Status of the Advanced Microwave Scanning Radiometer 3 (AMSR3) and its validation results

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IPWG-12@July 7, 2026

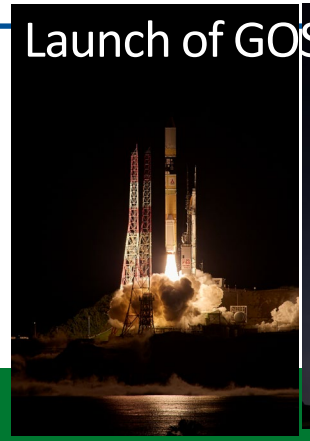
GOSAT-GW: Global Observation SATellite for Greenhouse gases and Water cycle

AMSR3 (Advanced Microwave Scanning Radiometer 3)


GOSAT-GW at Tanegashima Space Center on 20 May 202

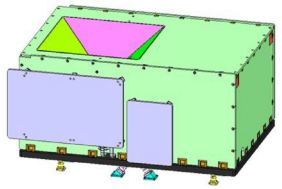
AMSR3, led by JAXA, succeeds AMSR series observations adding new high frequency channels for solid precipitation retrievals and water vapor analysis in NWP

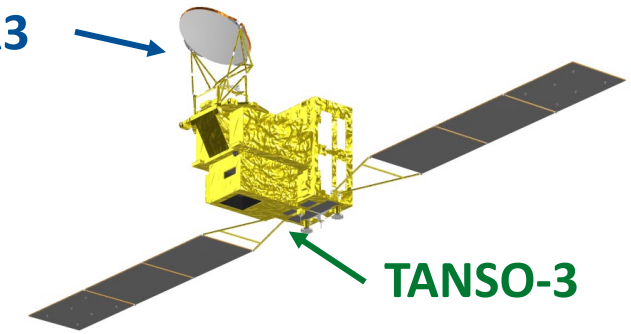
Launch of GOSAT-GW



TANSO-3 (Total Anthropogenic and Natural emissions mapping SpectrOmeter-3)

TANSO-3, led by Japanese Ministry of the Environment (MOE) and National Institute of Environment Studies (NIES), improves observation capability of greenhouse gases from GOSAT-2/TANSO-2





GOSAT-GW Satellite Specifications

Mission Instruments		AMSR3 (JAXA) TANSO-3 (MOE/NIES)
Orbit	**Type**	Sun-synchronous, Sub-recurrent orbit
	Altitude	666km, recurrent cycle 3days (same as GOSAT)
	Local sun time at ascending	13:30+/-15min (same as GCOM-W)
	Revisit time	3 days
Satellite Mass		2.6 tons (including propellant)
Designed lifetime		> 7 years
Launch		**29 June 2025 (JST)** by H-IIA #50

Mission Timeline after the Launch

Jun 29, 2025 (JST) | **July 1** | **October 8** | **June 30, 2026**

We are HERE

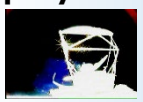
Critical Operations Phase

- Satellite separation
- Solar array paddles deployment
- AMSR3 antenna deployment
- Initial run-up of AMSR3
- Release of the pointing mirror lock for TANSO-3

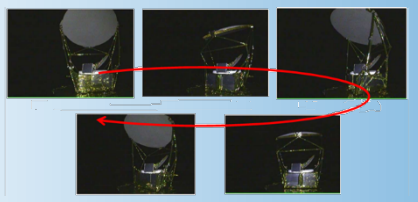
Launch

・Deployment of solar array paddles

・Antenna deployment



・Initial run-up (4rpm)

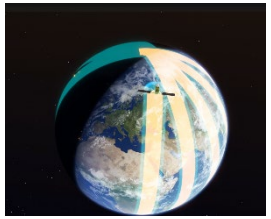


AMSR3

Initial Functional Verification Operations Phase

Verify the functions of satellite and onboard instruments

・Into the observation orbit



・Science mode (40rpm)

・Start observation

・Press-release of first images (Sep. 5)

Initial Calibration and Validation Operations Phase

Calibration and validation of AMSR3 and TANSO-3

Release of **Early AMSR3 data (Ver.0.1/00B)** to partners since end of Nov. 2025

Release of **Ver.0.2/00C** to partners since Mar. 2026

Release of **Ver.1.0/01A** to partners since Jun. 2026

Nominal Mission Operations Phase

Release of **AMSR3 standard product (Ver.1.0)** to public

*TANSO-3 products will be released by MOE/NIES.

