Status of AMSR3 Level 1 Products (Ver. 01A)

Earth Observation Research Center
Japan Aerospace Exploration Agency

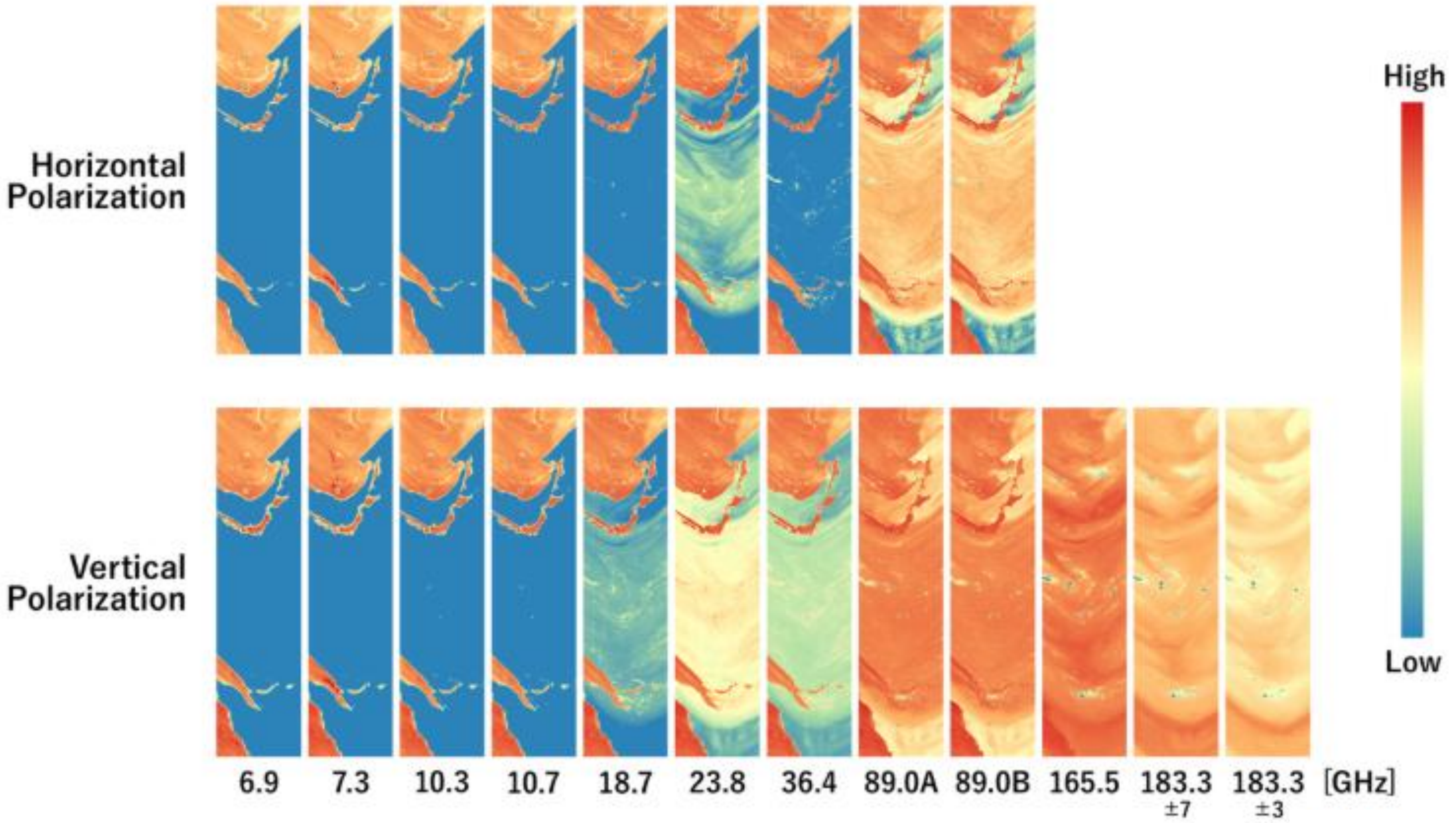
July 30, 2026

Current Status and Schedule

- **2025.06.29** GOSAT-GW (IBUKI-GW) launched from Tanegashima Space Center
- **2025.08.11** Started AMSR3 observation
- **2025.09.05** Issued press release on AMSR3 initial observation results
- **2025.10.08** Completed initial functional verification and transitioned to nominal operation
- **2025.11.21** Updated L1 processing (Ver.00B)
- **2025.11.27** Started providing preliminary products to collaborating agencies and PIs for evaluation
- **2026.03.05** Updated L1 processing (Ver.00C)
- **2026.04.02** Started providing preliminary Near-Real-Time products to approved GCOM-W special users
- **2026.06.04** Updated L1 processing (Ver.01A: release version)
- **2026.06.30** Public release

* Public release readiness was confirmed prior to data release using predefined criteria, including product accuracy.

