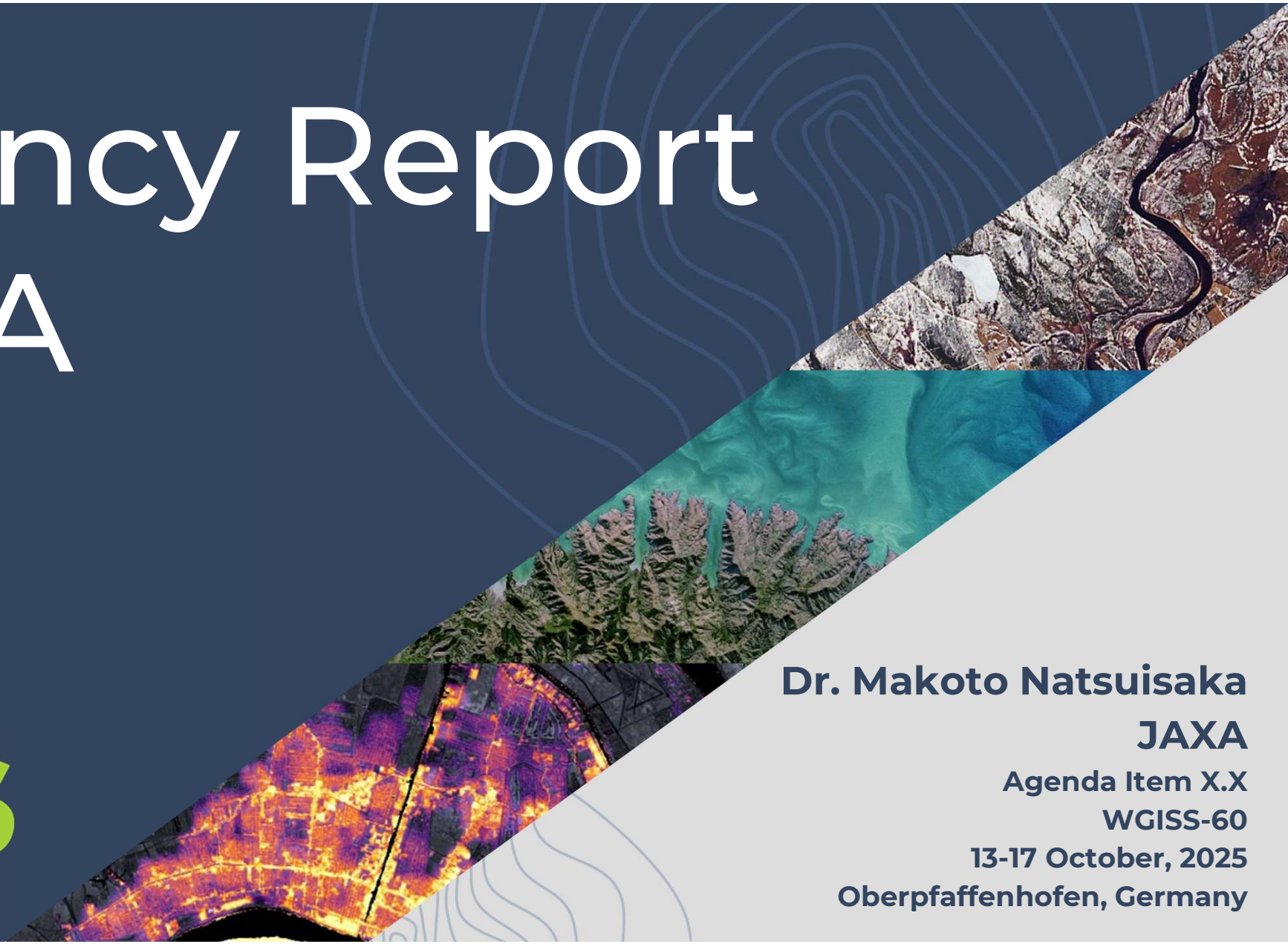
Agency Report
JAXA



Dr. Makoto Natsuisaka
JAXA

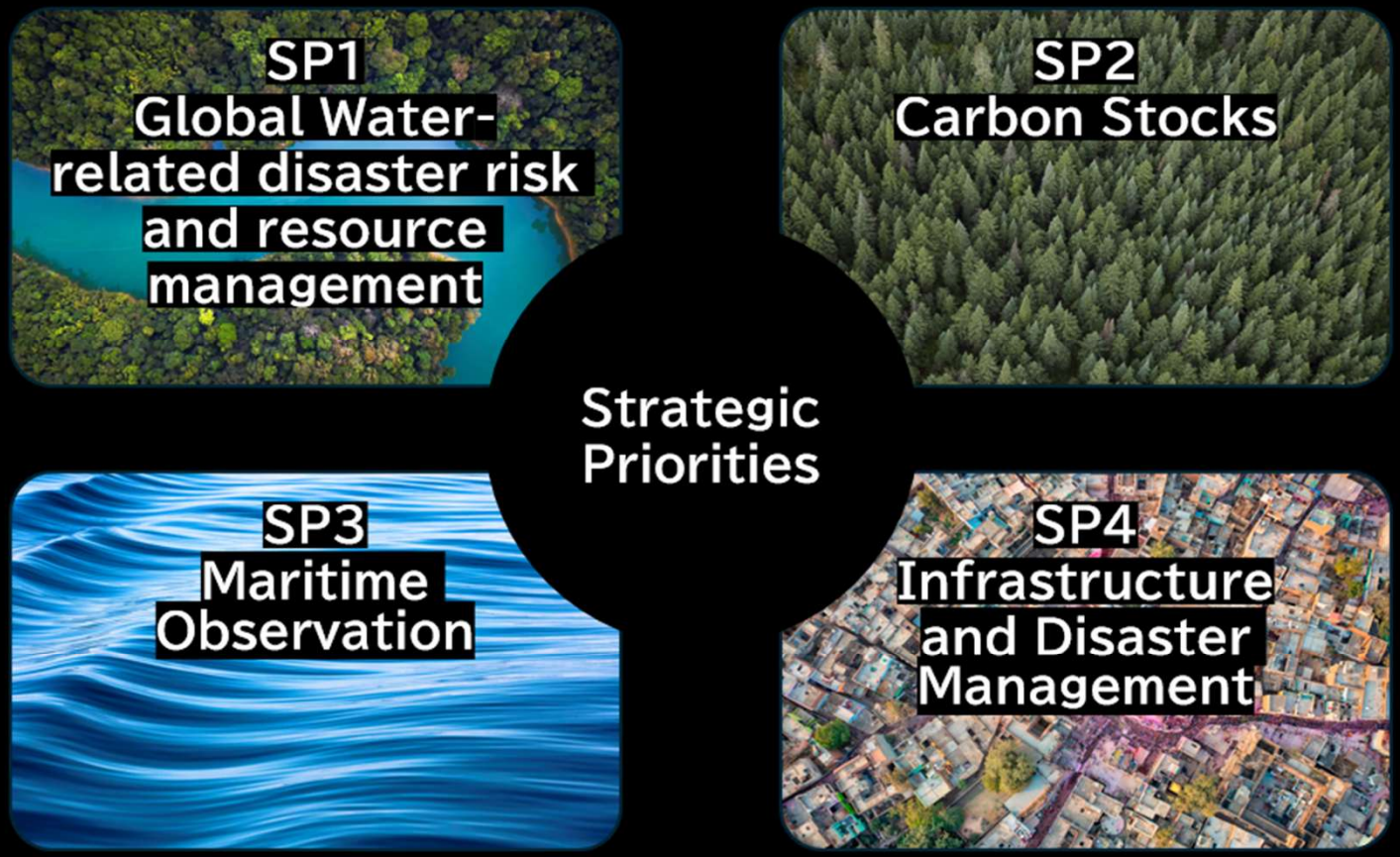
Agenda Item X.X
WGISS-60
13-17 October, 2025
Oberpfaffenhofen, Germany

