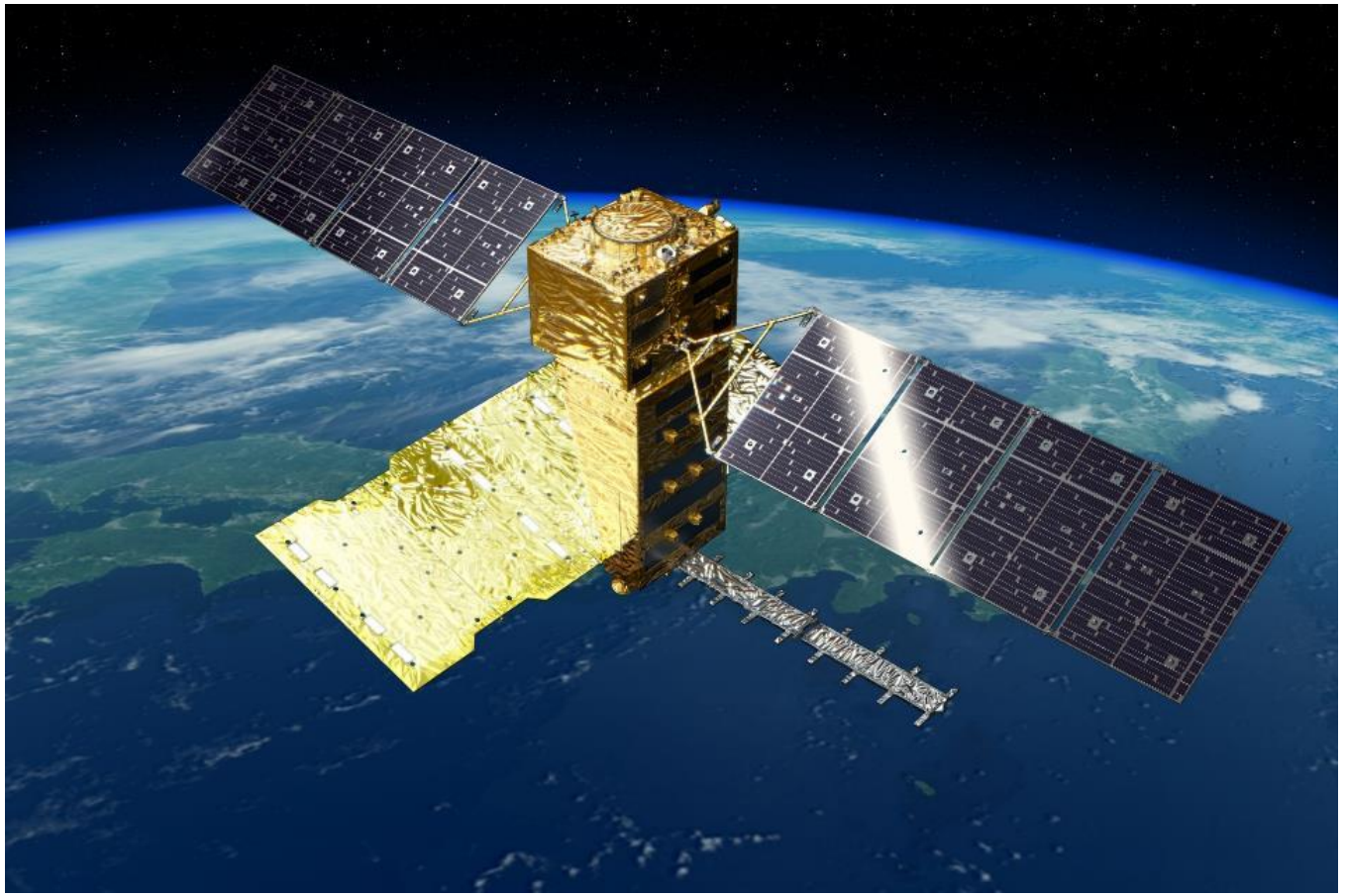
Overview of ALOS-4

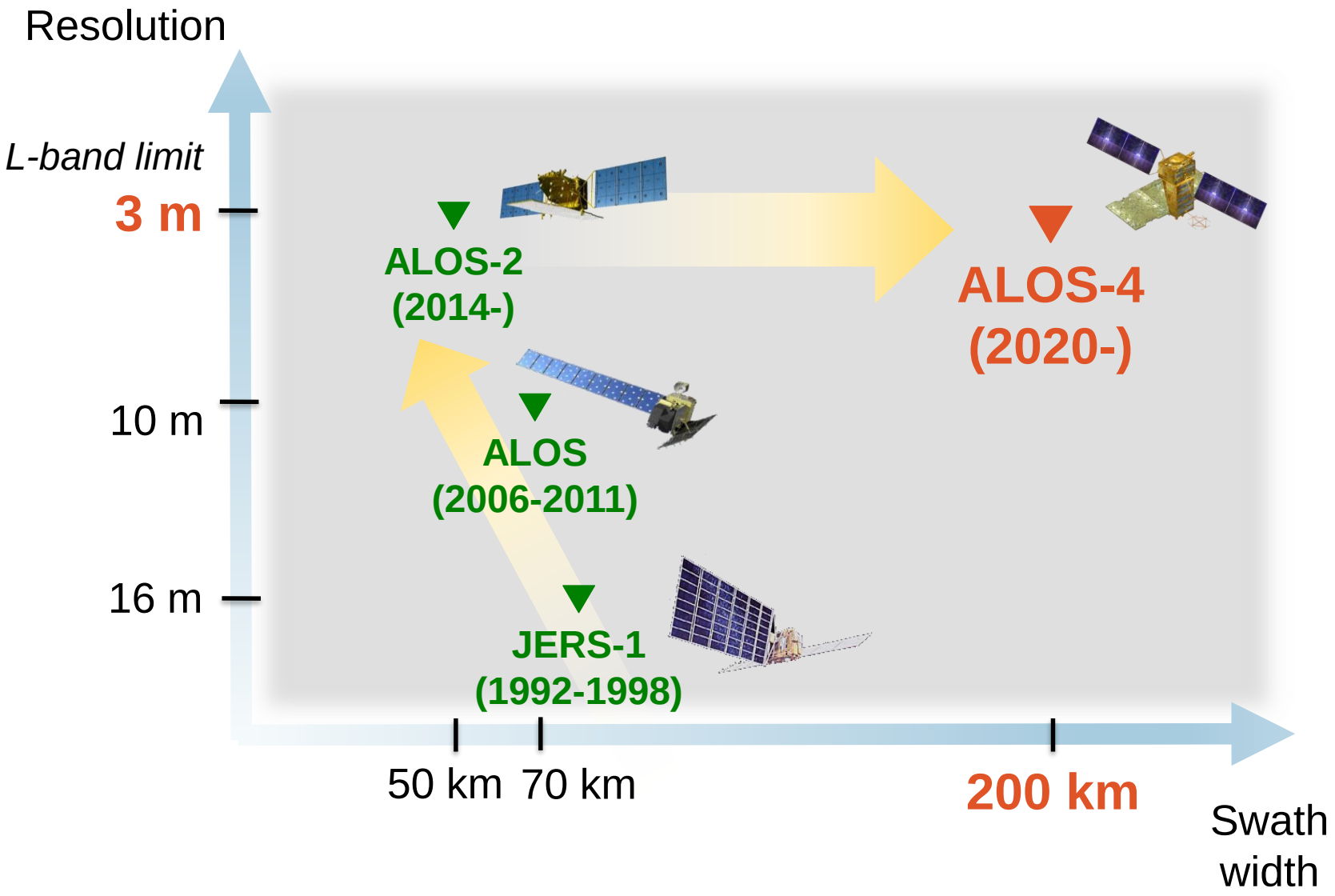


Takeshi Motohka
JAXA ALOS-4 Project Team / EORC

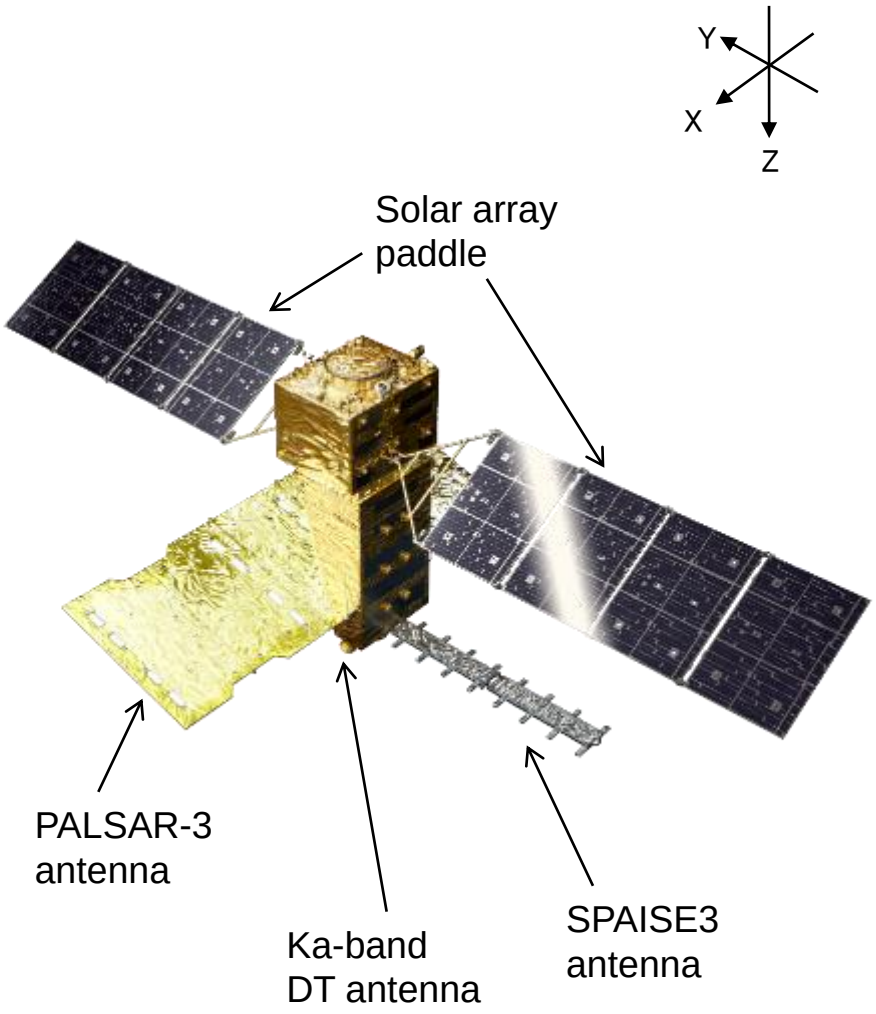
Mission objectives of ALOS-4

1. Precise monitoring of land deformation and subsidence for detecting anomalies at an early stage
2. Continuation and enhancement of the ALOS-2 mission and also exploring new applications
   - Disaster monitoring
   - Forest monitoring
   - Sea ice monitoring
   - Large infrastructure monitoring, etc.
3. Marine monitoring with AIS (Automatic Identification System)

