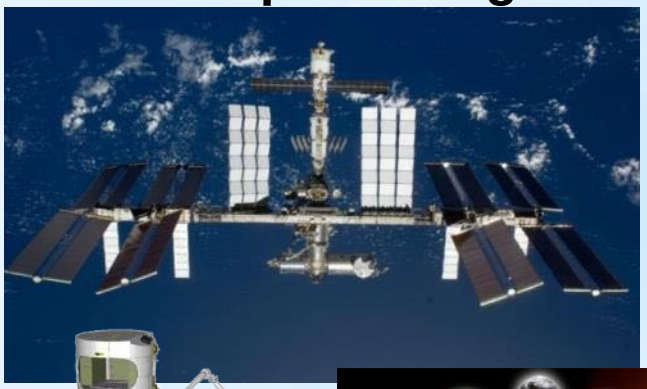
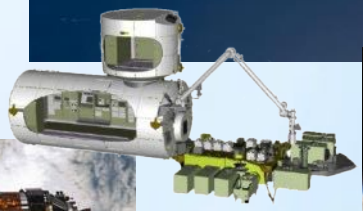
Japan Aerospace Exploration Agency (JAXA)

JAXA Activities

Space Transportation Program

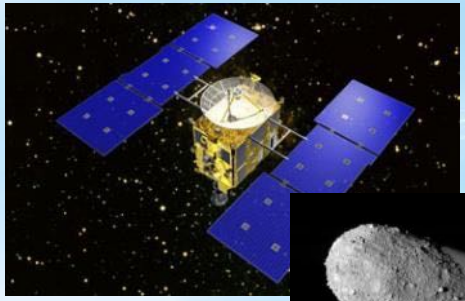
Human Space Program





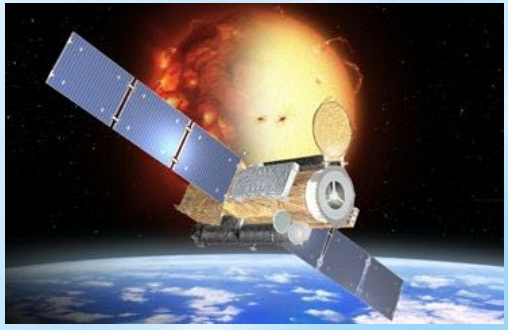
Satellite Program

Lunar & Planetary Exploration Program



Aviation Program

Space Science Program



Launch Vehicles

H-II A

- First Flight in 2001, and **30 / 31** successful launches.
- GTO 4-6 ton class capability

H-II B

- First Flight in 2009,
- **5** successful flights of 16.5 ton HTV to ISS
- GTO 8 ton class capability

Epsilon

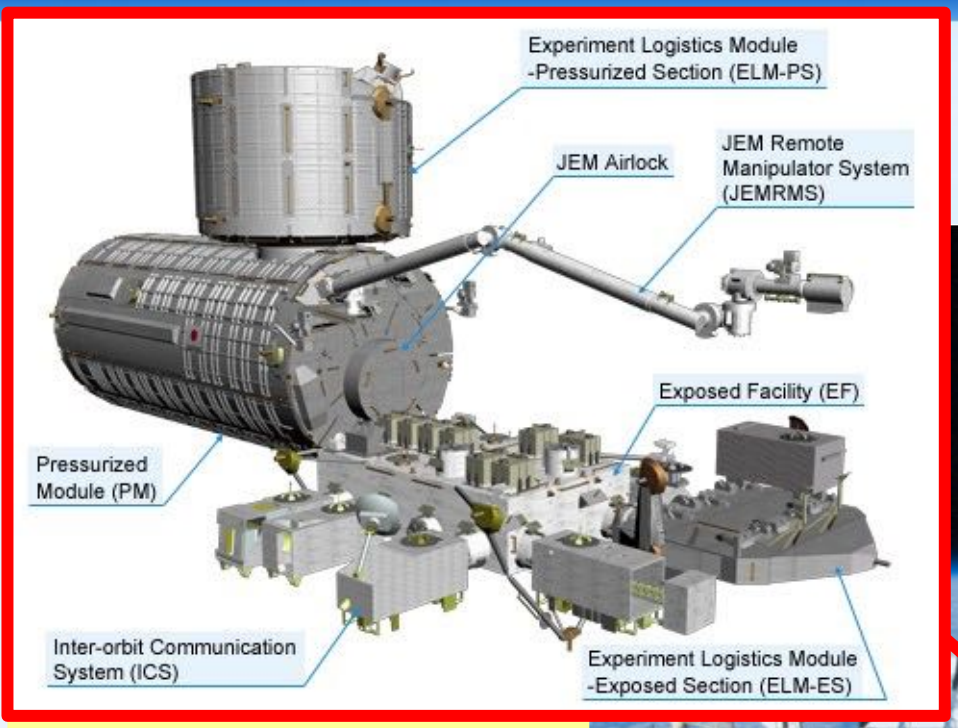
- **First Launch** on Sept 14, 2013
- 3 stages Solid Rocket
- LEO 1.2 ton, SSO 0.45 ton