CEOS
Committee on
Earth Observation Satellites

Program Update

- Strategic update is on going; from “R&Ds” to “more focusing on the social benefits”.

FOUR THEMATIC STRATEGIC PRIORITIES



Societal Benefit

- Disaster Resilience
- Infrastructure Management
- Climate Action
- Safety and Security
- Resource Management
- Urban Development
- Business

INITIATIVE | Strategic Priorities

SP1
Global Water-related Disaster Risk and Resource Management

Disaster Resilience | Resource Management | New Business

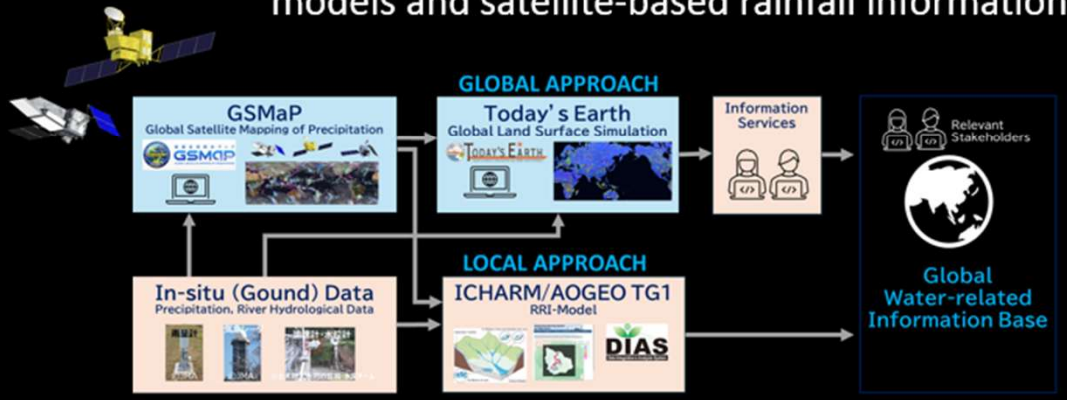
Strengthening global water-related disaster resilience and resource management through the space-based solutions for safer and more resilient society.

Challenges

- 1.4 Billion affected (2000-2019)
- Doubling of Death (in last 10years)
- US$155B in Losses (in last 50years)

Actions to resolve

Develop and deliver water-related solutions using high-resolution, borderless simulation models and satellite-based rainfall information



SP2
Understanding natural capital and utilizing satellite data for carbon credits

Climate Action | New Business

Establishing effective methods for assessing the natural capital of forests and rice paddies to support net zero targets and improve trust in carbon credits.

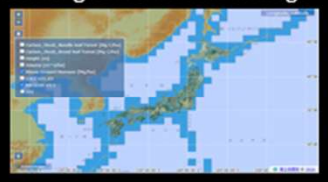
Challenges

Ensuring reliability and transparency of carbon credit

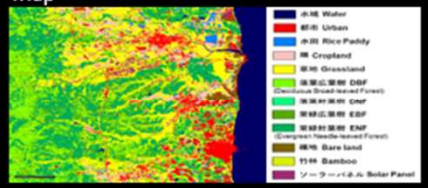
Actions to resolve

Develop and deliver water-related solutions using high-resolution, borderless simulation models and satellite-based rainfall information

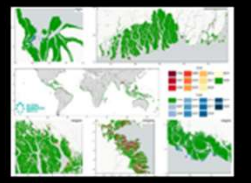
High-Resolution map of forest above-ground carbon storage

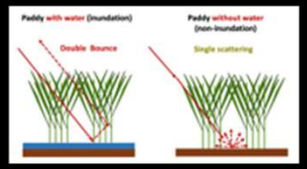


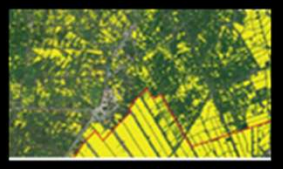
High-Resolution Land-Use and Land-Cover Map

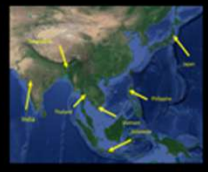


Global Mangrove Map









Paddy field inundation and non-inundation monitoring

APRSAF/SAFE CH4Rice project

INITIATIVE | Strategic Priorities

SP3
Maritime Observation

Safety and Security | New Business

Strengthening capabilities for monitoring maritime conditions through satellite observation, while building cooperative relationships with surrounding countries

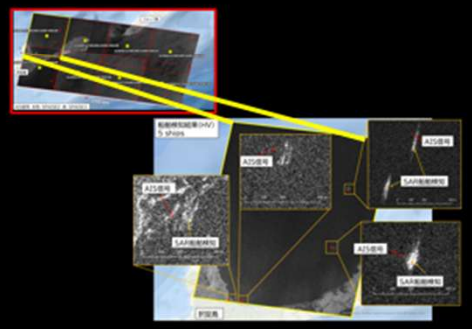
Challenges

Enhancement of maritime observation capabilities across wide ocean areas through international cooperation

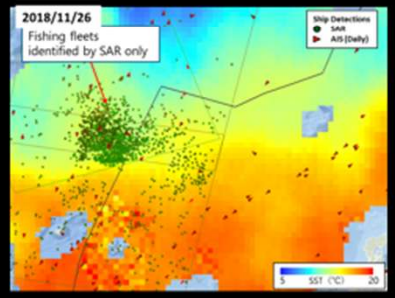
Actions to resolve

Strengthen capabilities for monitoring maritime activities and conditions through an extensive satellite observation network by public-private partnerships and promote international cooperation

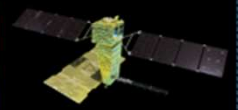
Ship Detection



Ocean Environment Monitoring



ALOS-4
(L-band SAR and AIS)



SP4
Infrastructure and Disaster Management

Disaster Resilience | Infrastructure Management | Urban Development | New Business

Leveraging satellite-based geospatial data and infrastructure monitoring services, we aim to streamline land management, build a digital disaster management platform, and create globally competitive businesses.