・Press-release of data release (Jun. 30, 2026)

AMSR3 Specification & Radiometric Performance

Red: Additional CHs
Blue: Modified CH

Center frequency [GHz]	Polarization	Band width [MHz]	Beam width (spatial resolution)	NEdT (1σ)[K]		
				Specification	Ground-test measurement (H/V)	On-orbit measurement (H/V)
6.925	V/H	350	1.8° (33km x 57km)	< 0.34	< 0.31 / < 0.30	< 0.29 / < 0.28
7.3	V/H	350		< 0.43	< 0.30 / < 0.30	< 0.30 / < 0.27
10.25	V/H	500	1.2° (22km x 38km)	< 0.33	< 0.29 / < 0.28	< 0.33 / < 0.32
10.65	V/H	100		< 0.70	< 0.59 / < 0.59	< 0.56 / < 0.57
18.7	V/H	200	0.65° (12km x 21km)	< 0.70	< 0.45 /< 0.45	< 0.40 / < 0.41
23.8	V/H	400	0.75° (14km x 24km)	< 0.60	< 0.37 / < 0.40	< 0.32 / < 0. 35
36.42	V/H	840	0.35° (6km x 11km)	< 0.70	< 0.37 / < 0.35	< 0.32 / < 0.32
89.0 A/B	V/H	3000	0.15° (3km x 5km)	< 1.20	<0.72 / <0.68 @89A	< 0.59 / < 0.54 @89A
					<0.72 / <0.77 @89B	< 0.58 / < 0.62 @89B
165.5(*1)	V	3200	AZ=0.23° / EL=0.30° (4km x 9km)	< 1.50	< 0.86	< 0.73
183.31±3	V	1470×2	AZ=0.23° / EL=0.27° (4km x 8km)	< 1.50	< 1.03	< 0.96
183.31±7	V	1700×2	AZ=0.23° / EL=0.27° (4km x 8km)	< 1.50	< 1.11	< 1.00

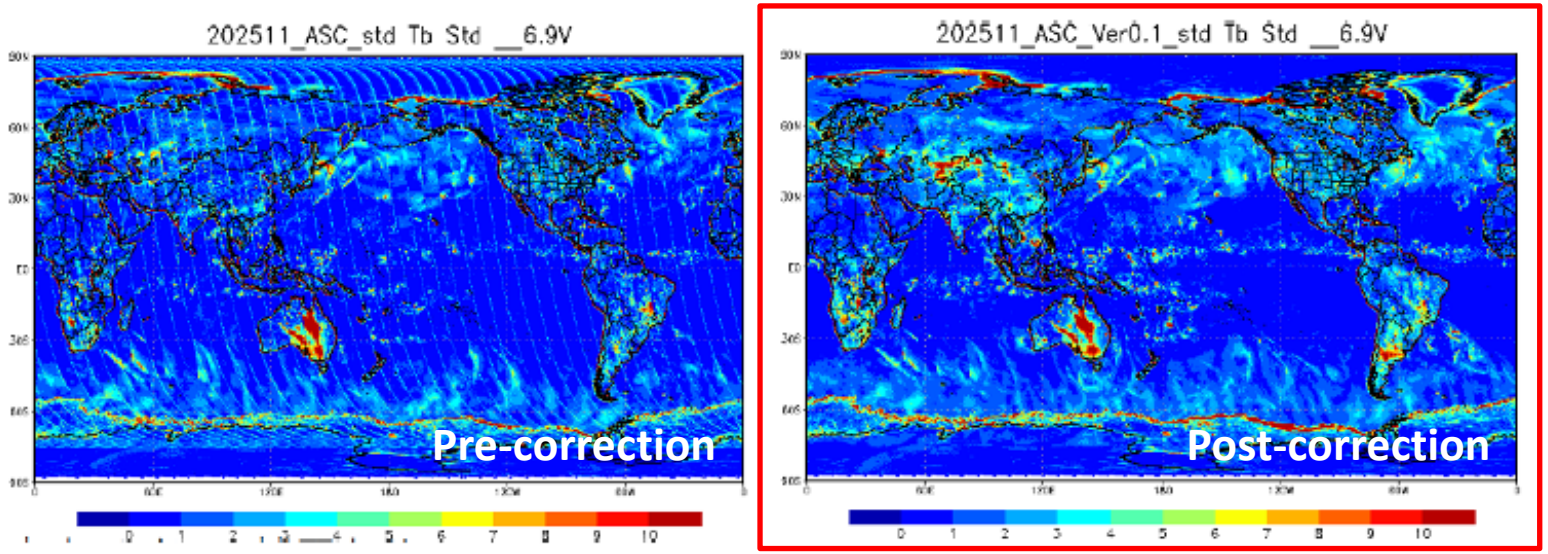
(*1) The 165.5 GHz ± 300 MHz band is excluded because the Double-Sideband (DSB) method is used.