H3
Launch in 2020

- To join the international launch market
- Launch from Tanegashima
- Starting engine test this winter

- Flexible capability
- Robust engines
- Launch cost by half
- High reliability

International Space Station



Kibo

Japan Experiment Module

European and Japanese astronauts stay on ISS

2014 2015 2016 2017

Koichi Wakata
(Nov 2013
- May 2014)

Kimiya Yui
(July 2015
- Dec 2015)

Takuya Onishi
(July 2016 –
Oct 2016)

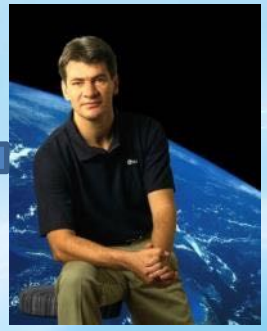
Norishige Kanai
(Nov 2017-)

Alexander Gerst
(May 2014
- Nov 2014)

Samantha Christoforetti
(Nov 2014
- Jun 2015)

Tim Peake
(Nov 2015
- June 2016)

Thomas Pesquet
(Nov 2016-)



Paolo Nespoli
(May 2017-)

ISS is usually habitated by 6 Crew Members : 3 Russian cosmonauts, 2 US astronauts, and 1 European or Japanese astronaut.

ISS Cooperation

- Trainings and Operations -

European/Italian astronaut trainings at JAXA □ (Tsukuba, Japan)

Operations in Japanese KIBO Module

JAXA astronauts participate CAVES training in Italy (Sardegna Island)

Sep. 2011
Kanai

Sep.2012
Noguchi

Sep. 2013
Furukawa

July 2016
Hoshide

Science Cooperation: CALET

Challenge to mysteries of Cosmic ray and Dark matter

Mistery 1: Origin and mechanisms of acceleration of high-energy cosmic rays and gamma

Mistery 2: Propagation mechanism of cosmic rays throughout the galaxy

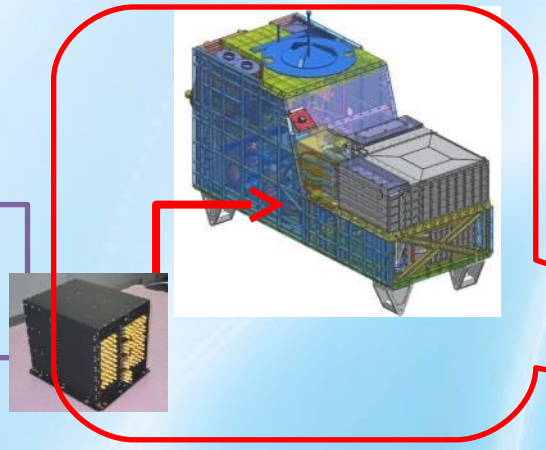
Mistery 3: Identity of dark matter

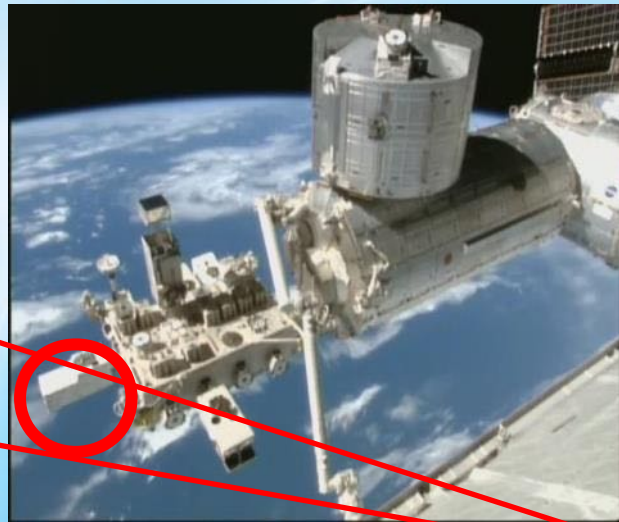
Estimated distribution of matter and energy in the universe