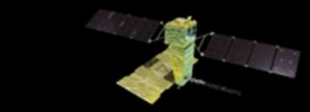
Challenges

Disaster risk management/response and rapid damage assessment

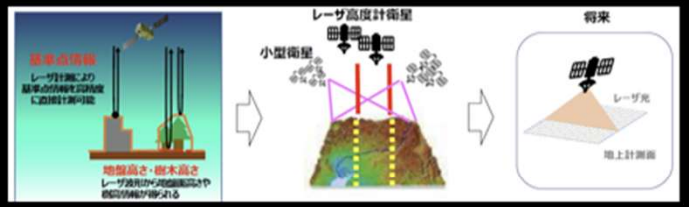
Actions to resolve

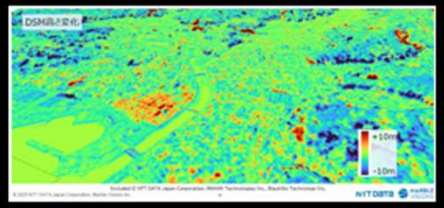
Enable and deliver high-precision 3D topographical information and infrastructure monitoring capabilities and services through satellite observation

ALOS-4
(L-band SAR and AIS)



Ground/infrastructure motion monitoring

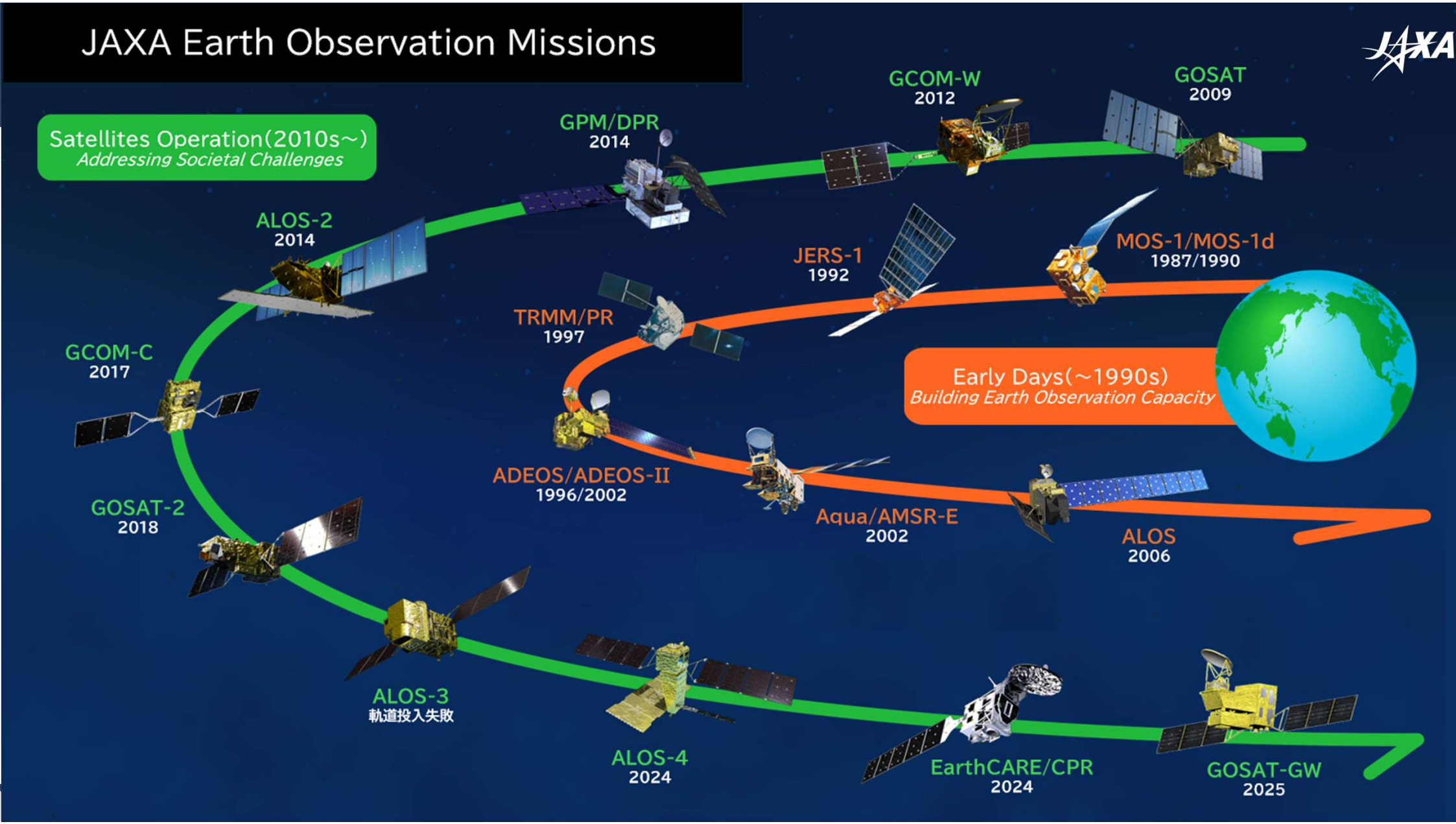




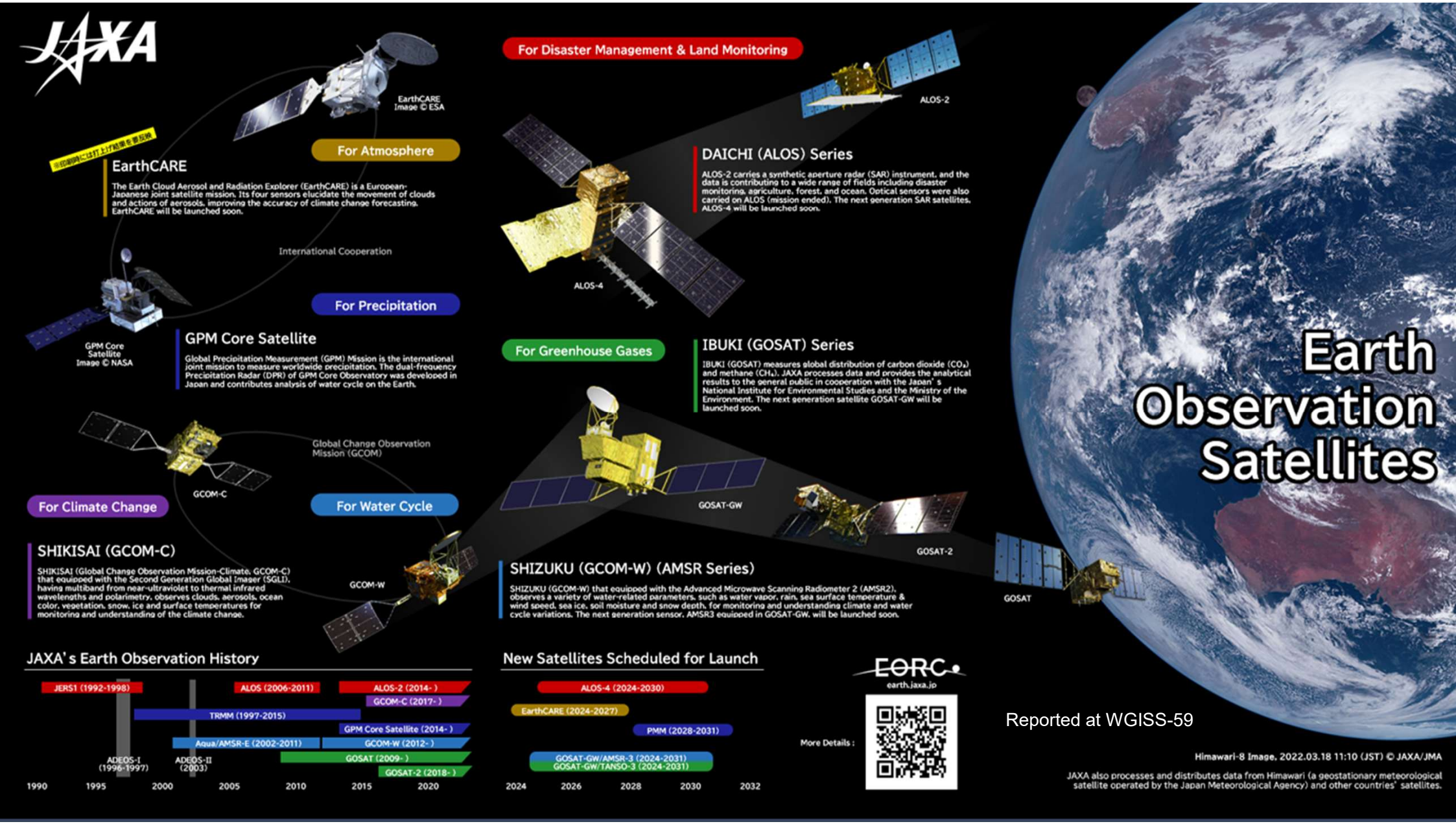
Accurate 3D mapping with optical and LIDAR sensors

Project Updates

- New Satellites
  - EarthCARE
  - ALOS-4
- Data Distribution
  - PID
  - G-Portal
  - STAC
  - AI/ML


JAXA Earth Observation Missions
JAXA
Satellites Operation(2010s~)
Addressing Societal Challenges
GCOM-W
2012
GOSAT
2009
GPM/DPR
2014
ALOS-2
2014
JERS-1
1992
MOS-1/MOS-1d
1987/1990
TRMM/PR
1997
GCOM-C
2017
Early Days(~1990s)
Building Earth Observation Capacity
ADEOS/ADEOS-II
1996/2002
Aqua/AMSR-E
2002
ALOS
2006
