

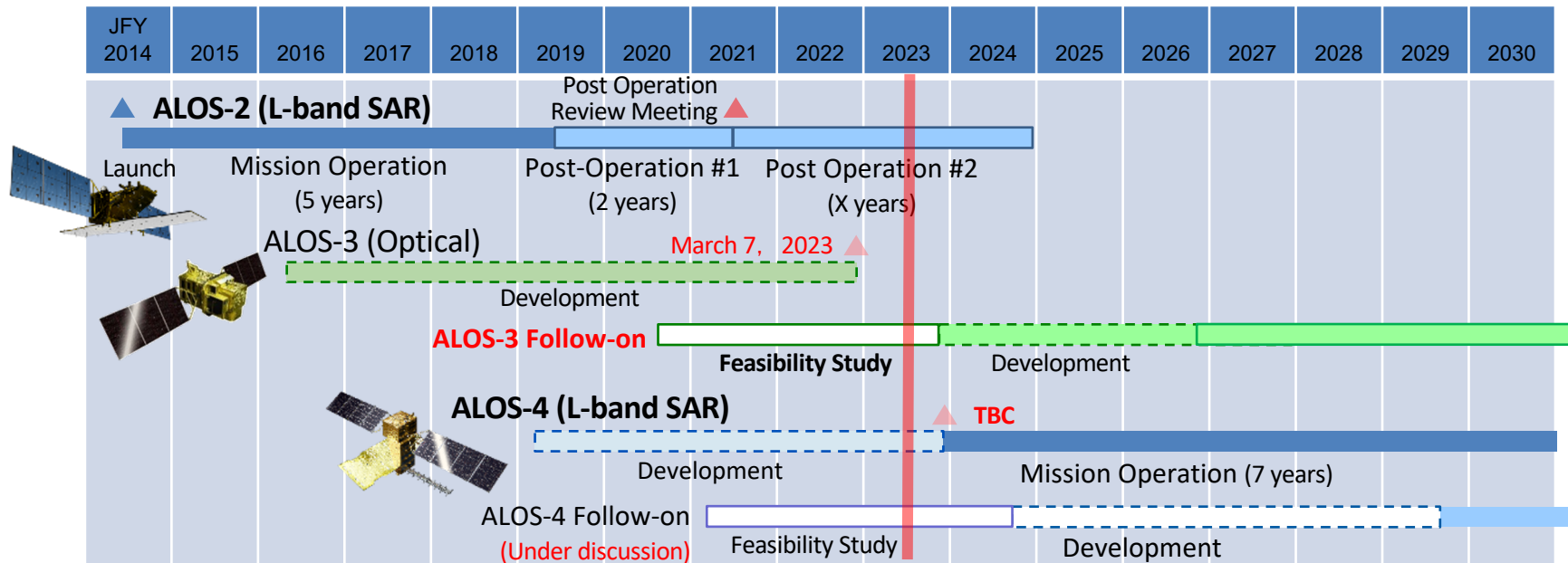
# JAXA mission and CEOS-ARD product development update

*Takeo Tadono, JAXA EORC*  
*Ake Rosenqvist, soloEO/JAXA*

# Update of the ALOS Series Missions



- Providing continuous L-band SAR observations since 2014, successor to “DAICHI” (ALOS PALSAR, PRISM and AVNIR-2) 2006-2011 and JERS-1 (SAR and VNIR) 1992-1998
  - ALOS-2 PALSAR-2 - operations ongoing
  - ALOS-3 optical – Launch failure on March 7, 2023 > Accelerate consideration of F/O Mission
  - ALOS-4 PALSAR-3 – TBA





# ALOS-2 PALSAR-2

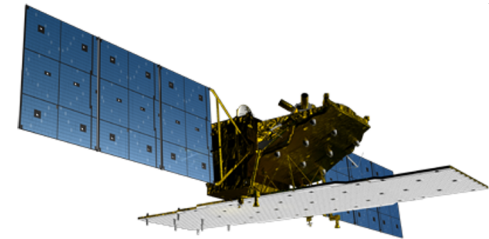


- On-board internal calibration is performed every 3 months.
- Product quality of major observation modes is evaluating regularly using SAR data over calibration sites.
- The standard product processing software was updated several times *e.g.*, in June 2018 (radiometric calibration), Nov. 2018 (correction of range offset), and April 2021 (updates for Spotlight and ScanSAR).