Recent updates

- CALET observed Relativistic Electron Precipitation events at the ISS.
  - These data are expected to contribute to space weather forecasting and reduction of satellites' electrification

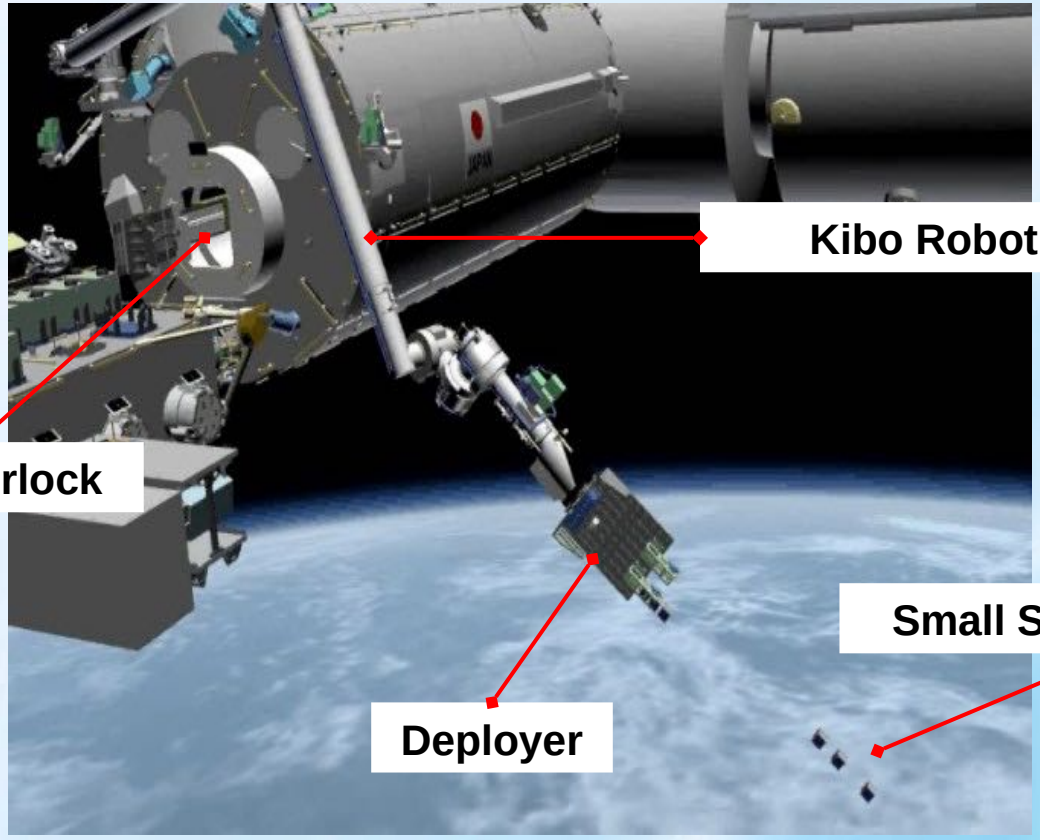
High-Voltage Power Supply Box (HV-BOX) Provided by ASI





Small Satellites Deploy from Kibo

- Kibo module provide unique capability to deploy small satellites.
  - Launched and carried on transfer vehicles to ISS
  - Astronauts set satellites (with deployer) on Kibo Airlock.
  - Kibo Airlock brings out satellites and Kibo Robotics Arm grapples.
  - SHOOT Small Satellite!
- About 150 small satellites were deployed from Kibo so far.
  - Satellites are developed by Universities, Research Institutes, Private Companies...



GAUSS Srl. and Japanese company (JAMSS) cooperated with Brazilian cubesat “TuPOD” which will be launched in December 2016 by HTV6.