Level 1B: Brightness Temperature (TBB)



Observations over Japan from AMSR3’s 21 channels
(Data from an ascending orbit on August 16, 2025)

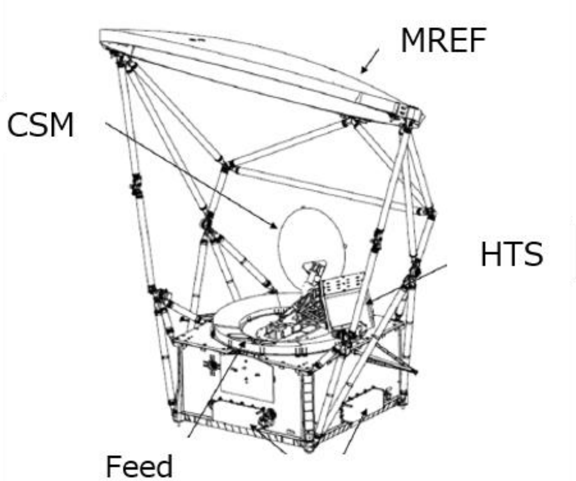
Radiometric Calibration Framework

◻ Framework Overviews

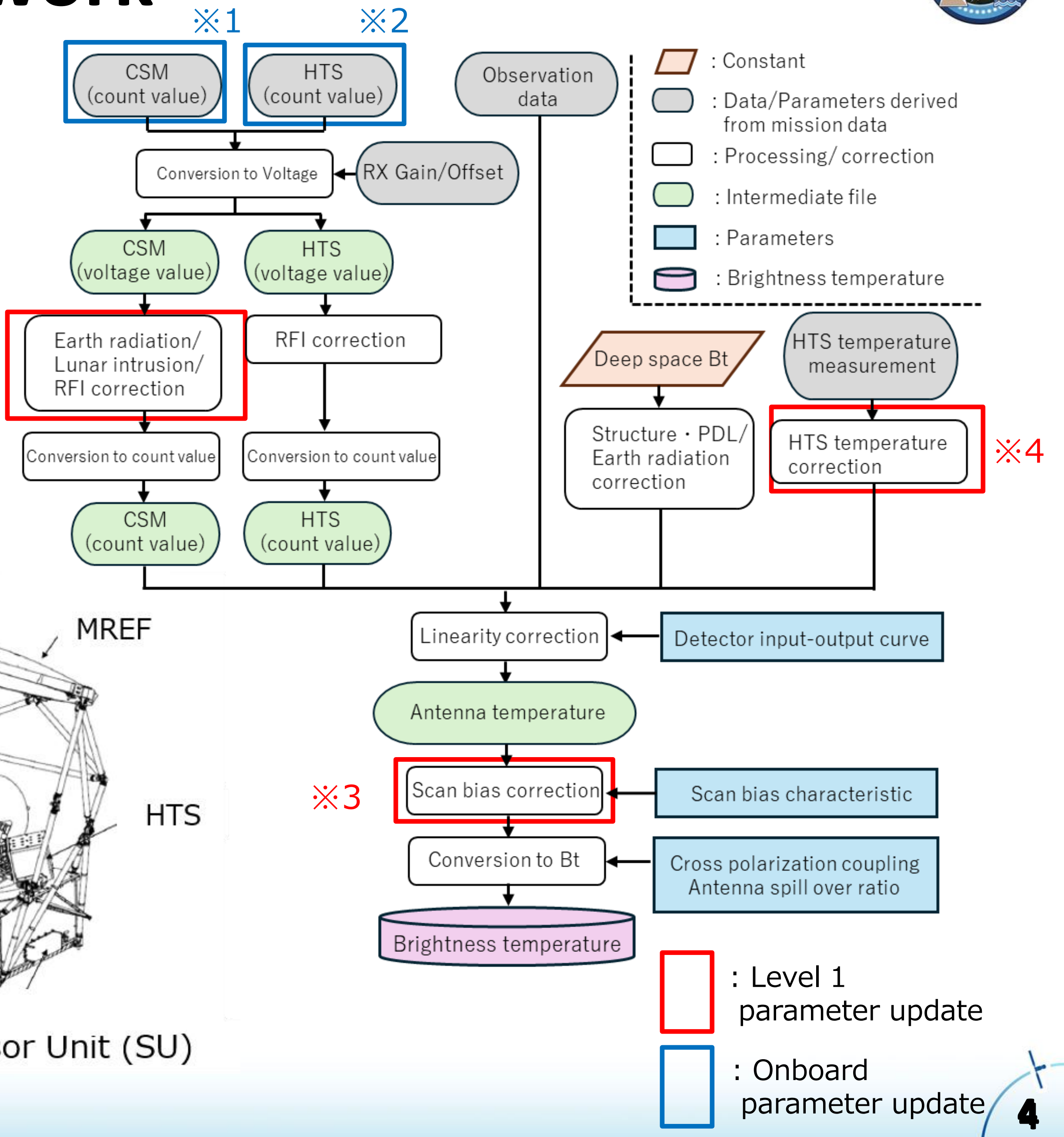
- ✓ Overall radiometric calibration flow (see right figure)
- ✓ Onboard and Level1 parameters updated based on on-orbit characterization