(Courtesy of GOSAT-GW Project Team)

Scan Bias Correction & Geometric Calibration

- **Correction of scan-dependent TB biases** (e.g., partial blockage by onboard calibration sources)
  - AMSR3 scan biases were evaluated and corrected same as AMSR2
  - Analysis were separated for cases of over ocean and land
- Results:
  - Scan bias characteristics were identified at 6.9-10.65 GHz (Right : 6.9 GHz V-pol example)
  - Edges biases were effectively reduced after correction (Bottom : 6.9 GHz V-pol example)
  - Improved spatial uniformity across the entire scan

AMSR3 6.9V TB in Nov. 2025



- **Geometric Calibration**
  - Geolocation errors evaluated using coastline matching
  - Observed brightness temperature maps ⇔ land-sea fraction patterns (GCP)
- Results
  - Post-calibration geometric errors are well within 20% of the IFOV for all channels

Geometric error for each AMSR3 frequency after geometric correction (around the scan center)

Frequency [GHz]	Geometric Error (Average)			
	V-pol Azimuth Direction	V-pol Along-track Direction	H-pol Azimuth Direction	H-pol Along-track Direction
6.925	-0.03 km	-0.07 km	-0.06 km	0.64 km
7.3	-0.21 km	0.13 km	0.04 km	0.60 km
10.25	-0.03 km	-0.05 km	0.01 km	0.38 km
10.65	0.01 km	0.09 km	-0.01 km	0.28 km
18.7	0.02 km	0.07 km	0.05 km	0.17 km
23.8	0.01 km	0.15 km	0.00 km	0.20 km
36.42	-0.01 km	0.13 km	-0.03 km	0.15 km
89.0(A)	-0.03 km	-0.02 km	-0.02 km	-0.02 km
89.0(B)	-0.04 km	-0.06 km	-0.04 km	-0.05 km
165.5*	-0.10 km	-0.17 km	–	–

*Comparable accuracy confirmed for 183.31GHz via 165.5GHz comparison.

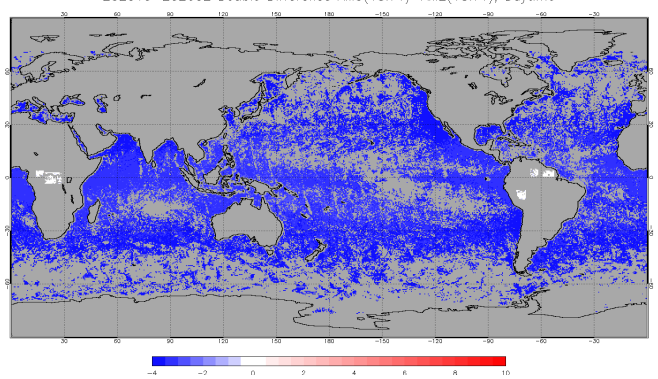
(Courtesy of GOSAT-GW Project Team)

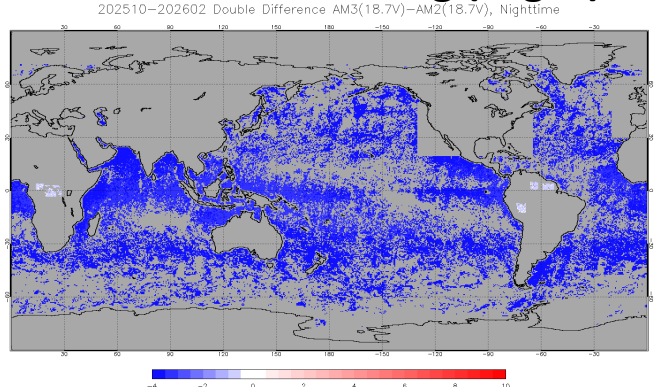
Cross-calibration of AMSR3 VS AMSR2 and GMI

- Double Difference (DD) method is applied to evaluate calibration error between AMSR3 and AMSR2 (6-89GHz), and GPM/GMI (10-183GHz).
  - Period: Oct. 1, 2025, to Feb. 28, 2026.
  - Small differences between Ascending & Descending orbits
  - Consistent with previous reports – AMSR3 TB in 10 GHz shows lower than AMSR2 and closer to GMI (and AMSR-E)

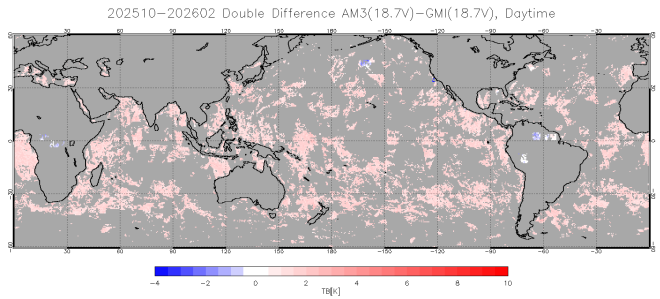
AMSR3 Ascending (Day) | **AMSR3 Descending (Night)**