> PALSAR-2 keeps good condition and performance.

## PALSAR-2 calibration summary (using PALSAR-2 acquired 07/2014 – 09/2022)

Items	Results	
Geometry (RMSE)	[Stripmap and Spotlight]	<b>5.39 m (L1.1) / 6.73 m (L2.1)</b>
	[ScanSAR]	<b>60.77 m (L1.1) / 29.33 m (L2.1)</b>
Radiometry	RCS accuracy ( $1\sigma$ )	<b>0.522 dB (corner reflectors)</b> <b>0.41 dB (Amazonian forests)</b>
Polarimetry	VV-HH amplitude ratio	<b>1.003 (<math>\sigma=0.012</math>)</b>
	VV-HH phase difference	<b>-0.362 deg (<math>\sigma=1.404</math>)</b>
	Cross talk	<b>[HV/HH] -42.970 dB (<math>\sigma=6.609</math>)</b> <b>[VH/VV] -42.889 dB (<math>\sigma=5.590</math>)</b>

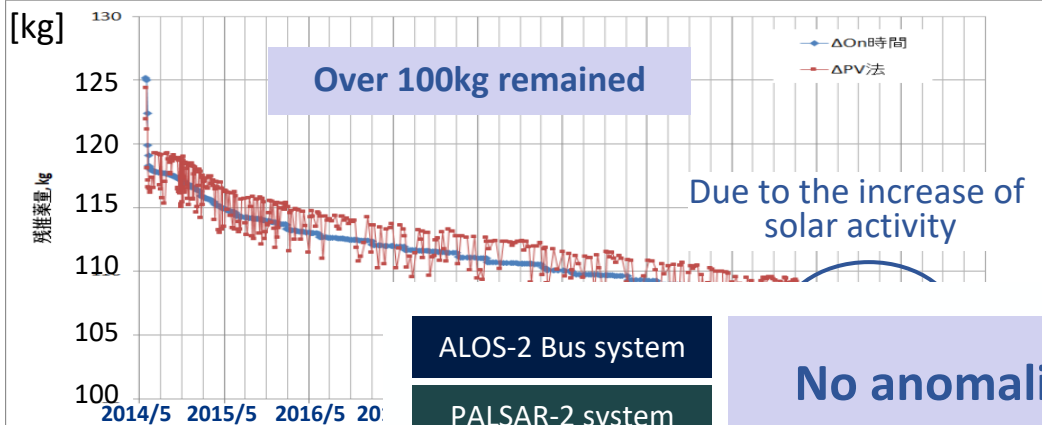


\* [https://www.eorc.jaxa.jp/ALOS/en/alos-2/a2\\_calval\\_e.htm](https://www.eorc.jaxa.jp/ALOS/en/alos-2/a2_calval_e.htm)

