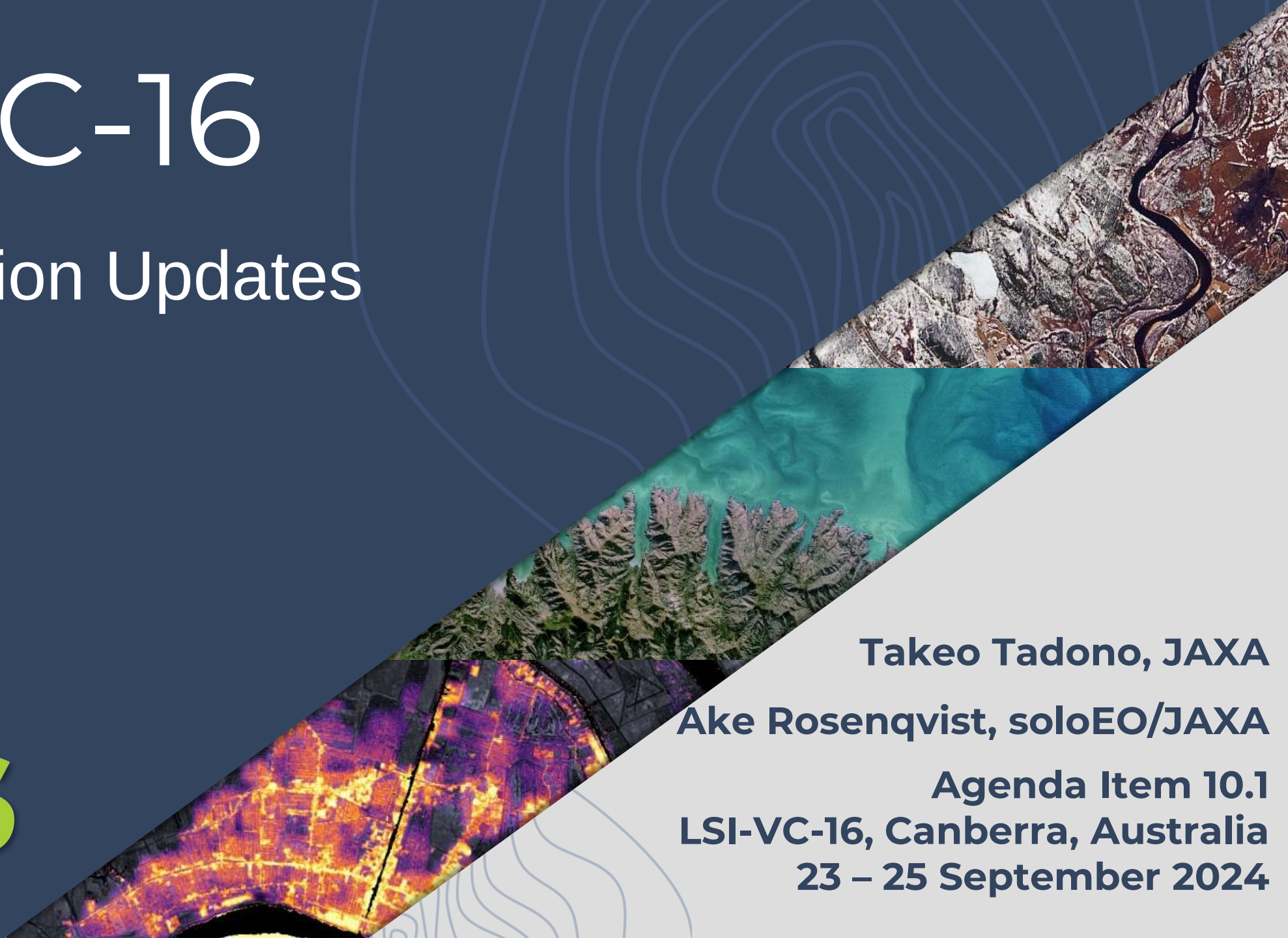
LSI-VC-16

JAXA Mission Updates

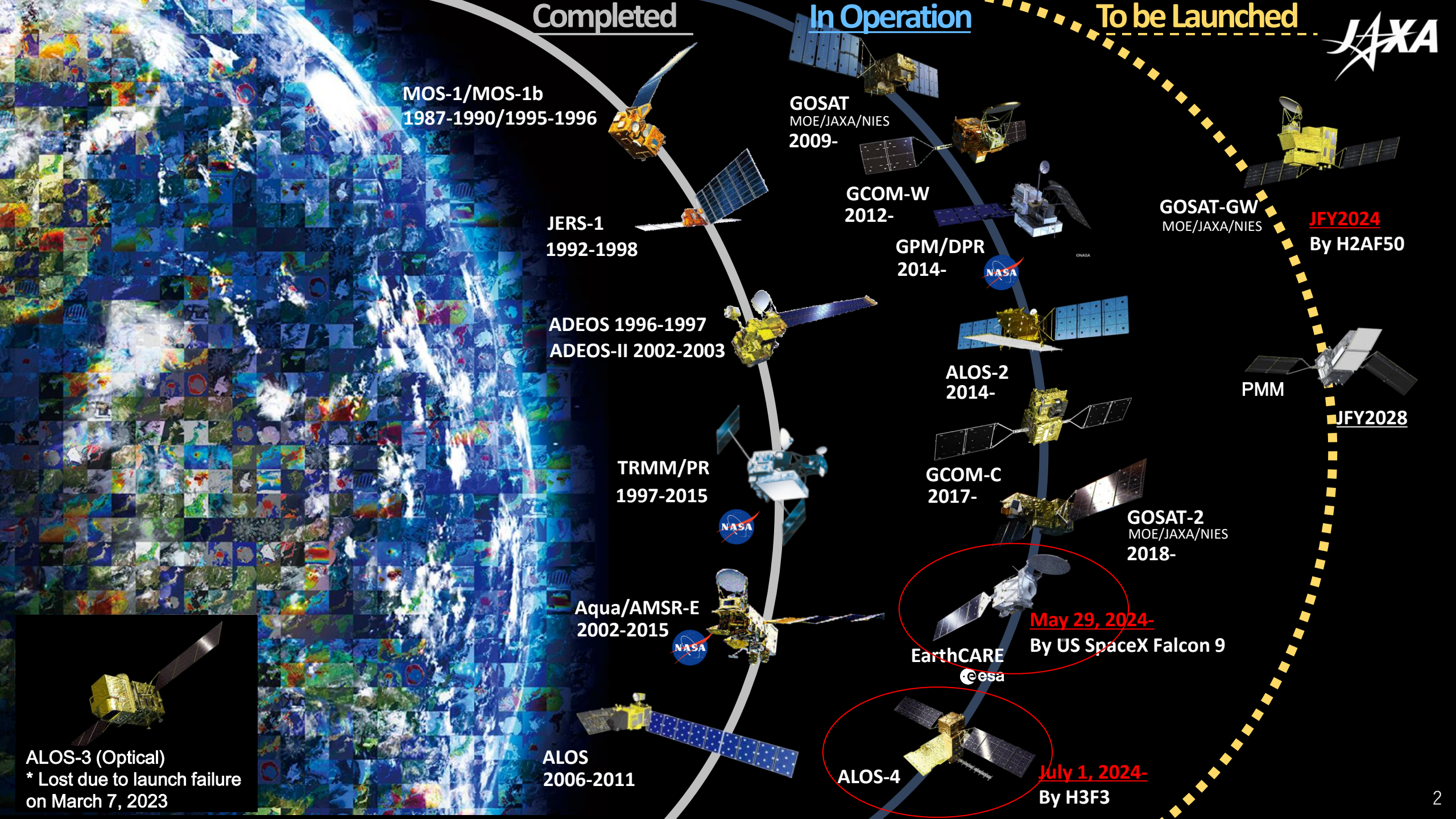


Takeo Tadono, JAXA

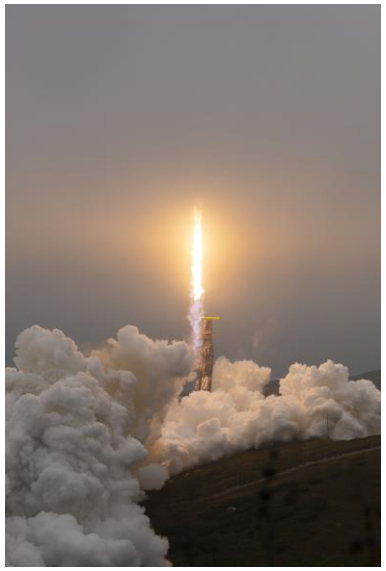
Ake Rosenqvist, soloEO/JAXA

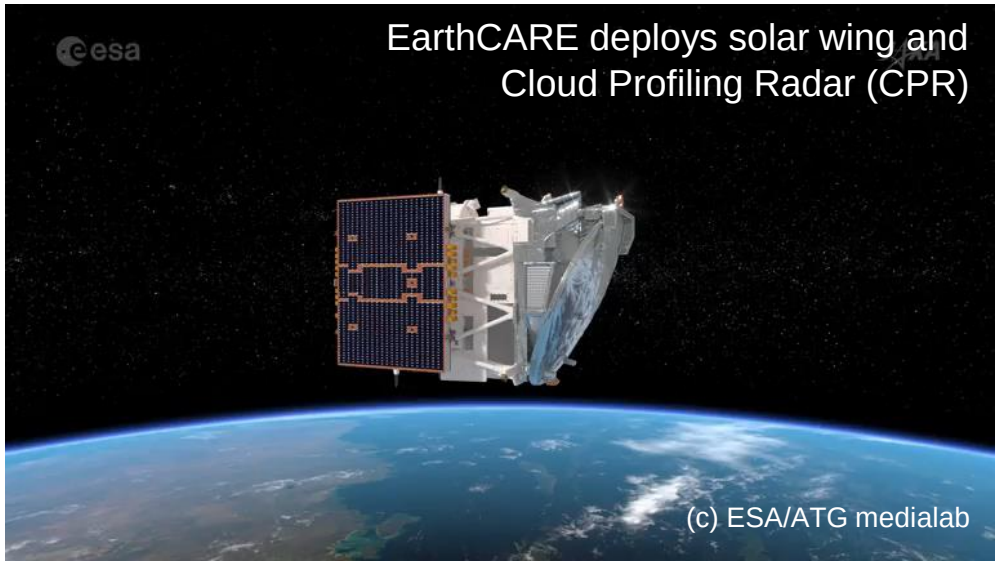
Agenda Item 10.1
LSI-VC-16, Canberra, Australia
23 – 25 September 2024

CEOS
Committee on
Earth Observation Satellites


Completed
In Operation
To be Launched
JAXA
MOS-1/MOS-1b
1987-1990/1995-1996
JERS-1
1992-1998
ADEOS 1996-1997
ADEOS-II 2002-2003
TRMM/PR
1997-2015
Aqua/AMSR-E
2002-2015
ALOS
2006-2011
GOSAT
MOE/JAXA/NIES
2009-
GCOM-W
2012-
GPM/DPR
2014-
ALOS-2
2014-
GCOM-C
2017-
GOSAT-2
MOE/JAXA/NIES
2018-
EarthCARE
esa
May 29, 2024-
By US SpaceX Falcon 9
ALOS-4
July 1, 2024-
By H3F3
GOSAT-GW
MOE/JAXA/NIES
JFY2024
By H2AF50
PMM
JFY2028
ALOS-3 (Optical)
* Lost due to launch failure
on March 7, 2023