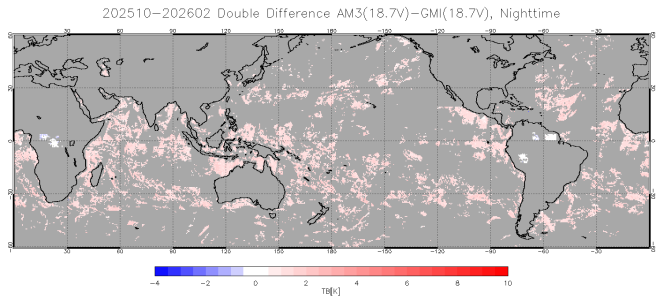
DD (**AMSR3 - AMSR2**) @18GHz V



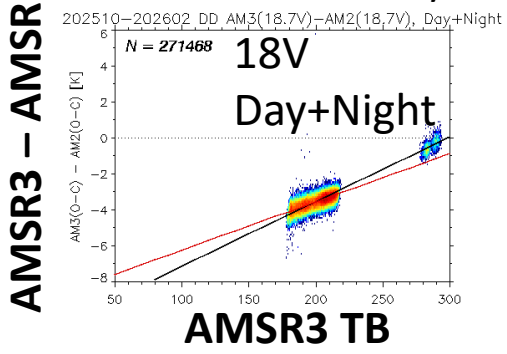


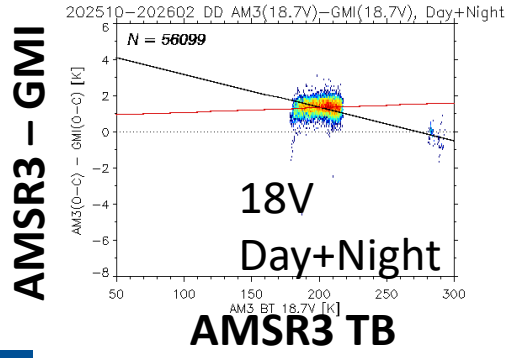
DD (**AMSR3 – GMI**) @18GHz V





—: Ocean + Land
—: Only Ocean

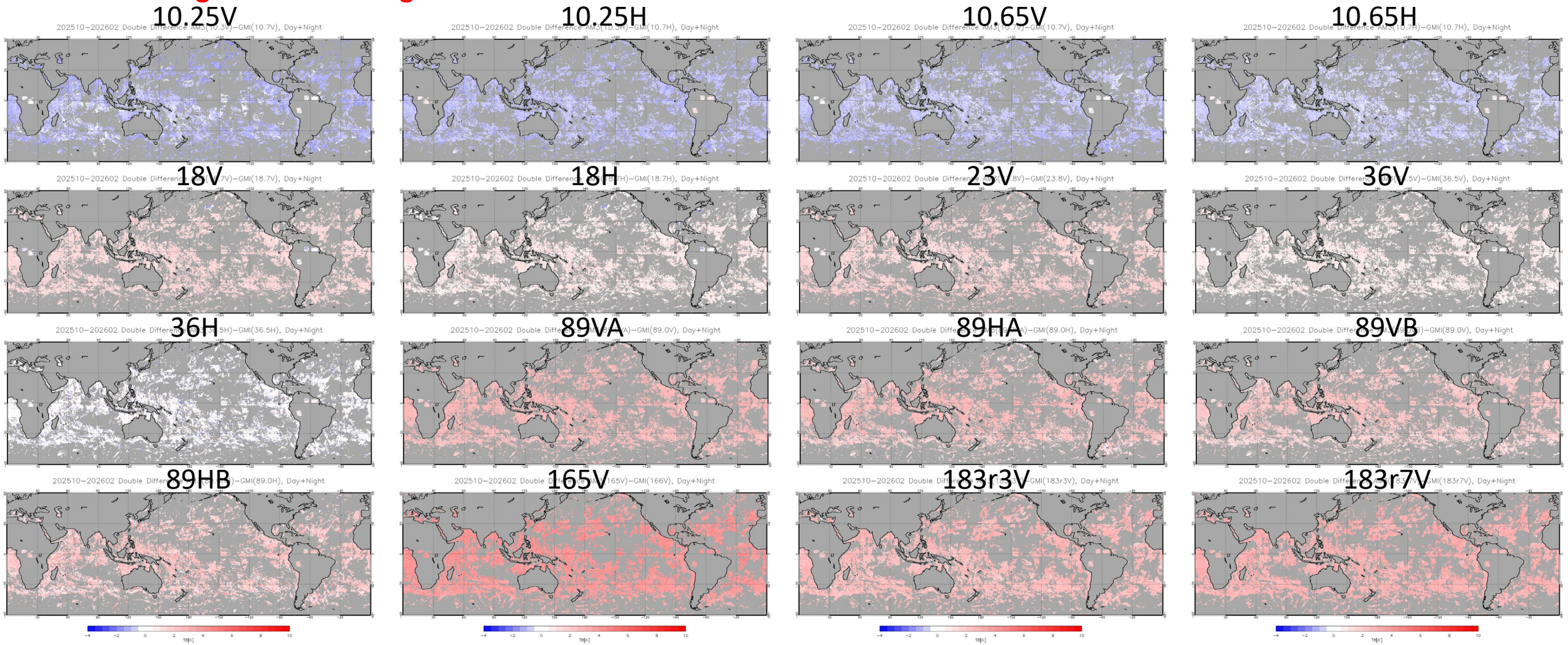




$$Tb_{AMSR3toAMSR2}[K] = Tb_{AMSR3}[K] - \Delta Cal\ [K]$$
$$\Delta Cal\ [K] = Tb_{AMSR3}[K] \times slope + intercept$$
$$* \ Tb_{AMSR3toAMSR2} : Tb_{AMSR3}\ Calibrated\ to\ Tb_{AMSR2}$$

Frequency dependency of DD (AMSR3 vs GMI)