Mission objectives of ALOS-4



ALOS-4 System characteristics



Launch	**JFY 2020 by H3 launch vehicle**
Orbit	**Same orbit as ALOS-2** ✓ Sun-synchronous sub-recurrent orbit ✓ Altitude: 628 km ✓ Inclination angle: 97.9 degree ✓ Local sun time at descending: 12:00 ± 15 min. ✓ Revisit time: 14 day (15-3/14 rev/day)
Lifetime	**7 years**
Satellite Mass	approx. 3 tons
Downlink	**3.6 Gbps/1.8 Gbps (Ka-band)**
Mission Instruments	- **PALSAR-3** (Phased Array type L-band Synthetic Aperture Radar-3) - **SPAISE3** (SPace based AIS Experiment 3)
Prime contractor	Mitsubishi Electric Corporation

Characteristics of PALSAR-3

- ✓ Expanding swath width without decreasing the resolution by using the digital beam forming (DBF).
- ✓ Keeping the observation geometry, major observation modes, and performance (NESZ, ambiguity level, etc.) of PALSAR-2

Swath width of ALOS-2/4

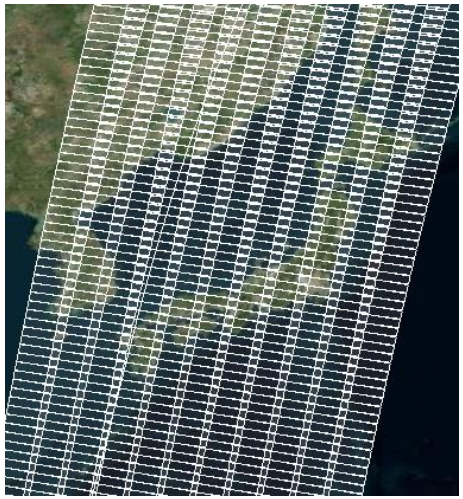
Modes	ALOS-4	ALOS-2
Stripmap (res. 3/6/10 m)	**100-200 km**	30-70 km
ScanSAR (res. 25m*)	**700 km**	350-490 km
Spotlight (res. 1 x 3 m)	**35km × 35km**	25km × 25km

*single look

Coverage of 1 repeat cycle (14 days)

ALOS-2 (50 km)