GOSAT-2
2018
ALOS-3
軌道投入失敗
ALOS-4
2024
EarthCARE/CPR
2024
GOSAT-GW
2025

Earth Observation Satellites



Reported at WGISS-59

Earth Cloud Aerosol and Radiation Explorer (EarthCARE)

EarthCARE

Earth Cloud Aerosol and Radiation Explorer

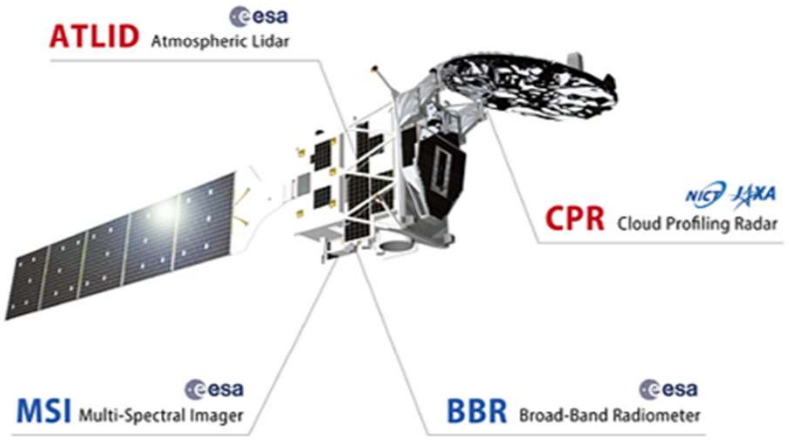
Cloud and aerosol continue to contribute the two largest source of uncertainty in the current climate projections, and accurate information on vertical cloud and aerosol layers is necessary.

EarthCARE is an ESA Earth Explorer jointly developed and operated by ESA and JAXA to observe cloud, aerosol and radiation (Illingworth et al. 2015, Wehr et al. 2023).

Observation Instruments on EarthCARE

CPR	Cloud Profiling Radar	NICT JAXA
ATLID	Atmospheric Lidar	esa
MSI	Multi-Spectral Imager	esa
BBR	Broadband Radiometer	esa

Synergetic Observation by 4 sensors



Cloud Profiling Radar CPR
(JAXA/NICT)

High Power 94GHz Doppler Radar

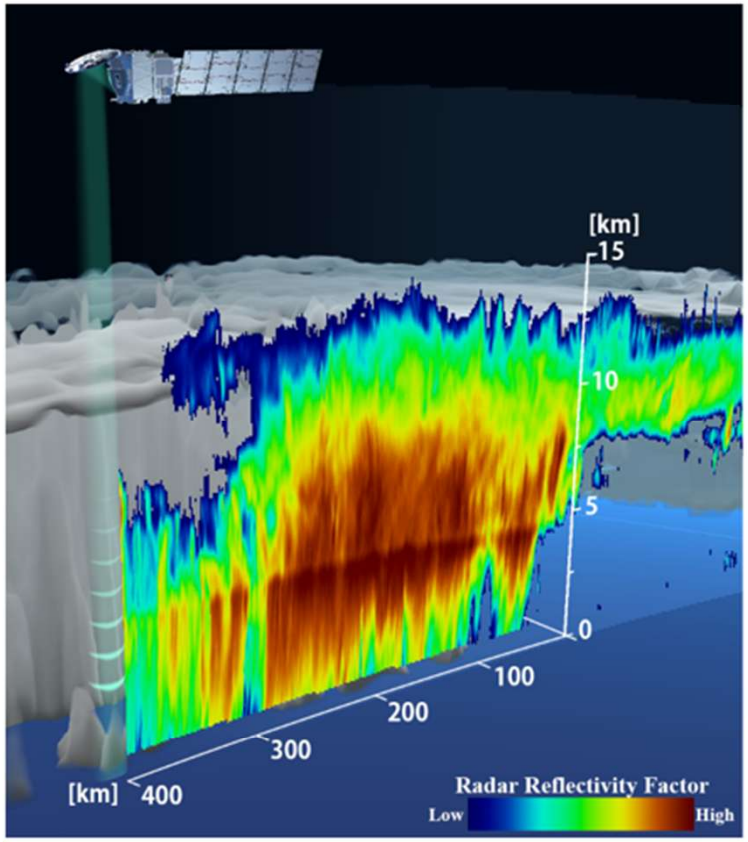
- *Cloud & Precipitation profiles, particle vertical velocity*