Launched EarthCARE by Falcon 9 on 29th May 2024

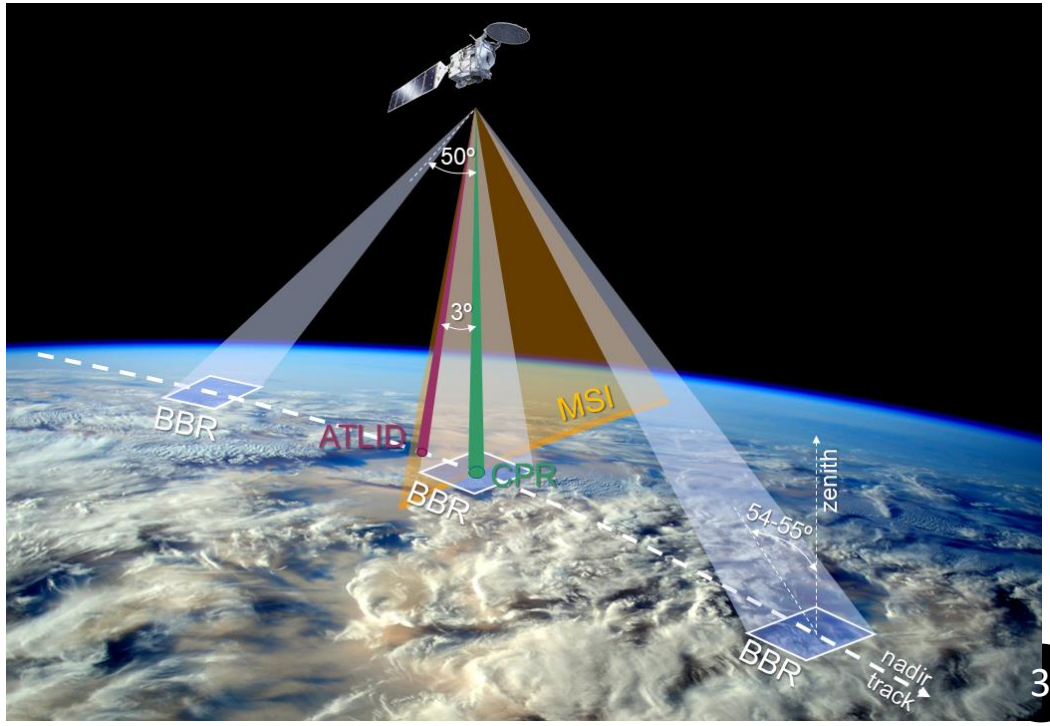


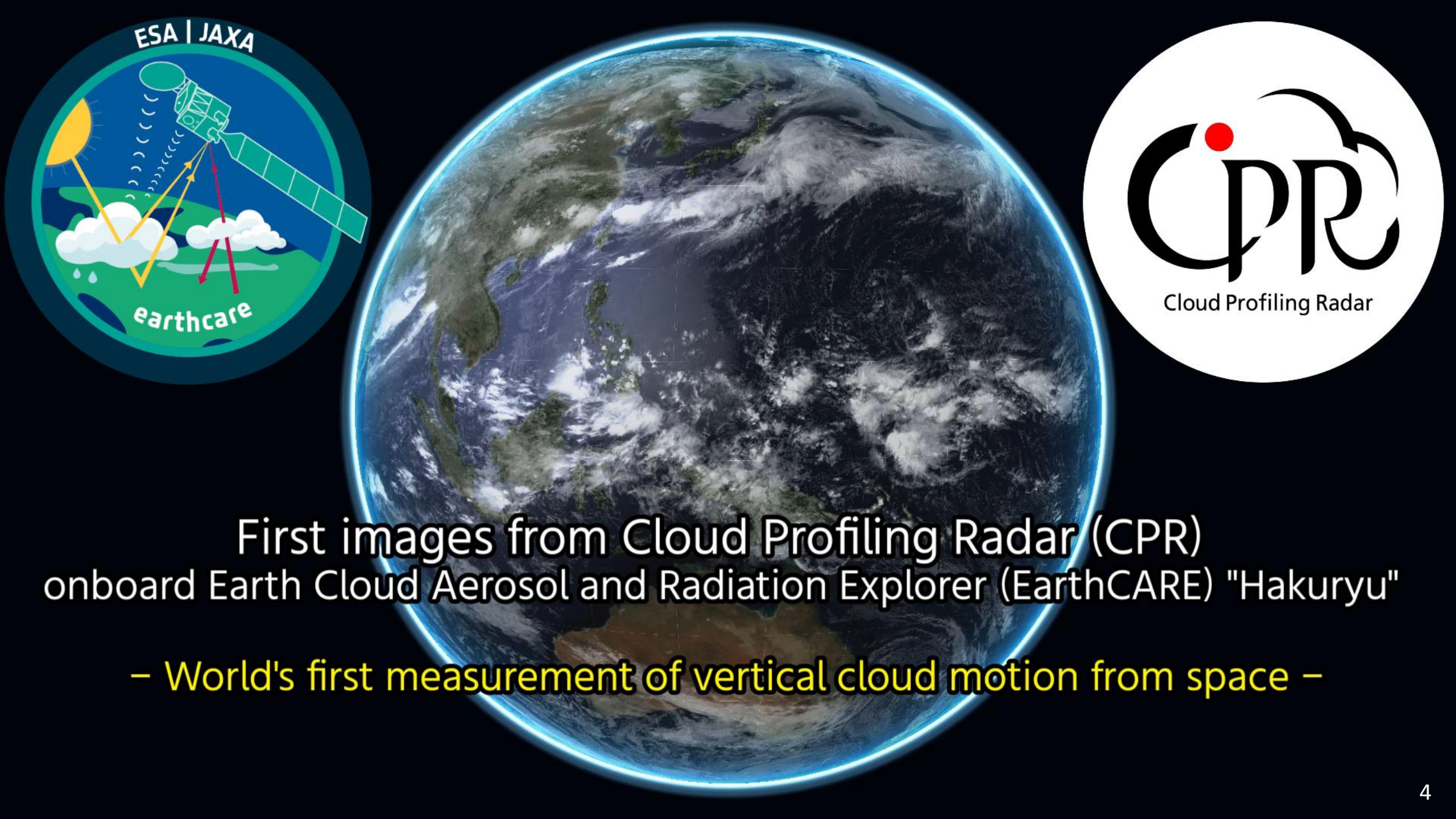


The full deployment of the EarthCARE/CPR was confirmed on 30th May 2024.

Orbit	Sun-synchronous sub-recurrent orbit Altitude: approx. 400km Inclination angle: 97.05° Local Sun Time at Desc.: 14:00 Revisit time: 25 days
Instruments	- **Cloud Profiling Radar (CPR)** by NICT & JAXA - **Atmospheric Lidar (ATLID)** by ESA - **Multi-Spectral Imager (MSI)** by ESA - **Broad-Band Radiometer (BBR)** by ESA
Mass	Approx. 2.2 tons at launch
Designed lifetime	3 years

- **Europe-Japan joint** mission
- **Global distributions of cloud & aerosol profiles and radiation budget** to contribute to precise **understanding of climate change**
- JAXA and NICT provides world's first satellite-based cloud vertical motion by the Cloud Profiling Radar (CPR) at 94 GHz with **Doppler Capability** at 0.8 km spatial resolution.





First images from Cloud Profiling Radar (CPR) onboard Earth Cloud Aerosol and Radiation Explorer (EarthCARE) "Hakuryu"

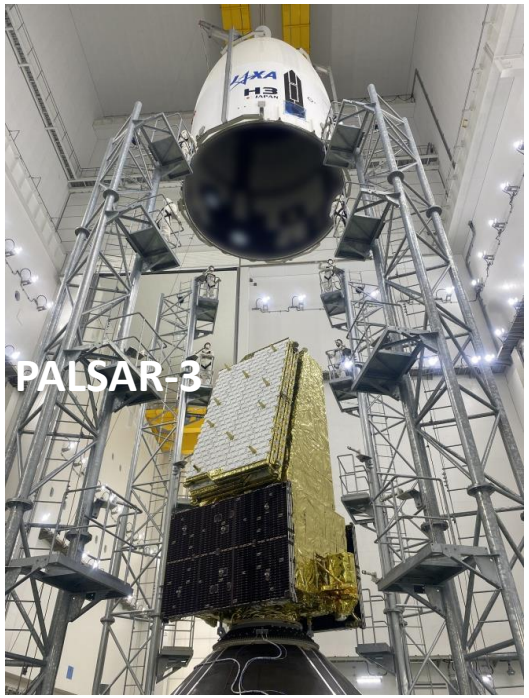
– World's first measurement of vertical cloud motion from space –