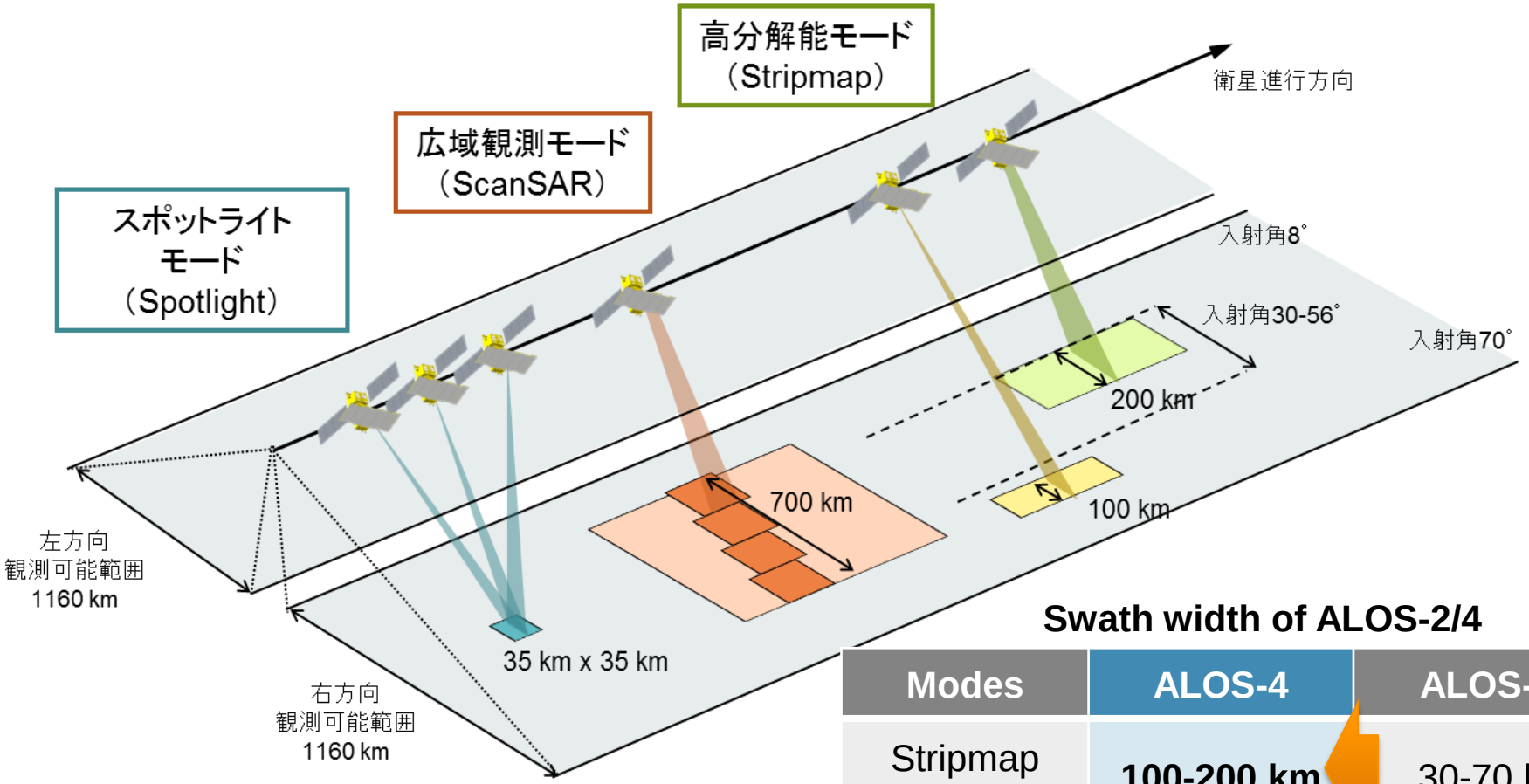
ALOS-4 (200 km)



System improvement from ALOS/ALOS-2

	ALOS 2006-2011	ALOS-2 2014-	**ALOS-4** **JFY 2020-**
Antenna size	3 m × 9 m	3 m × 10 m	**3.7 m** × 10 m
Number of T/R module	80 (Si)	180 (GaN)	**232 (GaN)**
Transmit power	2,000 W	6,120 W	**7,888 W**
Receive beam	Single beam	Dual beam (azimuth)	**DBF (range)** + Dual beam (azimuth)
Ionospheric correction	N/A	N/A	**Split-band observation**
Pointing	Right	Right and Left	Right and Left
Orbit control	< +/- 2.5 km (at equator)	< +/- 500 m (all latitude)	< +/- 500 m (all latitude) **Laser reflector for calibration**
Data recorder	90 GB	128 GB	**1 TB**
Data transmission	120 / 240 Mbps	800 Mbps	**3.6 / 1.8 Gbps**

PALSAR-3 acquisition mode



Swath width of ALOS-2/4

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PALSAR-3 acquisition mode

SAR mode	Spotlight (sliding)	Stripmap						Scan SAR
Center frequency [MHz]	1257.5	1257.5		1236.5 or 1257.5 or 1278.5				
Bandwidth [MHz]	84	84		42		28		28
Resolution [m]	3 x 1 (Rg x Az)	3		6		10		25 (1 look)
Swath width [km]	**35**	**200**	**100**	**200**	**100**	**200**	**100**	**700 (4 scan)**
Polarization	**1, 2**	1, 2	**1, 2, 4**	1, 2	1, 2, 4	1, 2	1, 2, 4	1, 2
Incidence angle range	8-70	30-56	8-70	30-56	8-70	29-56	8-70	8-70
NESZ	< -20 dB	< -20 dB		< -24 dB		< -28 dB		< -20 dB
Rg. S/A	> 15 dB	> 15 dB		> 15 dB		> 20 dB		> 15 dB
Az. S/A	> 15 dB	> 15 dB		> 15 dB		> 20 dB		> 15 dB
Pol. X-talk	< -30 dB							
Split-band option	X	X	X	X	X	○ 28+10 MHz	X	X