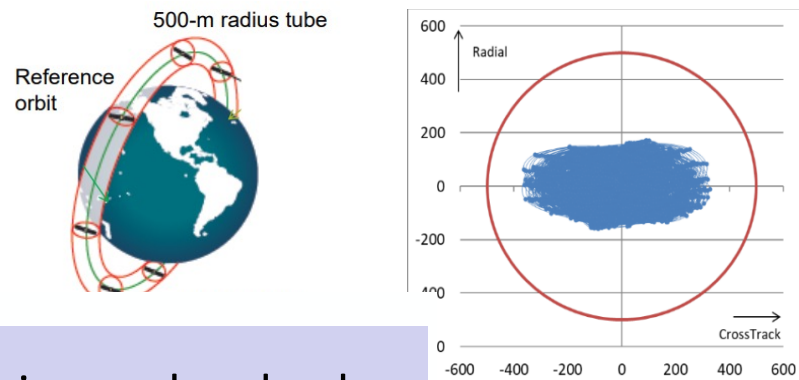
# ALOS-2 Operation Status



## The amount of remaining fuel

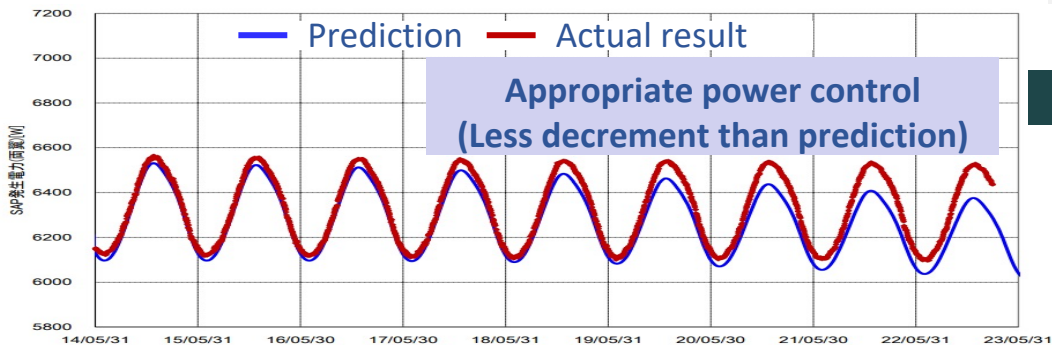


## The result of orbit control



No anomalies in regular check

## The transition of SAP (Solar Array Paddle) power generation



High conerency for InSAR processing

Orbit control result (As of May 2023)

## PALSAR-2 system evaluation


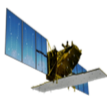
### Three-month check-ups

- Thermal condition of components
- Phase shifter performance
- Onboard RF characteristics

# ALOS-2 & ALOS Open & Free Data Distribution



As of July 3<sup>rd</sup> 2023

		CY 2022				CY 2023			
		1Q Jan - Mar	2Q Apr - Jun	3Q Jul - Sept	4Q Oct - Dec	1Q Jan - Mar	2Q Apr - Jun	3Q Jul - Sept	4Q Oct - Dec
ALOS 	AVNIR-2 (10 m)					Open and Free on G-Portal and GEE (only less than 30% cloud data)			
	PALSAR FBS/D(10 m), WD(100m)					Process all AVNIR-2 1B2			
						Open and Free on G-Portal			
ALOS-2 	PALSAR-2 ScanSAR (25m)	Process CARD4L (L2.2) Asia & Africa				Open and Free on G-Portal. GEE and open repository on AWS			
		Process L1.1 Asia and Africa				Process L1.1 and L2.2 America and other area			
					GEO2022 week				

- JAXA G-Portal: <https://gportal.jaxa.jp/gpr/?lang=en>
- AVNIR-2 EORC HP: [https://www.eorc.jaxa.jp/ALOS/en/dataset/ori\\_e.htm](https://www.eorc.jaxa.jp/ALOS/en/dataset/ori_e.htm)

Since 2019

ALOS-2 extended observation period

## Processing and providing massive time series of ALOS/ALOS-2 data.

- ✓ Implement intensive time series observation over Super Sites
- ✓ Working on the completion of data processing
- ✓ Process the massive data using JAXA's Supercomputer System (JSS3)

Since 2022

November 7<sup>th</sup> after GEO Week 2022

## ● Distributing data by **Open and Free** through JAXA data distribution system (G-Portal), GEE and AWS.

- Processing following ALOS-2 data sequentially
  - ✓ ScanSAR L1.1 SLC data
  - ✓ ScanSAR L2.2 ortho- and terrain-corrected data in CEOS Analysis Ready Data (ARD)

2023

Open data to the public

# CEOS-ARD SAR – ALOS-2 PALSAR-2



[Overview](#)
[Framework](#)
[Specifications](#)
[FAQ](#)
[Resources](#)
[Datasets](#)

[Strategy](#)

[Framework](#)

## CEOS Analysis-Ready Datasets

The following table summarises all of the satellite EO datasets that have been assessed as CEOS Analysis Ready Data (CEOS-ARD). DOI links are provided for access, along with links to further information, sample products, and the completed CEOS-ARD self-assessment and peer review outcome documents.