For Ascending and Descending



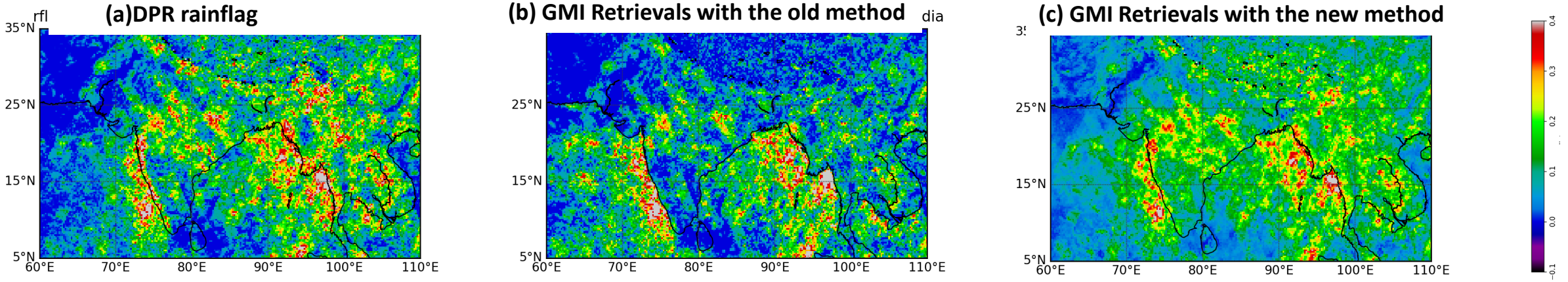
AMSR3 10GHz shows negative DD and 19-36 GHz 18GHz shows positive DD but smaller differences compared to differences with AMSR2.
AMSR3 89-183GHz shows positive DD relatively large.

AMSR3 Rainfall Algorithm (by K. Aonashi)

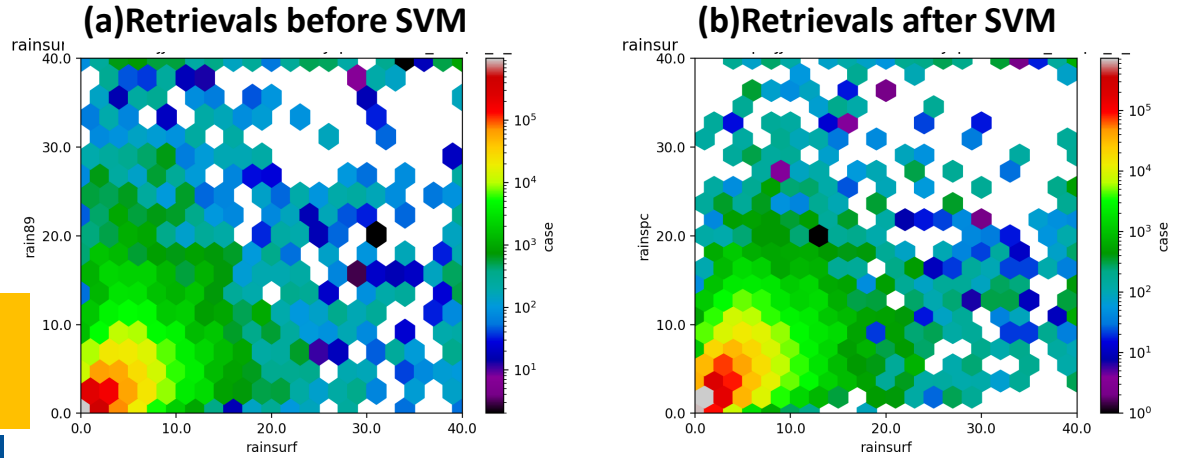
Update of precipitation detection method: The precipitation detection method has been updated to an approach which utilizes surface emissivity, fraction of water, orographic rain indices, etc.