InSAR capability between ALOS-2 and ALOS-4

Master/slave of InSAR pair		ALOS-4		ALOS-2	
		Stripmap 100/200 km	**ScanSAR 700 km**	**Stripmap 50/70 km**	**ScanSAR 350/490 km**
ALOS-4	**Stripmap 100/200 km**	○	○	○	○
	ScanSAR 700 km	○	○	○	×

- ✓ ALOS-4 reference orbit is the same as ALOS-2
- ✓ Controlling accuracy is within +/- 500 m (= small baseline)

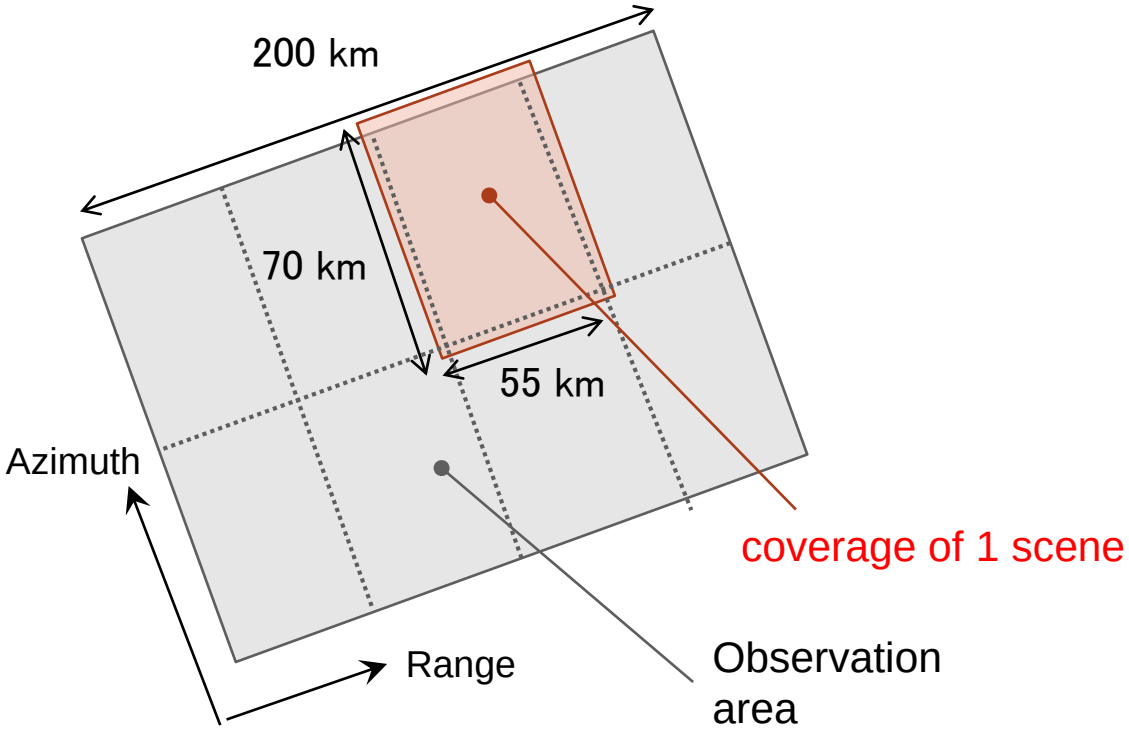
Standard product

✓ Keeping compatibility with ALOS-2 … algorithm, file format (CEOS), path-frame IDs, etc.