Launched ALOS-4 by H3 Flight 3 (H3 F3) on 1st July 2024

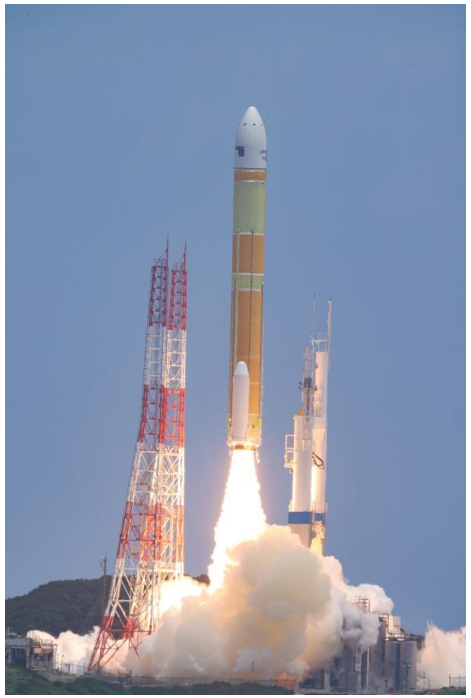
- H3 launch vehicle Flight 3 (H3 F3) carried on the Advanced Land Observing Satellite-4 (ALOS-4) was successfully launched at 12:06:42 on 1st July 2024 JST.
- After two days of the Critical Operations Phase to deploy the solar array paddles and the antennas of PALSAR-3 and SPAISE3 etc., ALOS-4 was confirmed to keep in a stable condition to remain in orbit.