HTV-X: ISS Cargo Transportation

HTV

HTV-X

JAXA 's Earth Observation

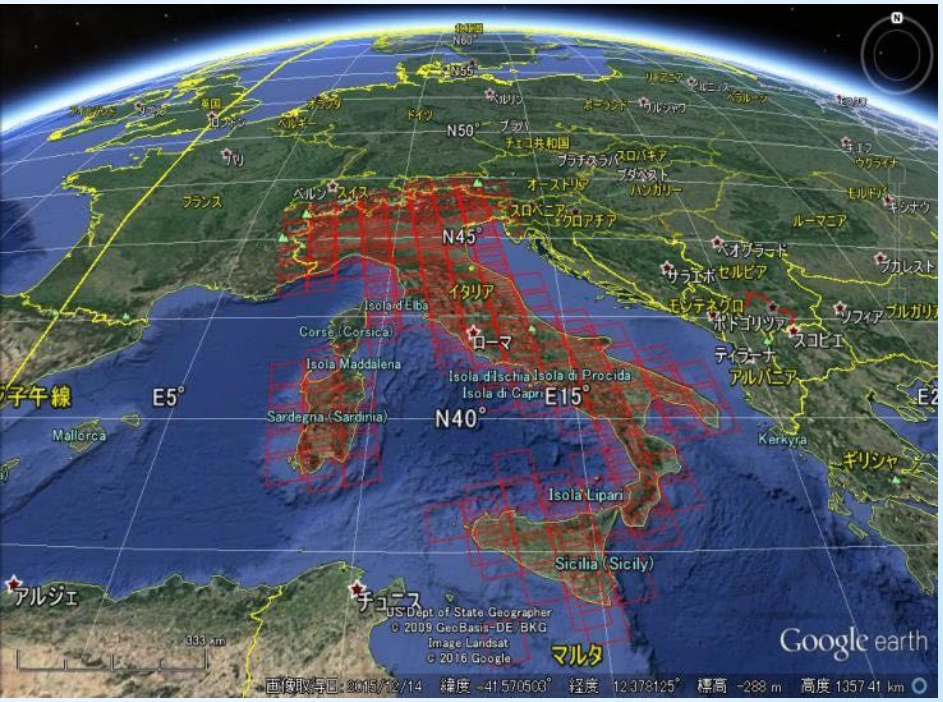
Advanced Land Observing Satellite-2 "DAICHI-2" (ALOS-2)

ALOS-2 was launched by H-IIA #24 on May 24, 2014.

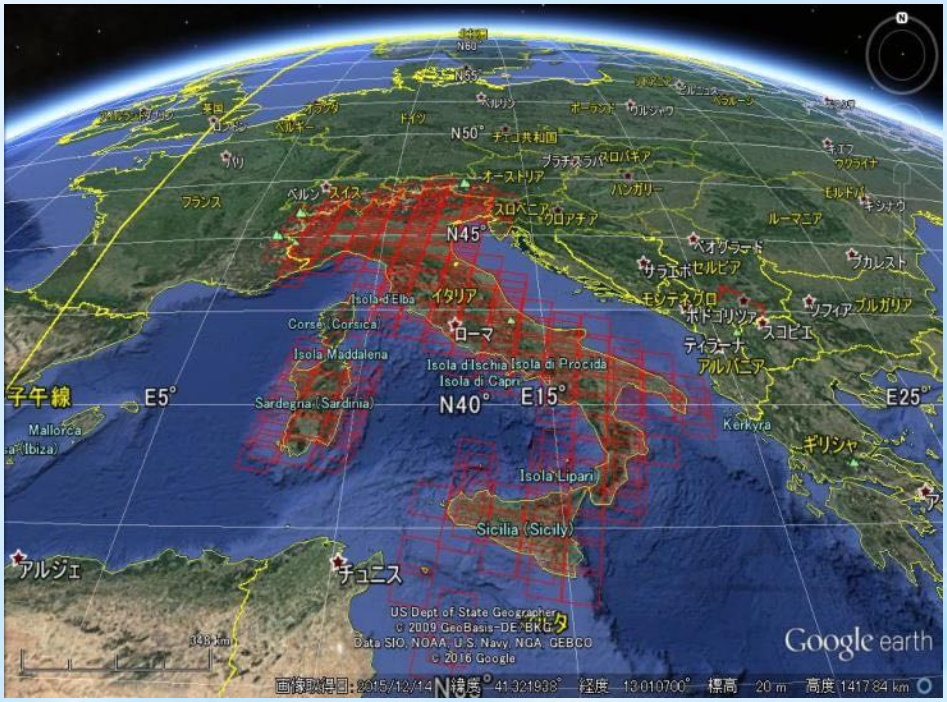
The Advanced Land Observing Satellite-2 (ALOS-2), follow-on mission from the "DAICHI", will contribute to disaster management, cartography, forest monitoring, and other various applications with the state-of-the-art L-band Synthetic Aperture Radar (PALSAR-2).