Precipitation fraction Average for June-August 2016 around India

See also 8.3 K. Aonashi's talk



New scattering-based precipitation retrieval:
We corrected over-land precipitation using SVM, incorporating physical variables related to the Convective Precipitation Fraction and Frozen Precipitation Depth.

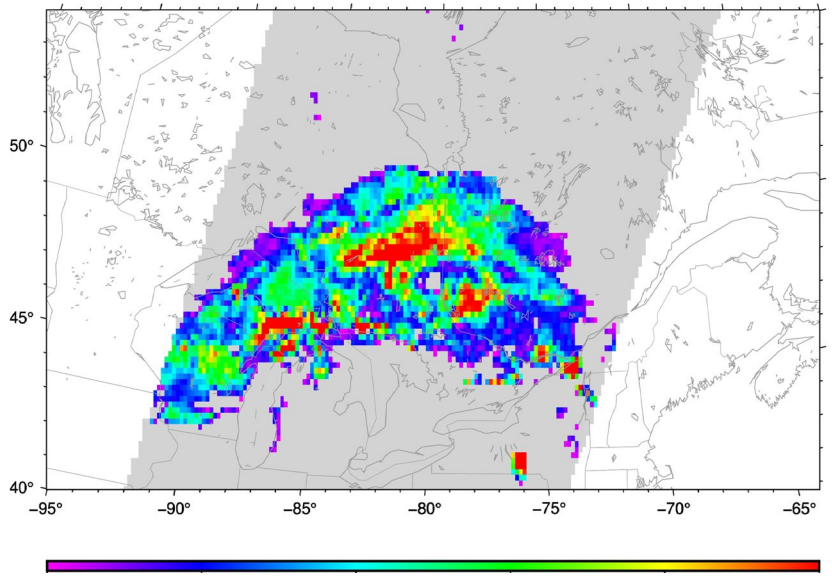


2D histograms (DPR rainsurf vs GMI rain retrievals) for June-August 2015 over land around Japan

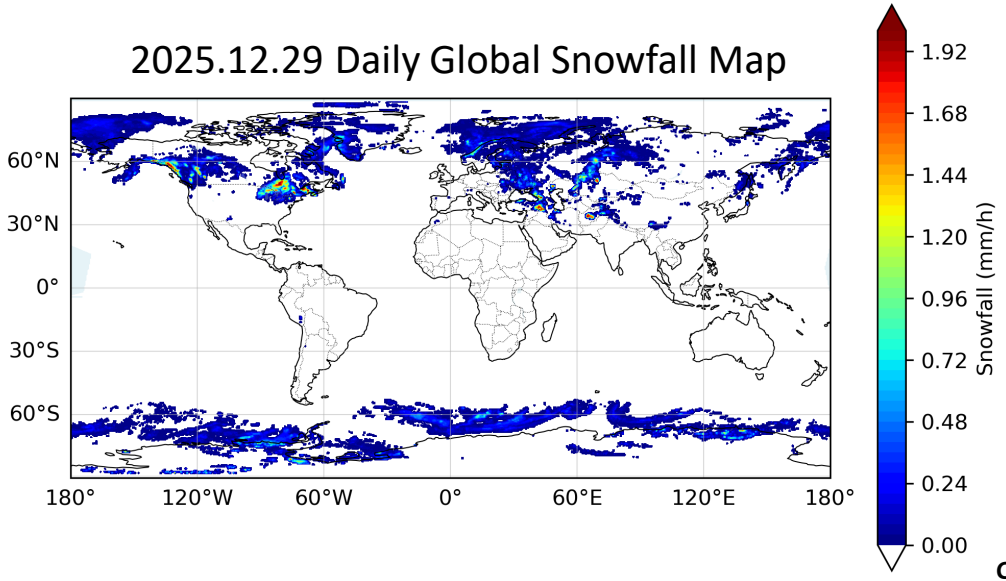
AMSR3 Snowfall Algorithm (by G. Liu)

- 3 Components
  - Rain-snow scene separation
  - Training database
    - CloudSat CPR – GMI matchups (2014-20)
    - EarthCARE CPR – GMI matchups (2024-25)
    - DPR – GMI matchups (2018, Nadir)
  - Snowfall retrieval using XGBoost model trained by above database
- 10 Environmental Regimes based on
  - surface type, air temperature and moisture
- 2-Step Retrieval
  - XGBoost Classification for yes/no precipitation
  - XGBoost Regression for TB to snowfall rate conversion
- The common snowfall algorithm among AMSR3, GMI and SSMIS has been applied in the GSMaP (see also 3.2 GSMaP talk).