◻ Parameter Updates from Initial Calibration

- ✓ Onboard updates:
  - CSM data acquisition timing ※1
  - HTS thermal control ※2
- ✓ Level 1 parameter updates:
  - Scan-bias correction ※3
  - HTS temperature correction ※4
    (HTS temperature-step handling)
  - RFI correction, etc. ※5



AMSR3 Sensor Unit (SU)



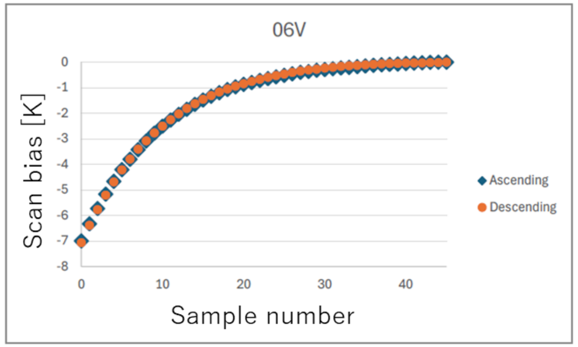
Radiometric Performance

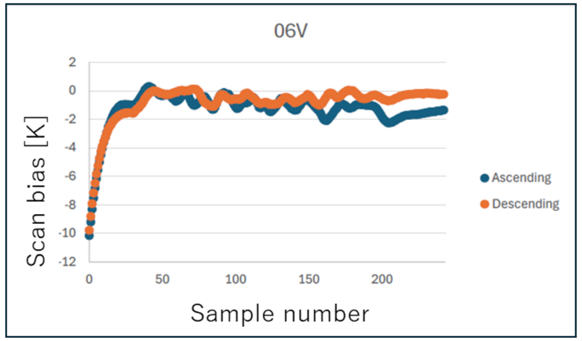
Center frequency [GHz]	Polarization	Band width [MHz]	NEdT (1σ)[K]		
			Specification	Ground-test measurement (H/V)	On-orbit measurement (H/V)
6.925	V/H	350	< 0.34	< 0.31 / < 0.30	< 0.29 / < 0.28
7.3	V/H	350	< 0.43	< 0.30 / < 0.30	< 0.30 / < 0.27
10.25	V/H	500	< 0.33	< 0.29 / < 0.28	< 0.33 / < 0.32
10.65	V/H	100	< 0.70	< 0.59 / < 0.59	< 0.56 / < 0.57
18.7	V/H	200	< 0.70	< 0.45 /< 0.45	< 0.40 / < 0.41
23.8	V/H	400	< 0.60	< 0.37 / < 0.40	< 0.32 / < 0. 35
36.42	V/H	840	< 0.70	< 0.37 / < 0.35	< 0.32 / < 0.32
89.0 A/B	V/H	3000	< 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	< 1.50	< 0.86	< 0.73
183.31±3	V	1470×2	< 1.50	< 1.03	< 0.96
183.31±7	V	1700×2	< 1.50	< 1.11	< 1.00