Basemap acquisition by ALOS-2

Descending Orbit



Ascending Orbit

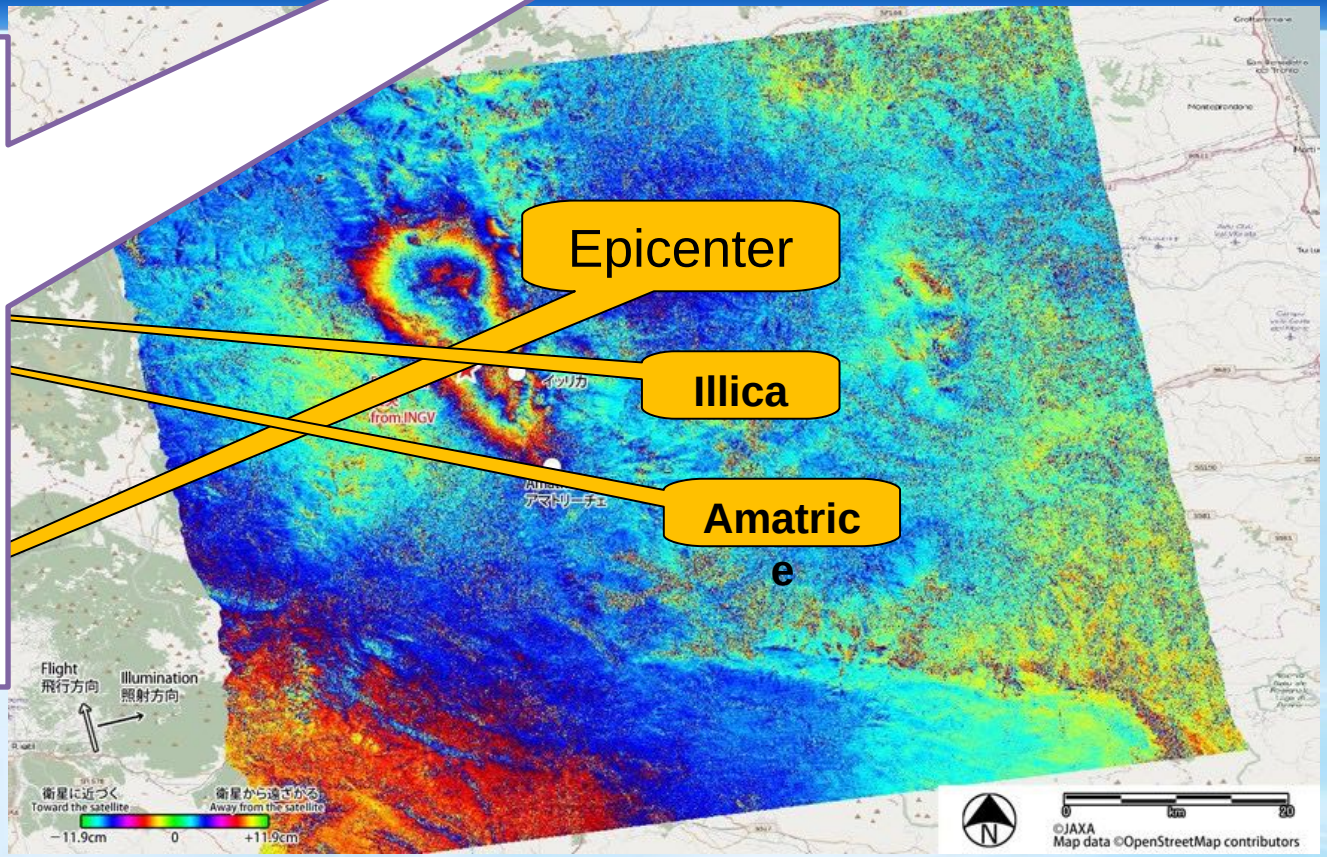


- **The basemap data will be obtained 4 times per year through ALOS-2's seamless observations: ascending orbit will cover Summer and Winter and descending orbit will cover Spring and Autumn.**
- **Resolution: 10 m (Swath: 70 km)**
- **Polarization: HH HV, Right Looking, Insident angle: around 30 degrees**

⇒ **When a disaster (such as an earthquake) occurs, the basemap data will be combined with the newly acquired data to analyze/assess the situation.**