> *Conducting the Initial Functional Verification*

ALOS-4



Stored in the fairing

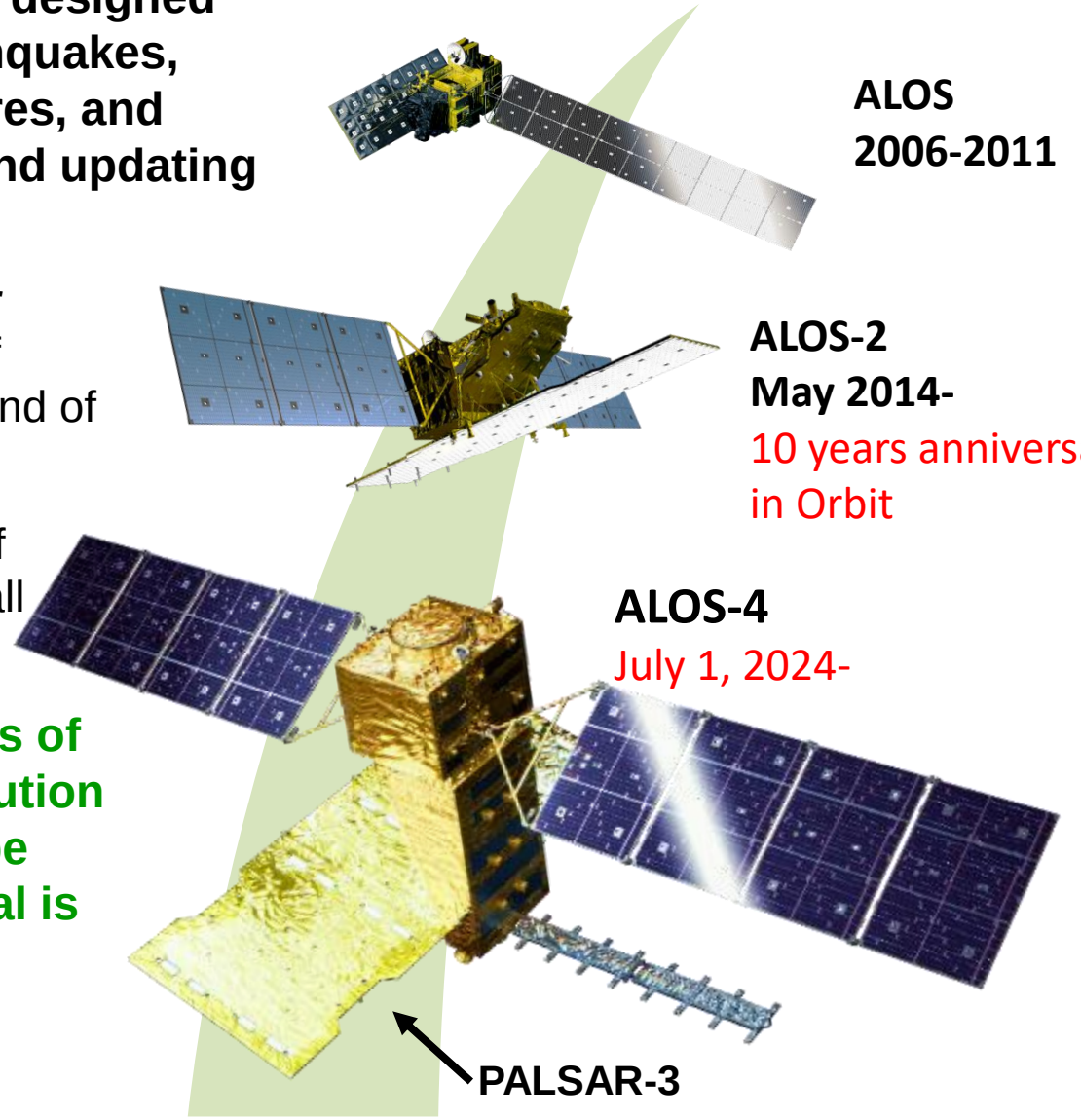


H3F3 launch

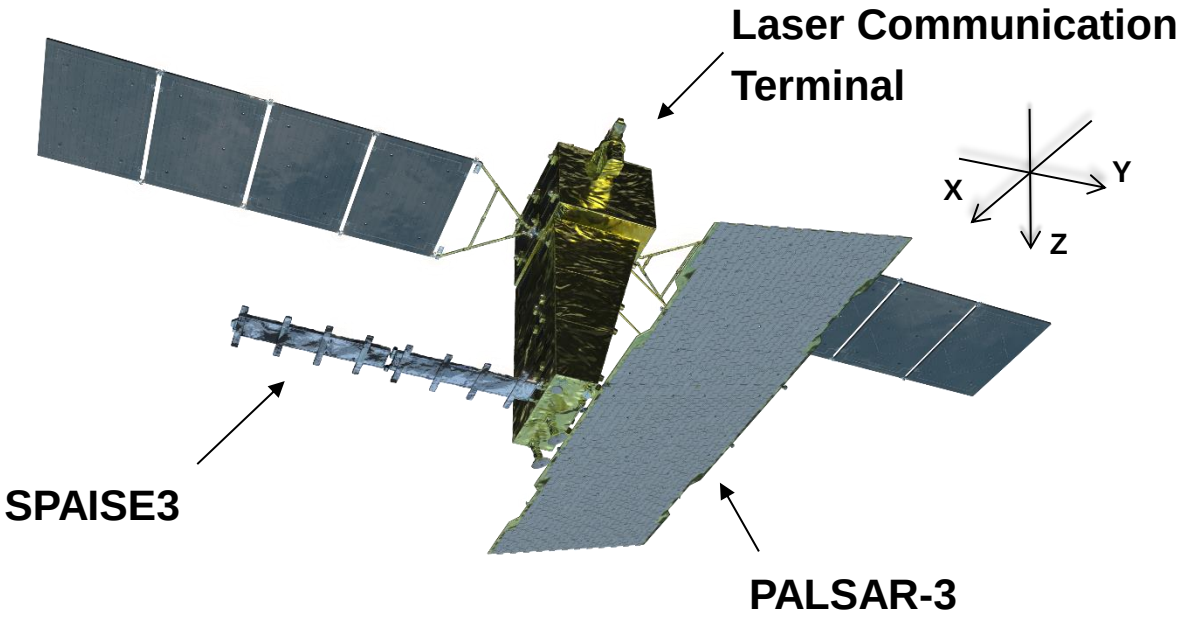
ALOS Series Missions and ALOS-4

ALOS series missions are Earth observation satellites designed to monitor and assess various disasters such as earthquakes, floods and landslides caused by heavy rains, forest fires, and volcanic eruptions, and to contribute to maintaining and updating geospatial information.

- The first ALOS with ***optical*** and ***Synthetic Aperture Radar (SAR)***, launched in 2006, had been used in a wide range of fields including mapping and disaster monitoring, until the end of its operations in 2011.
- ALOS-2, launched in 2014, succeeds to the SAR mission of ALOS. The SAR sensor can observe day and night and in all weather conditions.