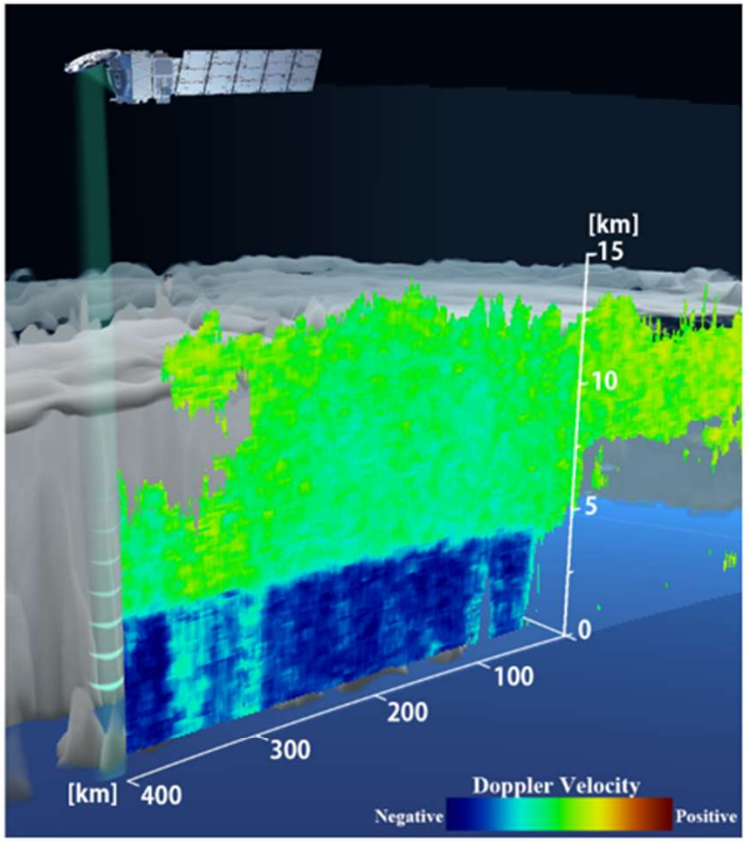
CPR is a **94 GHz (W-band) Doppler Radar** jointly developed by Japan Aerospace Exploration Agency (JAXA) and National Institute of Information and Communications Technology (NICT).

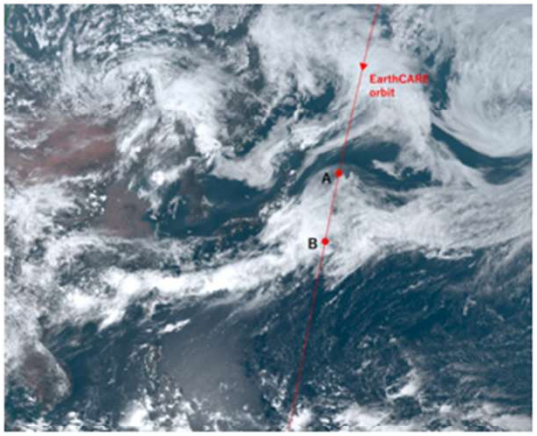
From its millimeter radar signal, it has the capability to observe **vertical distribution** and **physical characteristics** of **cloud** and **precipitation**.

In addition, information on the **in-cloud vertical motion** by **Doppler measurement function** can contribute to the understanding of cloud and precipitation process.

First images from Cloud Profiling Radar (CPR) :
JAXA/NICT/ESA released CPR first images on 27th June 2024







Cloud imagery from the Himawari-9 satellite with the orbit of the EarthCARE satellite

World's first measurement of vertical cloud motion from space

"Radar reflectivity factor"

→ Observation of cloud vertical structure

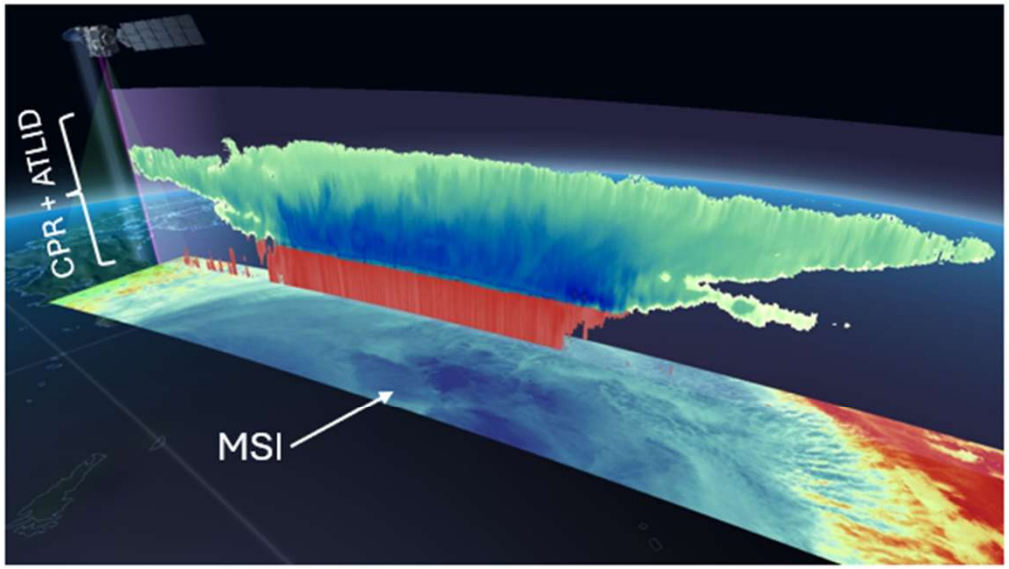
"Doppler velocity" (vertical cloud motion)

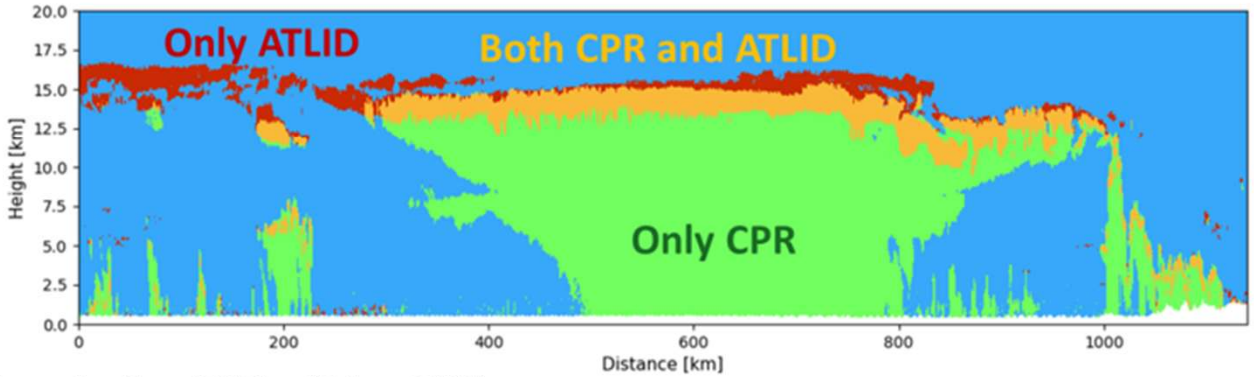
Increases downward at altitudes below 5 km