Product	CEOS-ARD Type	PFS Version	Agency	Mission(s)	Threshold Specification	Target Specification	Access (DOI)	Info	Self Assessment	Peer Review	Sample Products
ALOS-2 PALSAR-2 Global Mosaics (RTC)	Normalised Radar Backscatter	v5.5	JAXA	<a href="#">ALOS-2 PALSAR-2</a>	● 100%	Not assessed		<a href="#">Public access @JAXA EORC www, GEE</a>			
ALOS-2 PALSAR-2 25m ScanSAR NRB	Normalised Radar Backscatter	v5.5	JAXA	<a href="#">ALOS-2 PALSAR-2</a>	● 100%	Not assessed		<a href="#">Public access @JAXA G-Portal, GEE, AWS, [DE-Africa]</a>			
ALOS-2 PALSAR-2 50m ScanSAR NRB	Normalised Radar Backscatter	v5.5	JAXA	<a href="#">ALOS-2 PALSAR-2</a>	● 100%	Not assess		<a href="#">Access through JAXA RA (K&amp;C) programme</a>			

## Global Mosaic revisions

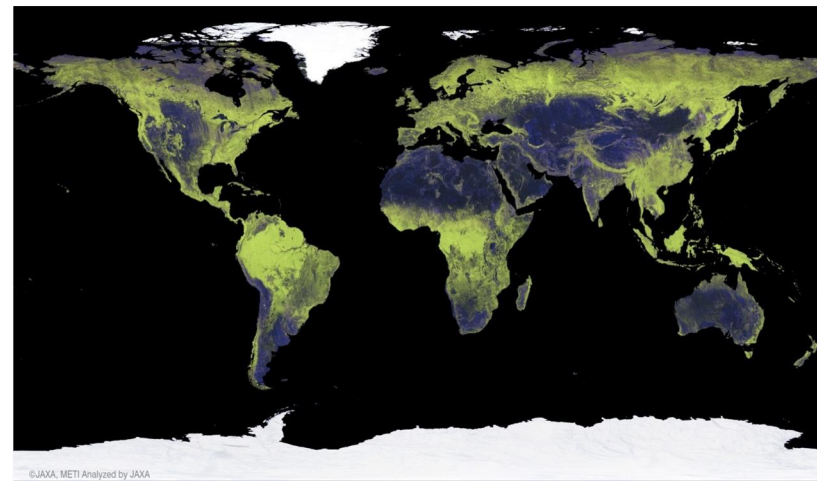
Modifications to the Sigma-SAR processor and EORC mosaicking software undertaken during 2021/2022.

### Processing/Re-processing status

- **ALOS-2** 2015 – 2022 [COMPLETED]
- **ALOS**: 2007 – 2010: [COMPLETED]
- **JERS-1** 1993-1998:
  - Tiles [COMPLETED]
  - Global mosaics: Q4/2023

Public download [www](http://www.eorc.jaxa.jp):

[https://www.eorc.jaxa.jp/ALOS/en/dataset/fnf\\_e.htm](https://www.eorc.jaxa.jp/ALOS/en/dataset/fnf_e.htm)