2025.12.29 Snowstorm in N. America



2025.12.29 Daily Global Snowfall Map



AMSR3 Standard Products and Validation Results

Product		Area	Release Accuracy	Standard Accuracy	Evaluation Status
Integrated Water Vapor Content	Ocean	Global Ocean	3.5 kg/m^2	3.0 kg/m^2	vs sonde: 2.65 kg/m^2 vs GPS : 1.65 kg/m^2
	Land (except vegetation & ice area)	Global Land	6.5 kg/m^2	3.5 kg/m^2	VS sonde: 3.73 kg/m^2 vs GPS : 2.72 kg/m^2
Integrated Cloud Liquid Water Content		Global Ocean	0.10 kg/m^2	0.05 kg/m^2	0.058 kg/m^2
Precipitation	Liquid	Global	50 % (ocean) 120 % (land)	50 % (ocean) 120 % (land)	44.7 % (ocean) 72.5 % (land)
	Solid		130 % (ocean) 200 % (land)	130 % (ocean) 200 % (land)	88.7 % (ocean) 109.1 % (land)
Sea Surface Temperature	6 GHz	Global Ocean	0.8 °C	0.5 °C	0.52 ℃
	10 GHz			0.6 °C	0.53 ℃
	Multi-band				0.51 ℃
Sea Surface Wind Speed		Global Ocean	1.5 m/s	1.0 m/s	1.47 m/s
All-weather Sea Surface Wind Speed		Global Ocean	7 m/s	5 m/s	4.61 m/s
Sea Ice Concentration		Polar Ocean	10 %	10 %	2.72 %
High-resolution Sea Ice Concentration		Polar Ocean	15 %	15 %	3.80 %
Snow Depth		Global Land	20 cm	10 cm	9.2 cm
Soil Moisture Content		Global Land	10 %	5 %	4.54 %
Sea Ice Motion Vector		Polar Ocean	6 cm	6 cm	EW: 4.2 cm, NS: 4.3 cm

Orbit Differences between AMSR3 and AMSR2

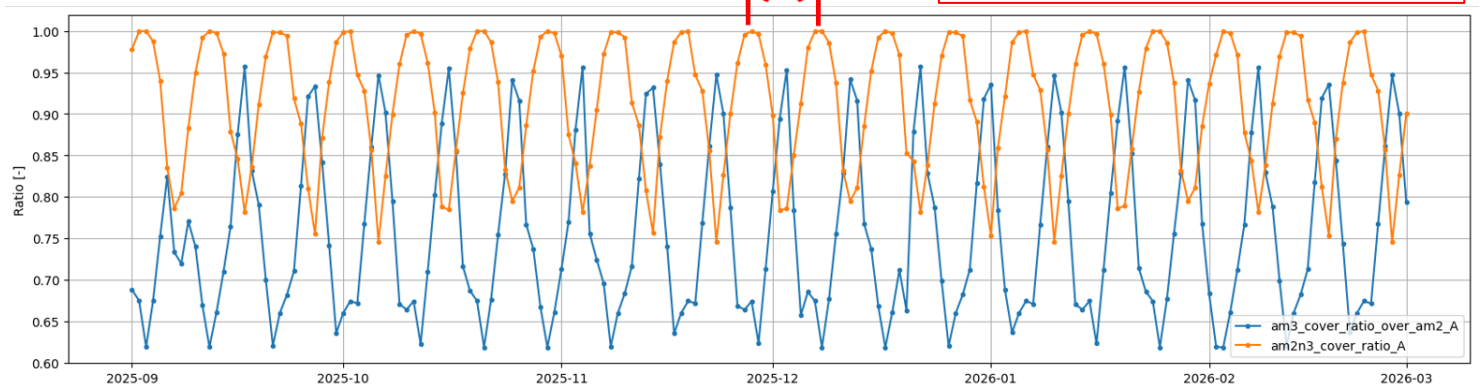
Same local time, but different altitude and revisit time (AMSR3: 3-day, AMSR2: 16-day)