M 6. 2 Earthquake in Central Italy

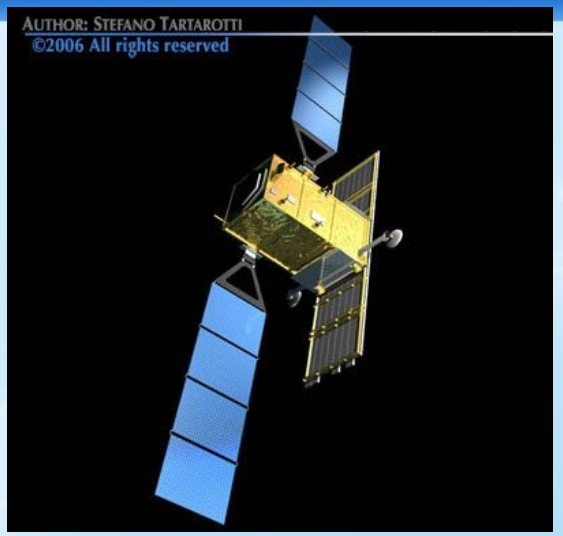
This is the interferometry result using the PALSAR-2 data acquired before (September 9, 2015; UTC) and after (August 24, 2016; UTC) the earthquake. Approx. 20cm deformation away from the satellite (eastward and/or downward movement) is detected in the east region of the epicenter. The deformation area extends approx. 20km from north to south and 10km from west to east.



On August 24th, 2016 at 1:36 (UTC) the magnitude-6.2 earthquake hit the central Italy. ALOS-2 performed an emergency observation in a timely mannar: 23:00 (UTC) on the same day and 11:15 on the 31th for the second observation.

<u>JAXA has also conducted the emergency observation over the region that was hit by quakes on October 26th and 30th in response to ASI's request and will continually observe the area.</u>

COSMO-SkyMed monitoring of Volcano



COSMO-SkyMed has observed the Sakurajima once or twice per Month since 2010.

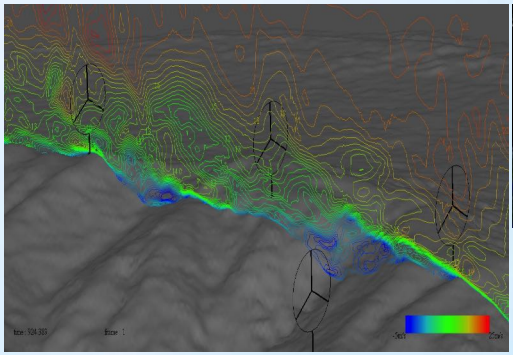
The photos were taken by Kagoshima meteorological observatory

Utilization of Space Technology

Applications by positioning satellite

Automatied Agriculture (2018) □□□□

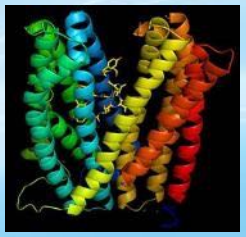
Automatied Driving (2020) □□□□□



© Tsubasa Windfarm Design RIAM-COMPACT® □□

3D Mapping

(C)Yakult



(C)PeptiDream

Biomedical applications using ISS/Kibo

Towards 2020 and Beyond

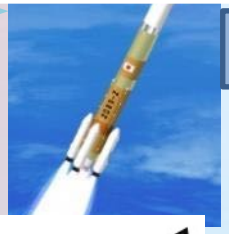
2015 | 2020 | 2025

▲Basic Plan for Space Policy

▲Tokyo Olympic and Paralymics

H-IIA

Enhanced Epsilon



International launch market

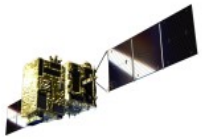
First H3 Launch

▲COP21

GCOM-C

GOSAT-2

Advanced Optical



QZSS

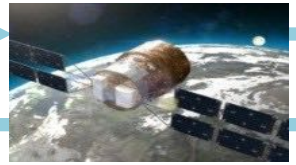
Social Infrastructure/ Societal Benefits

2024

LEO and beyond LEO

ISS

HTV



HTV-X

KIBO Utilization

Human Space Technologies

Env. Control and Life Support System

Hayabusa2

Sample Return

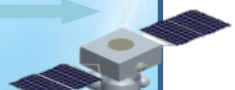
To Mercury

Robotics Space Technologies

BepiColombo

SLIM

Pin point Landing on Moon



Mars Moon Exploration

Moon, Asteroid and Mars missions


Thank you for your attention.