→ high falling speed of the raindrops

https://www.youtube.com/watch?v=1wIHIE6_RX8

Synergistic “cloud” images by sensors onboard the EarthCARE satellite





Observation time: 17UTC on 27 August 2024

https://www.satnavi.jaxa.jp/en/news/2024/10/04/9923/index.html

First image of the synergistic “cloud” images by sensors onboard the EarthCARE satellite for Typhoon Shanshan (2024), approaching the Japanese archipelago.

- Red colors indicate the vertical distribution of rain or cloud water, while blue colors indicate the vertical distribution of snow or cloud ice.

The CPR is sensitive to thick cloud, and the ATLID is sensitive to thin cloud and aerosol.
Combining the CPR and the ATLID allows observation of a wider range of cloud types. In addition, in cloud areas where both the CPR and the ATLID can observe, the cloud amount can be estimated more accurately using both sensors.

EarthCARE Products

EarthCARE is equipped with four types of sensors: Radar (CPR), Lidar (ATLID), Imager (MSI), and Broad-band Radiometer (BBR). These sensors are characterized by "synergy observation," which observes a single target point at the same time.

- **Level 1 (L1) product**

  Data obtained by converting the observation data of each individual sensor into engineering values.

  - CPR L1 algorithm/processor has been developed by JAXA/NICT.

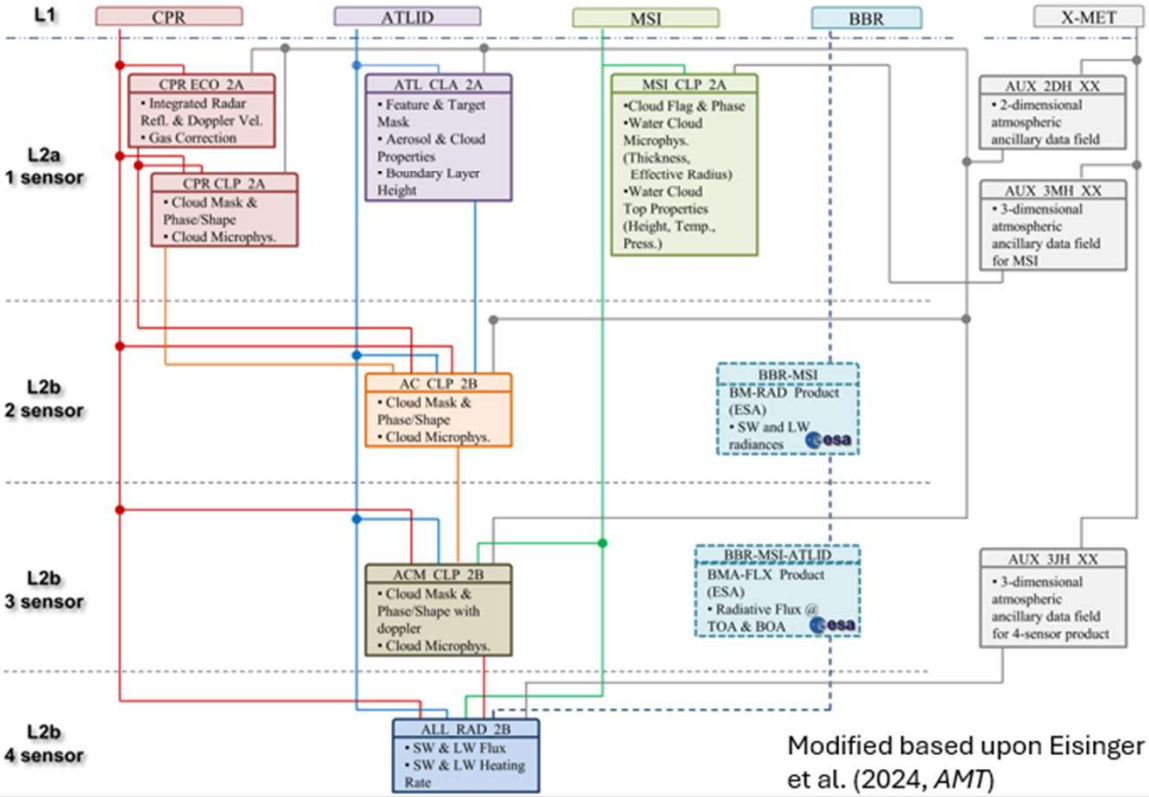
- **Level 2 (L2) product**

  Data obtained by converting the L1 product into atmospheric physical quantities (cloud water volume, cloud ice volume, optical thickness, etc.).

  - **L2a: Single sensor**
  - **L2b: Synergy**

L2 processing software have been developed in both Japan and Europe.

EarthCARE JAXA L2 Algorithm Flow Chart



Modified based upon Eisinger et al. (2024, *AMT*)

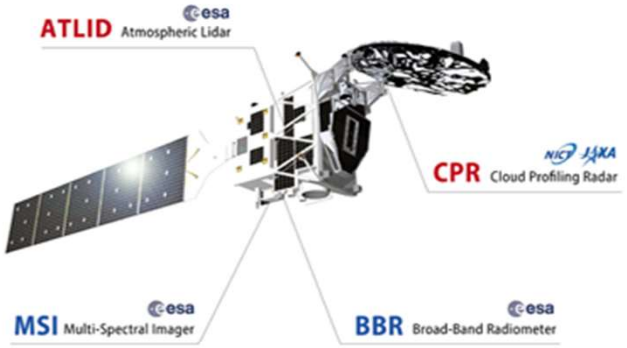
Level 1: Calibrated Instrument Data (Published 14/01/2025)

Level 2a: Single sensor Products (Published 17/03/2025)

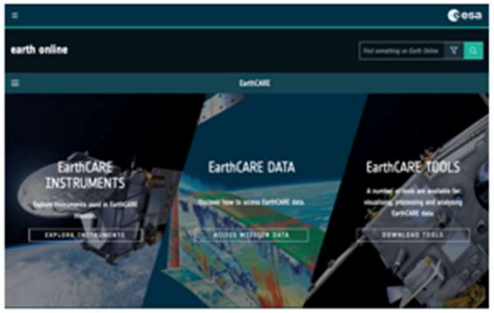
Level 2b: two-sensor synergy Products (Published 17/03/2025)

Level 2b: three- and four-sensor synergy Products (Planned release: 01/12/2025)