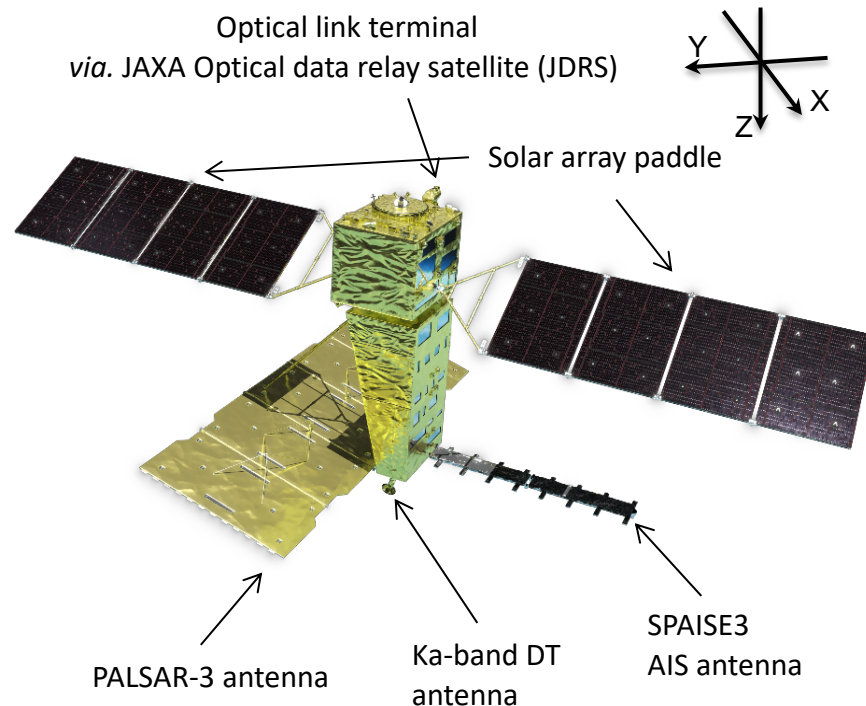
### New mosaic features:

- Improved geometric accuracy
- Single-year data only (i.e. no gap-filling from other years in case of missing data)
- Cloud Optimized GeoTiff (COG) format
- Compliance with CARD4L NRB v5.5

# ALOS-4 PALSAR-3



Launch	<b>TBA</b>
Orbit	<b>Same orbit as ALOS-2</b> Sun-synchronous sub-recurrent orbit Altitude: 628 km Inclination angle: 97.9 degree Local sun time at descending: 12:00 ± 15 min. Revisit time: <b>14 days</b> (14+11/14 rev/day)
Lifetime	<b>7 years</b>
Size	X 10.0 m x Y 20.0 m x Z 6.4 m
Satellite Mass	~2,990 kg
Downlink	<b>1.8 / 3.6 Gbps (Ka-band)</b>
Mission Instruments	<ul style="list-style-type: none"><li>- <b>PALSAR-3</b> (Phased Array type L-band Synthetic Aperture Radar-3)</li><li>- <b>SPAISE3</b> (SPace based AIS Experiment 3)</li></ul>



In-orbit configuration

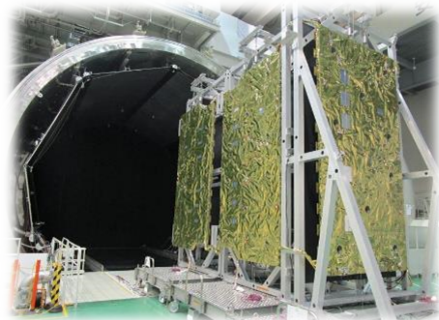
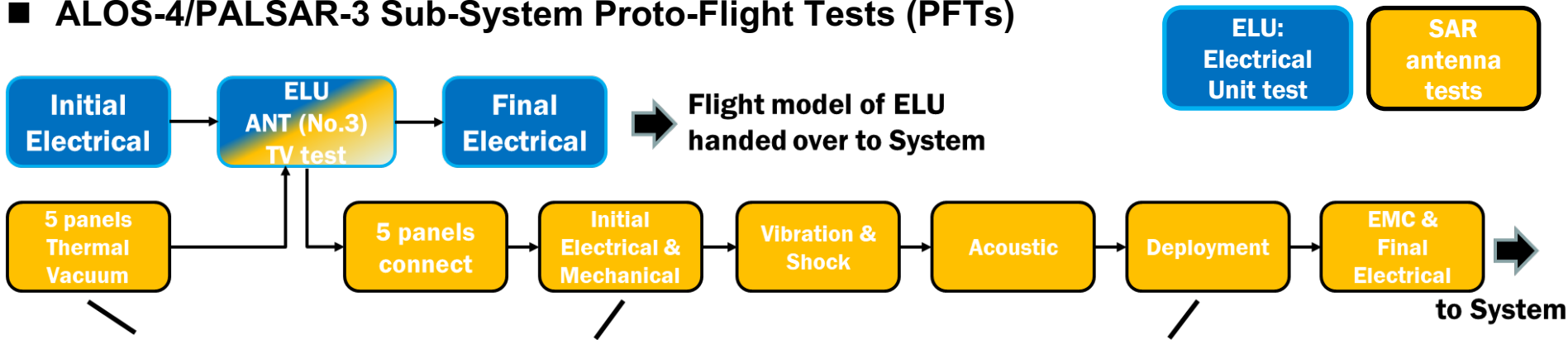