- **ALOS-4 is the successor to the L-band SAR missions of ALOS and ALOS-2. While maintaining the high resolution (3 m), the width and frequency of observations will be significantly improved compared to ALOS-2. The goal is to ensure the continuity with ALOS-2 data, to early generate results and to develop new use cases.**



ALOS-4 Overview

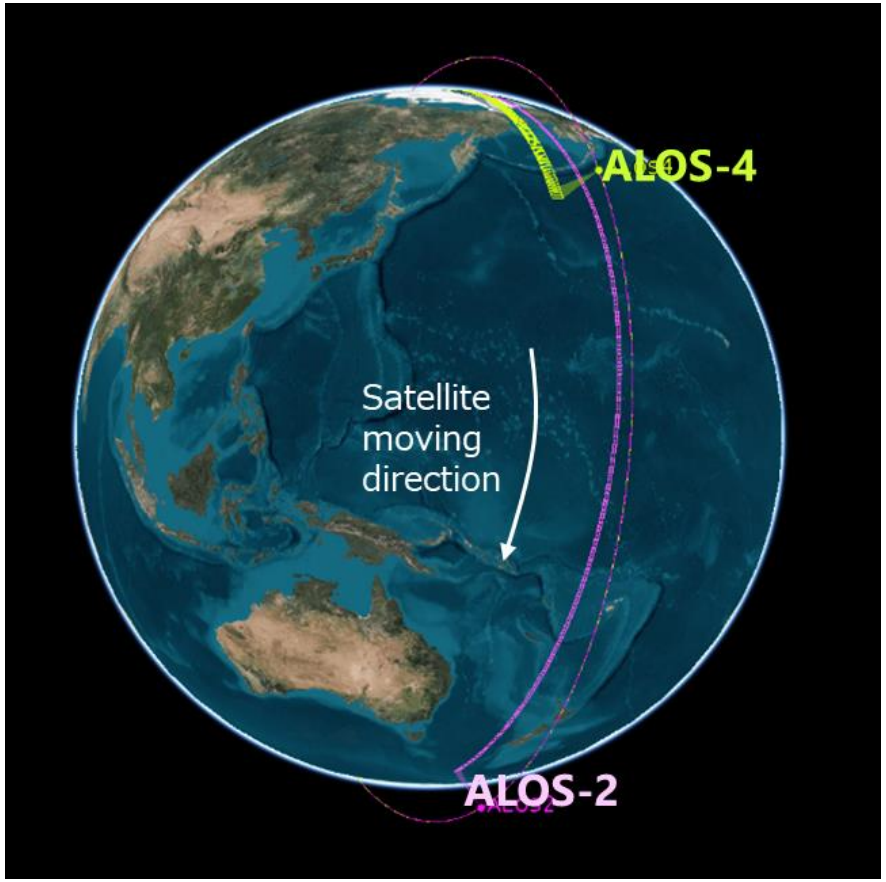


Same orbit as ALOS-2
↓
Enable analysis combining data from ALOS-2 and ALOS-4

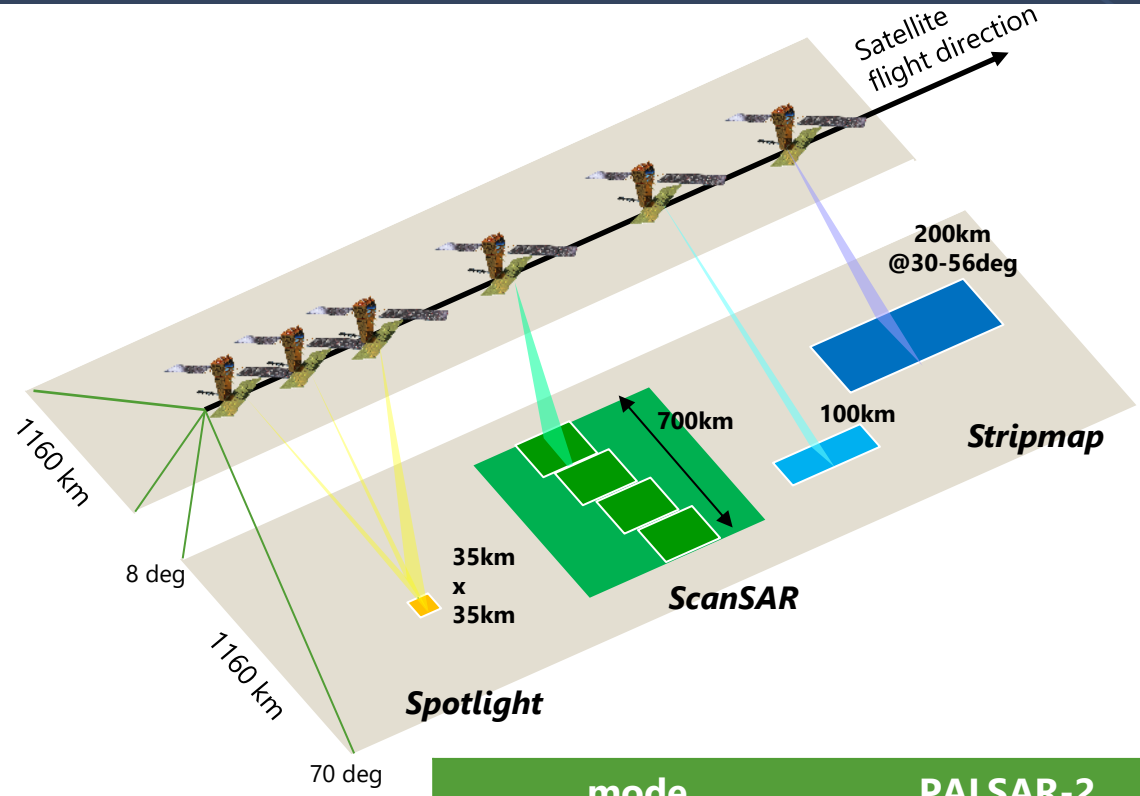
Designed Life Time		7 years
Mission Instruments		PALSAR-3 SPAISE3
Size (X, Y, Z)		10.0m×20.0m×6.4m
Satellite Mass		Approx. 3,000 kg
Electricity	Solar Array	Approx. 7,000 W
	Battery	380 Ah
Data Recorder		Approx. 1 Tbyte
Orbit	Type	Sun-synchronous
	Altitude	628 km
	LSDN	12:00
	Revisit Cycle	14 days
	Inclination	97.9 deg.