EarthCARE data utilization



JAXA G-Portal (data dissemination system) & the ESA website



https://gportal.jaxa.jp/gpr/?lang=en
https://earth.esa.int/eogateway/missions/earthcare

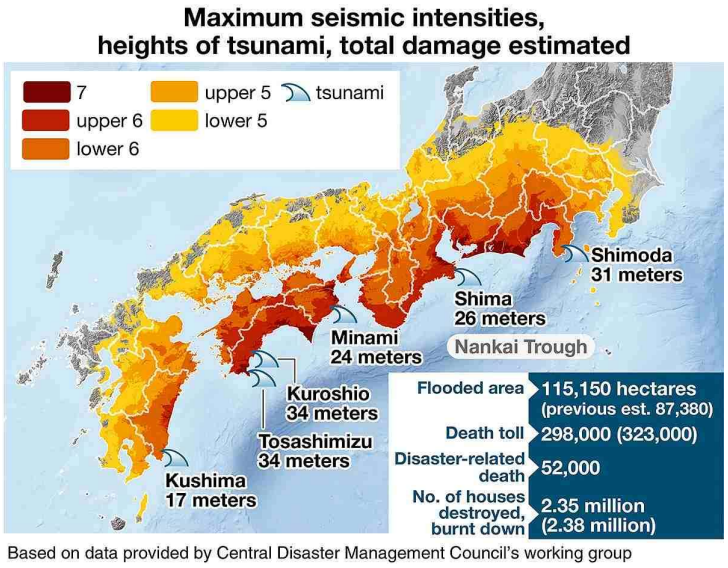
Exploring the scientific basis of cloud and aerosol in Climate Change
with the Japanese researchers from JAMSTEC, NiPR, universities and research institutes, …

Evaluating and improving climate models
with the Japanese researchers (Univ. Tokyo, JMA/MRI, JAMSTEC, NIES, RIKEN, universities and research institutes, …)

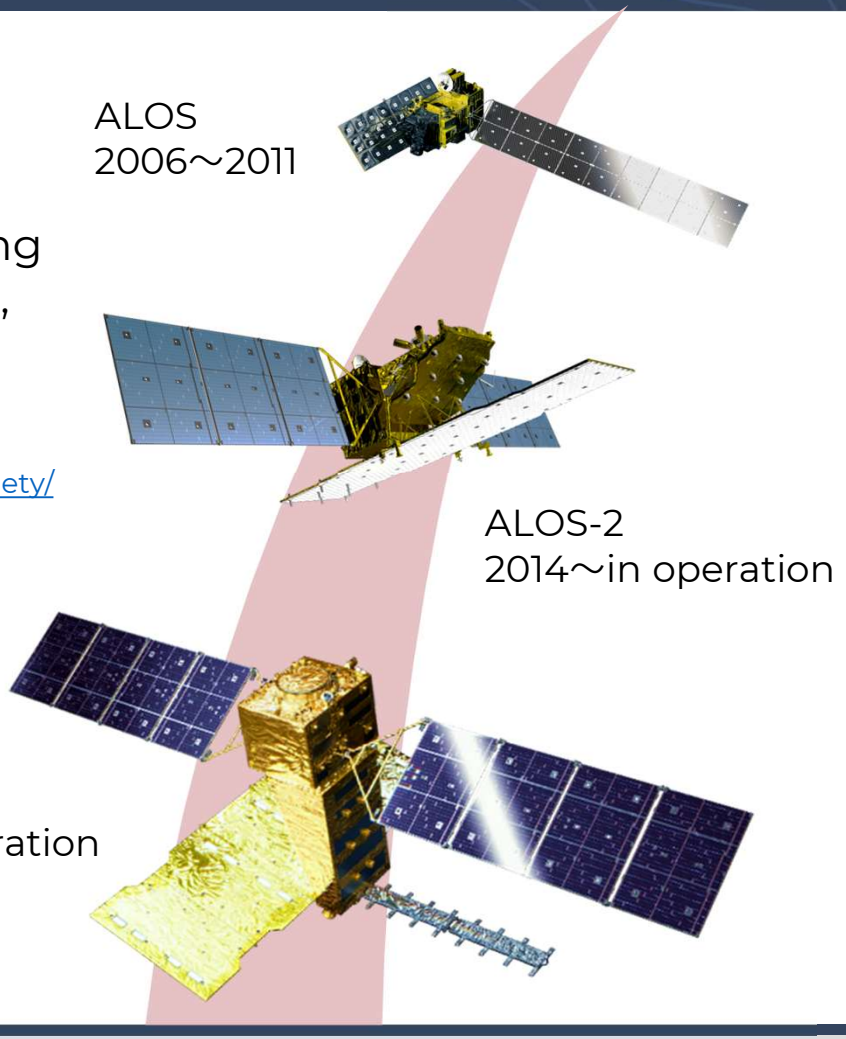
Improving predictions for weather and air pollution
with the Japanese researchers (JMA/MRI, NIES, Kyusyu Univ., RIKEN, universities and research institutes, …)

ALOS-4

- L-Band SAR (High Resolution; 3m)
- Launched on July 1st, 2024
- Development & Maintenance of the Basemap & GIS
- Disaster Monitoring; earthquake (wide area monitoring for Nankai megathrust earthquake, Tokai earthquake, earthquake directly beneath the capital, etc.), flood cased by heavy rain, wildfire, volcano eruption