- L1.1 single look complex
- L1.5 ground-range amplitude image
- L2.1 ortho-rectified amplitude image

Standard product

Example:
Stripmap 3m
200 km swath



	Spotlight 1m	Stripmap 3m, 6m	Stripmap 10m	ScanSAR
Swath width	35 km	200 km	200 km	700 km
Scene width	Same as swath	55 km	70 km	[L1.1] each scan (about 180 km) [L1.5/L2.1] 700 km
Scene length	Same as swath	70 km	70 km	355 km

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Standard product

✓ New quality flags:

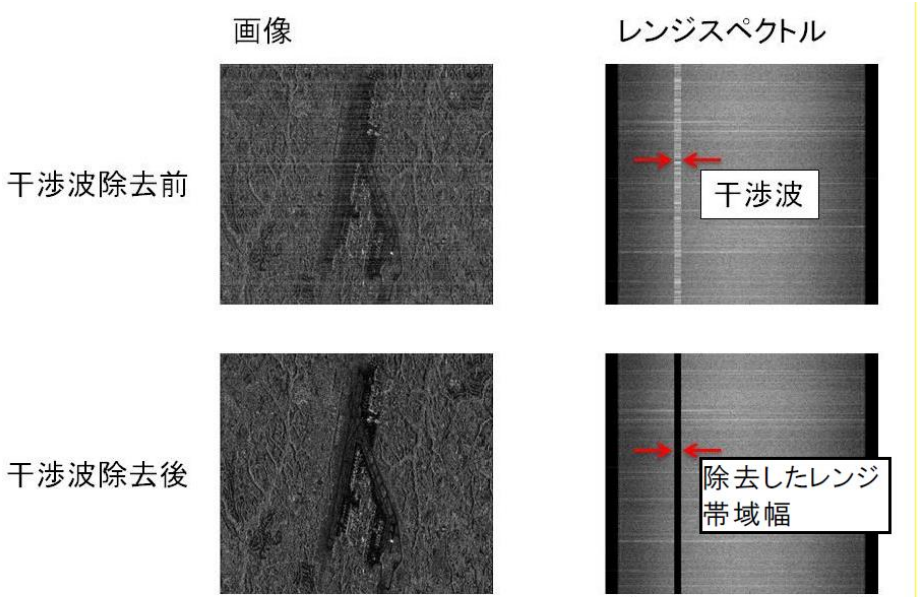
(1) RFI removal rate

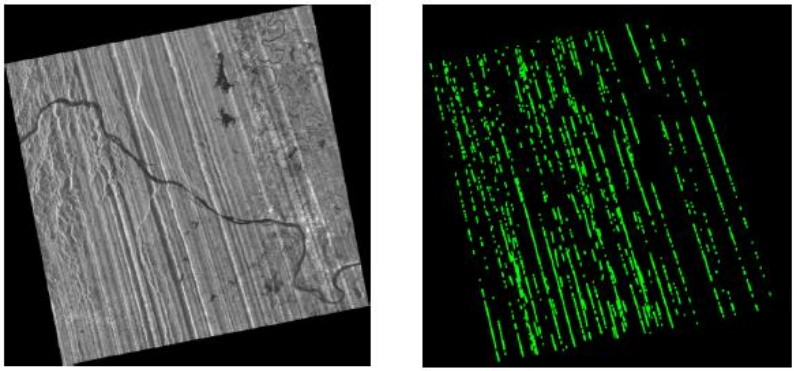
= $BW_{removed}$ / BW_{total}

BW: range bandwidth

(2) Ionospheric noise detection in amplitude image

Flag: [OK / FAIR / POOR]





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Future works

- ✓ Research Announcement (RA) activity for ALOS-4 Cal/Val will start in the year.

- ✓ Observation Scenario

  Every cycle observation (14 days interval) for global is impossible due to the limitation of data downlink resource. Effective scenario is needed to be considered.

- ✓ ALOS-4 project will move to Phase D (manufacture and test of the flight model) in this year.