SPAISE3：SPace based Automatic Identification System Experiment 3
PALSAR-3：Phased Array type L-band Synthetic Aperture Radar-3

ALOS-4 “DAICHI-4” & PALSAR-3



The phase difference between ALOS-2/-4 is about 103°, resulting short latency (<30 min) for emergency observations



mode	PALSAR-2	PALSAR-3
Stripmap (res. 3 m/6 m/10 m)	30-70 km	**100 or 200 km**
ScanSAR (res. 25 m)	350 or 490 km	**700 km**
Spotlight (res. 3 m x 1 m)	25 km x 25 km	**35 km x 35 km**

ALOS-4 Upcoming Plan

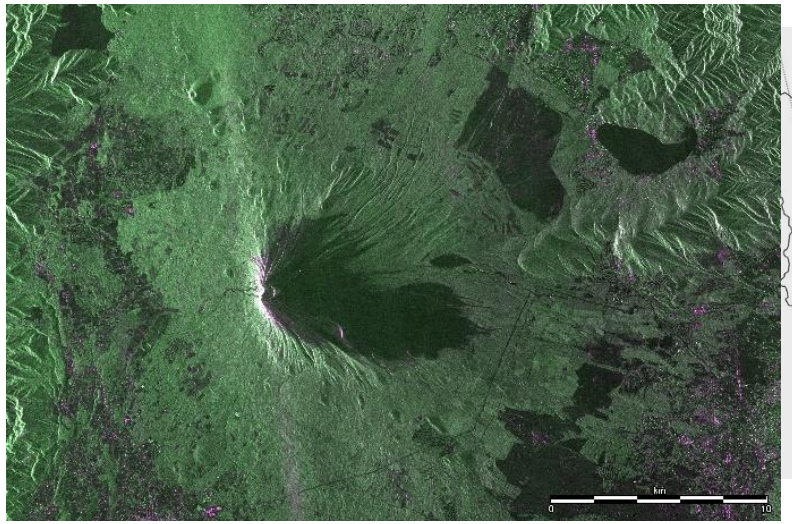
Launch ▲ **July 1st, 2024**

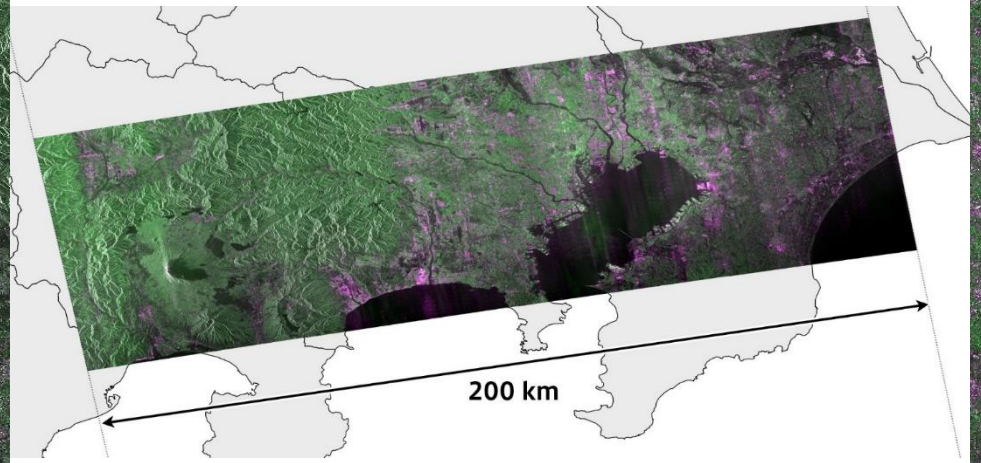
Critical Operation	Initial Functional Verification Operation	Initial Calibration and Validation Operation	Nominal Observation Operation
After separation, satellite attitude stabilization and deployment of solar array paddle, and deployments of PALSAR-3 antenna and SPAISE3 antenna	Verification of functions and performance of the satellite system and mission instruments	Calibration and validation of PALSAR-3 standard products	Start of provision of PALSAR-3 standard products
Up to 3 days after launch			
	July 3, 2024		
	CVST #1 *Sep. 6 online*	**CVST #2** *F2F in PI Workshop on Nov. 18-22*	**CVST #3** *M/Dec online*
	Up to 3 months after launch		
		Up to 6 months after launch	After 6 months from launch

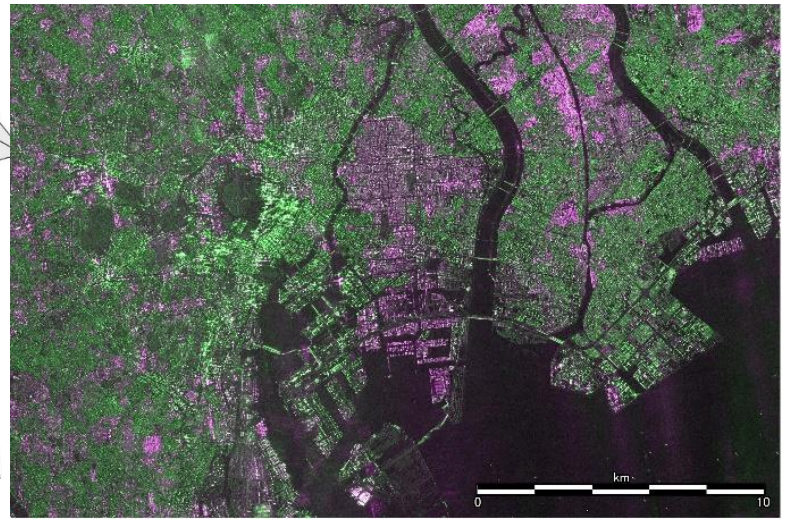
- ✓ **The first image have been released on July 31, 2024.**
- ✓ **The "Cal/Val and Science Team" (CVST) initial activity is starting now: The 1st Meeting on Sep. 6 by online, the 2nd Meeting will be in the PI Workshop on Nov. 18-22, and the 3rd Meeting will be around mid-December online.**
- ✓ **CVST Member will report the evaluation status and results in the 2nd and 3rd meetings.**