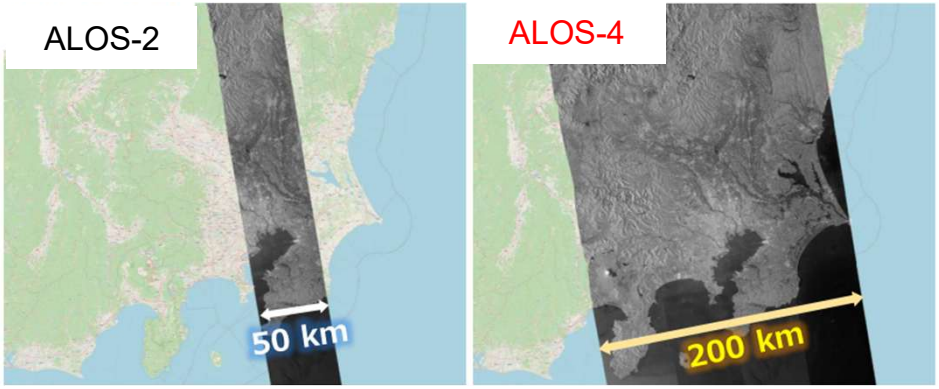


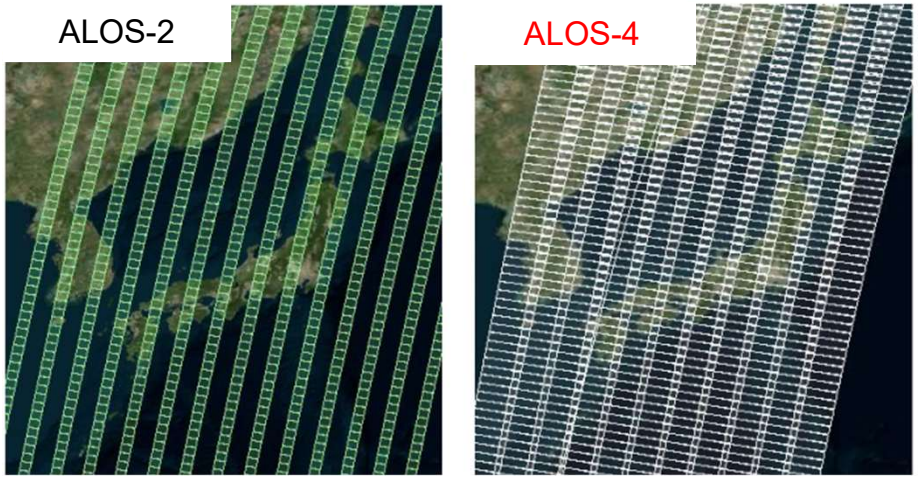
https://japannews.yomiuri.co.jp/society/general-news/20250331-246274/



Strong Points

➢ Expanding SWAS





	ALOS-2	ALOS-4
Stripmap (Res. 3,, 6m, 10m)	50km, 70km	100-200km
ScanSAR (Res. 25m)	350km, 490km	700km
Spotlight (Res. 1m x 3m)	25km x 25km	35km x35km

➢ Expanding Coverage

	ALOS-2	ALOS-4
Stripmap (Res. 3,, 6m, 10m)	4 times/year	20 times/year (twice a week)

Data Policy for ALOS-4

User		Ref ALOS-2	ALOS4 Launch - JFY2027	ALOS4 JFY2027- (TBD)
Mission partner (GSI*)		Free from JAXA	Free from JAXA	Free from JAXA
Governmental & Cooperating Organization	International Cooperation	Free from JAXA	Free from JAXA	Free from JAXA
	Governmental Organization (National Security)	Free from JAXA	Actual Cost from JAXA	Free from JAXA
	Disaster Governmental Organization (Other than the above) Cooperation	Free from JAXA for Limited Number and Actual Cost from JAXA for Excessed the Limit	Free from JAXA for Limited Number and Actual Cost from JAXA for Excessed the Limit	Service Migration to Industries will be decided until JFY2027
Research User	RA user etc..	Free from JAXA for Limited Number	Free from JAXA for Limited Number	Free from JAXA for Limited Number
Public User		Actual Cost from Industries	Actual Cost from Industries	To be decided until JFY2027

* Geospatial Information Authority of Japan

Service Providers for ALOS-4

Service Providers for ALOS-4 were selected.

https://www.satnavi.jaxa.jp/ja/news/2025/01/15/10395/index.html

- Tenchijin

https://tenchijin.co.jp/

- PASCO

https://alos-pasco.com/

- Synspective

https://synspective.com/

Numbers of Data Provisions

Satellite	JFY2012	JFY2013	JFY2014	JFY2015	JFY2016	JFY2017	JFY2018	JFY2019	JFY2020	JFY2021	JFY2022	JFY2023	JFY2024
MOS-1/MOS-1b	0	0	0	0	2	0	20	9	6	4	6	12	6
JERS-1	575	722	280	2,655	48,367	85,584	14,937	2,690	9,413	625	640, 639	456,648	51,170
ADEOS	0	0	19	710	31	2	10	12	33	48	18	53	24
TRMM	564,258	109,632	161,811	359,374	316,250	377,039	472,743	200,115	937	189,989	225,067	244,955	535,924
Aqua	1,934,217	1,643,585	5,582,670	3,424,642	3,540,226	3,744,344	2,286,678	1,110,230	1,452,202	4,468,052	1,352,289	1,297,549	2,916,505
ADEOS-II	138,407	2,322	18,978	82,408	447,864	633,192	49,970	30,479	213	30	112	509	27,353
MODIS	37,947	45,539	3,264	24,188	32,528	34,223	48,052	17,306	2,651	476	1,648	36	1,278
ALOS	36,469	29,534	36,057	21,567	18,061	12,785	11	6,518	4,335	1,671	917	82	97
ALOS-2	-	-	6,593	8,489	10,944	11,732	12,639	13,698	12,317	11,789	12,402	11,652	11,632
ALOS-4	-	-	-	-	-	-	-	-	-	-	-	-	0
GOSAT	5,592,234	9,314,801	1,371,196	18,094,443	5,162,207	2,404,810	11,154,884	14,234,370	15,954,019	16,356,657	2,590, 036	10,669,145	2,628,450
GOSAT-2							31,129	366,681	945,752	1,474,972	27,510,943	1,168,141	1,286,997
GCOM-W	382,164	3,379,886	4,007,717	6,153,648	6,935,100	9,381,174	4,597,307	13,737,449	14,219,029	15,585,063	16,937,422	26,701,621	29,013,505
GPM	-	-	451,347	881,709	3,318,336	2,388,078	765,718	1,505,856	1,197,463	1,170,492	1,772,789	2,019,112	4,916,912
GCOM-C	-	-	-	-	-	-	245,023	19,285,587	17,607,337	19,477,938	27,510,943	17,016,486	19,182,590
EathCARE/CPR	-	-	-	-	-	-	-	-	-	-	-	-	216,512
Total	8,686,271	14,526,021	11,639,932	29,053,833	19,829,916	19,072,963	19,679,121	50,511,000	51,405,707	58,737,806	75,324,556	59,586,001	60,788,955

PID Updates

https://earth.jaxa.jp/doi/en/

Giving DOIs to research products has been started, while it doesn't match to a recommendation of Persistent Identifier Best Practice …

- **Standard Products**

"Standard" products is that JAXA guarantees its accuracy to and permanently stores and provides from the Earth observation satellite data provision system, G-Portal. "Near real-time" products which are ones aiming at quick report rather than its accuracy are out of focus because they will be deleted after a certain period.
The DOI numbers given to the products can be checked in **the list of DOI numbers -Standard Products**.

- **Research Products**

"Research" products are provided by the Earth Observation Research Center (EORC) and consist of products under research such as algorithms.
The DOI numbers given to the products can be checked in **the list of DOI numbers -Research Products**.

Also, new numbers were given to EarthCARE standard products.

New Challenges

Cloud migration of G-Portal is on-going.

- Tsukuba Space Center → AWS Asian Pacific (Tokyo) Region
- 2PB Data Migration via SINET* to AWS
- The release is planned in JFY2026

* Science Information NETwork, SINET, is an information and communication network built and operated by the National Institute of Informatics (NII) as scientific information infrastructure for universities and research institutions throughout Japan.
https://www.sinet.ad.jp/en

Yosuke is challenging for development of STAC APIs.

JAXA has been investigating AI/ML applications like AI agent etc..