Daily changes of each ratio

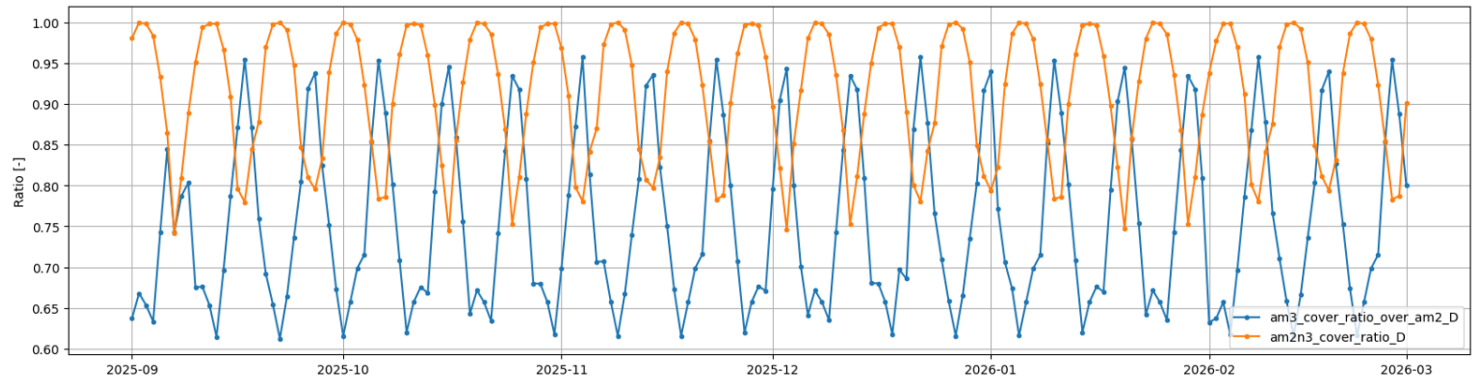
9.58 days

Blue: Coincidence ratio
Orange: Global cover ratio

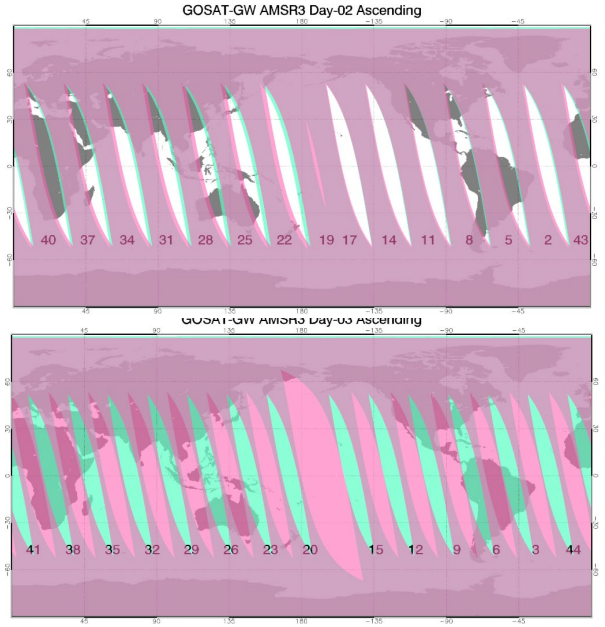
Asc.



Desc.



Pink: AMSR3 orbit
Green: AMSR2 orbit



Example of Asc. orbit

Coincidence **95%**
Global cover **75%**

Coincidence **60%**
Global cover **100%**

Not only retrieval error but also sampling error may exist

(Courtesy of Dr. Kentaro Aida, JAXA/EORC)

Summary

- GOSAT-GW/AMSR3 was successfully launched on 29 Jun. 2026 (JST), and we completed initial calibration and validation operations phase
  - Details of initial calibration, cross-calibration, L2 validation, and ATBD can be found at the **AMSR Web** and **QR codes in rights**
  - All AMSR3 Ver.1.0 (01A) products achieved release accuracy
  - The common precipitation (rain & snow) algorithms among AMSR3, GMI and SSMIS have been applied in the GSMaP (see also 3.2 GSMaP talk)
  - Due to different orbit (altitude, revisit time), both retrieval and sampling errors exist between AMSR3 and AMSR2 → need to be considered in climate monitoring
  - Further improvement of calibration, refection of deep-space maneuver & cross-calibration results, and algorithm updates are planned in 2027
- AMSR3 data is available to **public since 30 Jun. 2026** via the **JAXA G-Portal**
  - Reprocessing since 11 Aug. 2025 is underway (L1/L2 completed)
  - Users who need NRT access can apply “special user request” same as AMSR2
- AMSR2 operation continuation
  - AMSR2 NRT distribution (<3 hrs) will terminate at 00UTC on 2 Sep. 2026
  - After then, only delayed mode distribution (3-12 hrs) will be available
  - Users are kindly asked to consider to use AMSR3 in their system instead of AMSR2 in near future

AMSR web

ATBD

L1 CAL Status

L2 VAL Status

JAXA G-Portal