ALOS-4 First Image

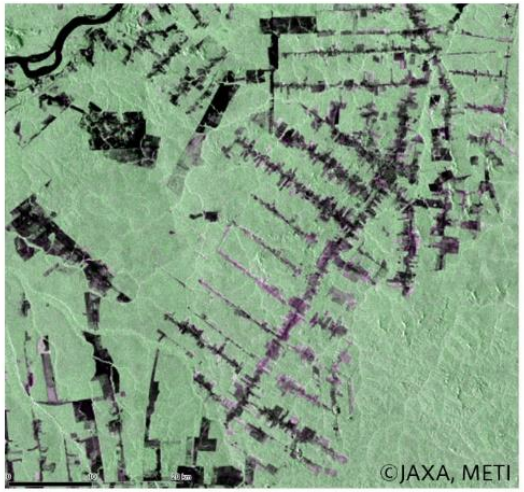
■ ***"3 m resolution, dual-pol, and 200 km of obs. swath width" in Japan*** (23:38, July 15, 2024 JST)



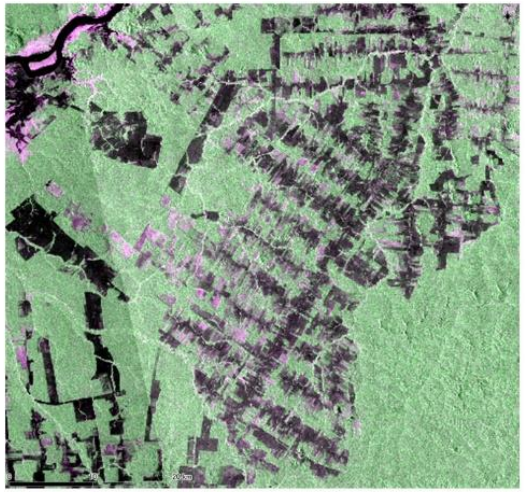




■ ***"Observation Continuity"*** **10 m resolution, dual-pol, and 200 km of obs. swath width in Rondônia, Brazil** (13:43, July 15, 2024 JST)



PALSAR
July-Aug., 2007



PALSAR-2
Oct. 2014 – Feb. 2015

PALSAR-3
July 15, 2024

ALOS-4 Basic Observation Scenario (BOS)

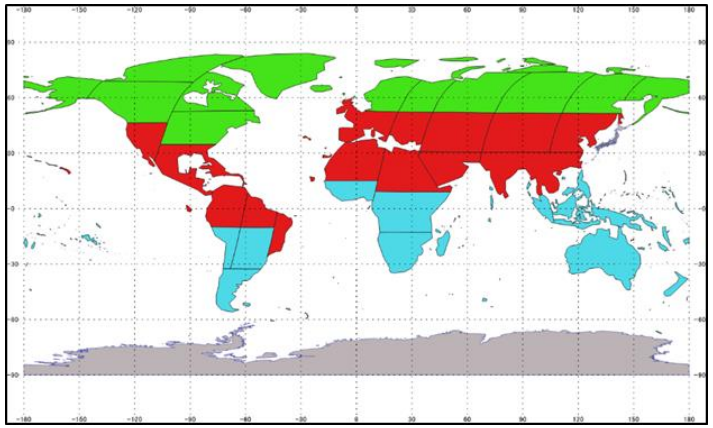
Global Observations *Draft version (under discussion)*

1 year = 26 cycles

Cycle	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26
day	1	15	29	43	57	71	85	99	113	127	141	155	169	183	197	211	225	239	253	267	281	295	309	323	337	351
Des.	**Global basemap**								**Disaster**		**Thematic observations**															
	HB6R	HB8R	HB6R	HB8R	HB6R	HB8R			XB2R		(background: FW1R, HB6/8R, etc.)															
Asc.	**Global basemap**				**Disaster**		**Thematic observations**																			
	FW1R				XB2R		(background: FW1R, HB6/8R, etc.)																			

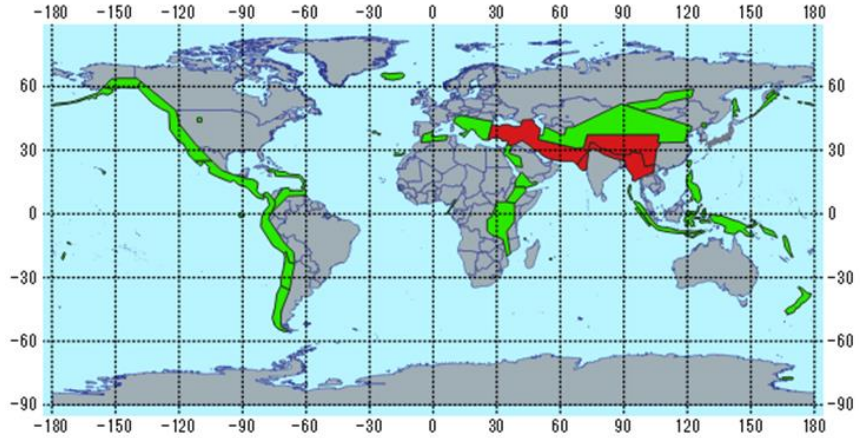
Global basemap

- **Stripmap 10 m DP 200 km swath** covered by 3 cycles
- **Stripmap 6 m FP 100 km swath** covered by 6 cycles