# ALOS-4 Proto-Flight Testing (PFT)



## ALOS-4/PALSAR-3 Sub-System Proto-Flight Tests (PFTs)



1<sup>st</sup> WING deploying



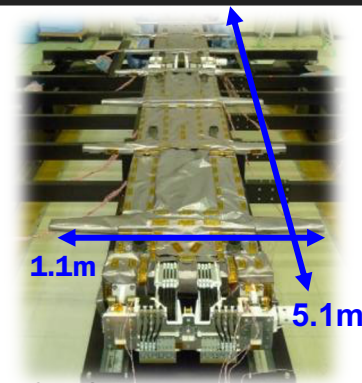
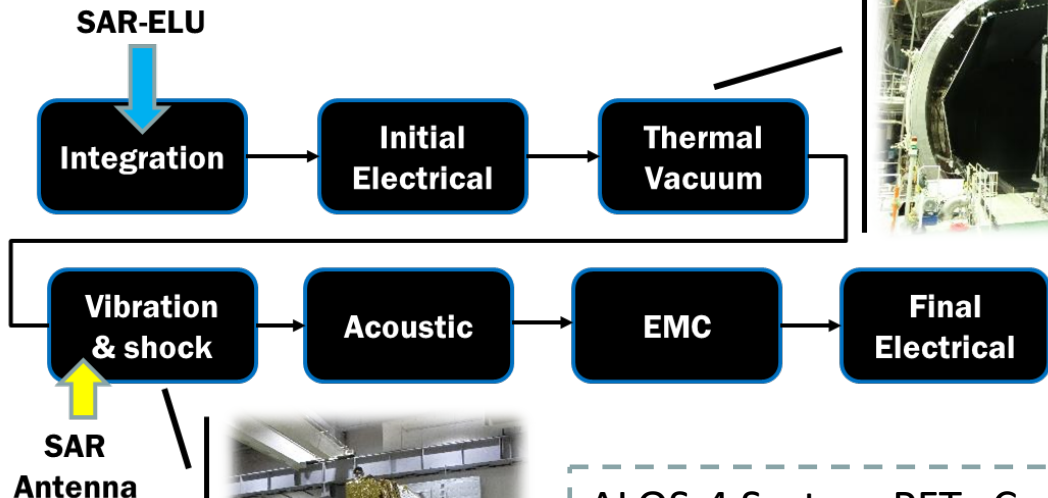
2<sup>nd</sup> WING deploying



Deployed!

# ALOS-4 Proto-Flight Testing (PFT)

## ALOS-4 System PFTs



©NEC

SPAISE3 had also completed the PFTs individually.



### ALOS-4 System PFTs Conclusions:

- System PFT had completed and confirmed there is no issue for flight.
- System PFT include “End to End test” were conducted with assuming realistic operation scenarios with ground segments.
- **ALOS-4 including PALSAR-3 sub-system had completed preparation for launch.**

## Standard processing

CEOS-ARD products currently not included in JAXA's standard processing (AUIG4) system for ALOS-4 PALSAR-3.

## Special processing for R&D (@ JAXA EORC)

Global ALOS-4 mosaics:

- Annual observations in Dual / QP mode
- CEOS-ARD NRB compliant (including new CARD4SAR PFS)

K&C Initiative Science project:

- Continuous R&D project since 2001 – now part of AXA EORC's EORA3 programme
- R&D focus on local or regional study areas
- PALSAR-3 Time-series observations (~monthly) in QP mode over K&C sites
- Pol-SAR/InSAR/Pol-InSAR theme in ALOS-4 era under consideration
- Generation of CEOS-ARD [POL] and [GSLC] compliant products under consideration