Disaster basemap

- **ScanSAR DP 700 km** covered by 2 cycles



ALOS-4 Products

Standard Products

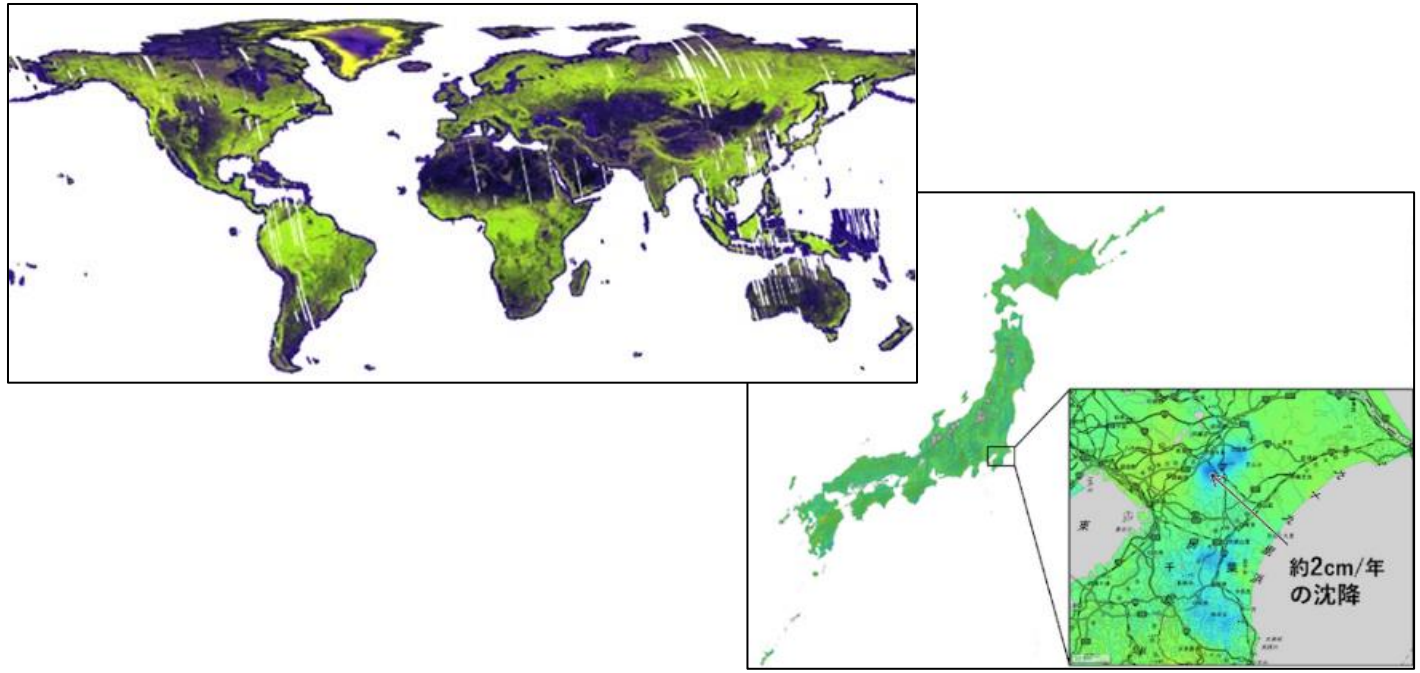
- Compatible definition with ALOS-2
- Product documentation and sample products are in preparation
- Data policy is under discussion

Processing level	Content	Format
L1.1	Single look complex image	CEOS
L1.2	Signal data processed to a single-beam observation equivalent and uniform PRF	CEOS
L1.5	Ground-range multi-look amplitude image	CEOS, GeoTIFF
L2.1	Ground-range multi-look amplitude image with ortho correction to L1.5	CEOS, GeoTIFF

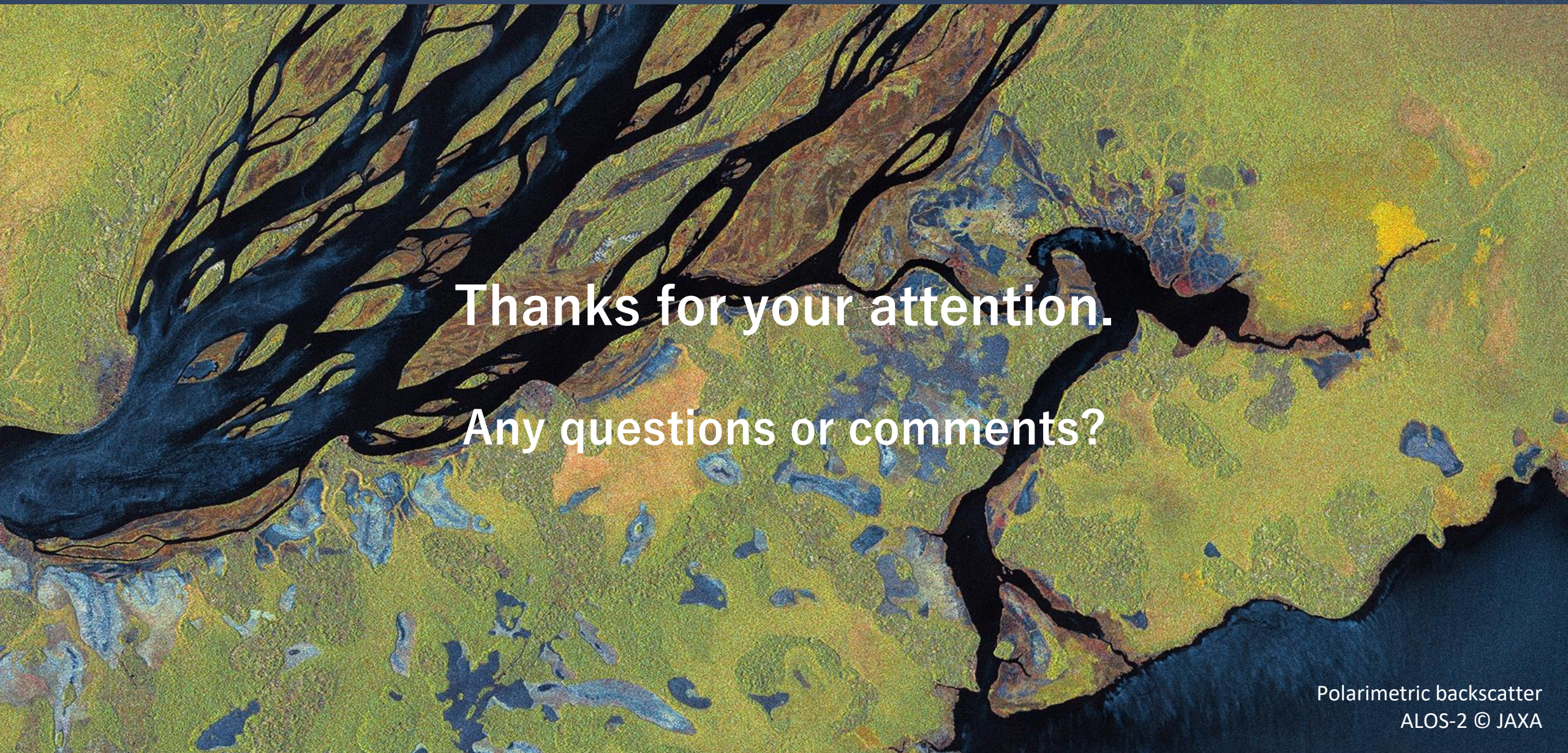
Higher-level Products

https://ceos.org/ard/

- Global mosaic compliant CEOS-ARD SAR NRB
- Global forest/non-forest map (FNF)
- Disaster response map and information
- Time-series InSAR over entire Japan by GSI, etc.



© GSI



Thanks for your attention.

Any questions or comments?

Polarimetric backscatter
ALOS-2 © JAXA