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

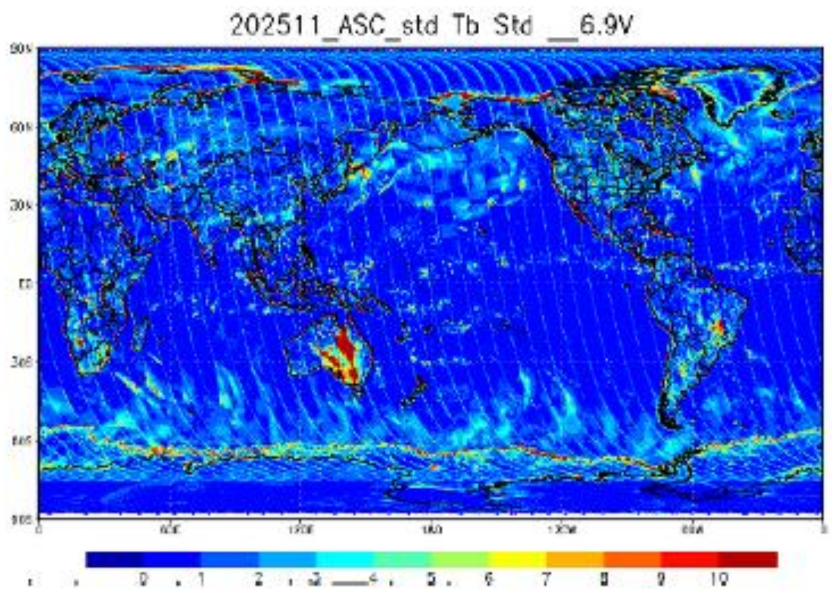
Scan Bias Correction

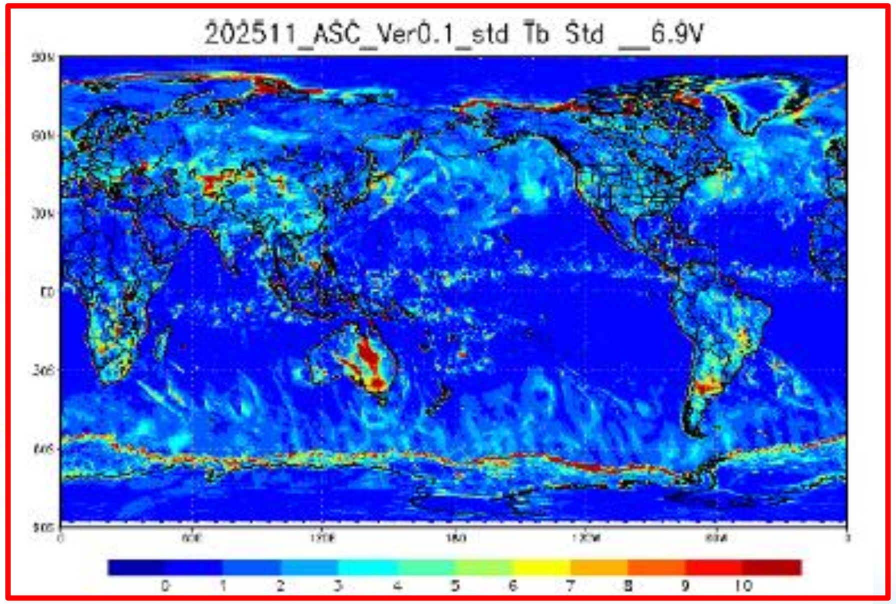
- Correction of scan-dependent BT biases (e.g., partial blockage by onboard calibration sources)
  - ✓ **Action**:
    - AMSR3 scan bias evaluated and corrected following the AMSR2 methodology
    - Separate analyses over ocean and land (low-variability Siberia)
    - Bias approximated using second-order polynomial functions
  - ✓ **Result:**
    - Scan bias characteristics identified at 6.9-10.65 GHz (Right : 6.9 GHz V-pol example)
    - Edges biases effectively reduced after correction （Bottom : 6.9 GHz V-pol example)
    - Improved spatial uniformity across the entire scan





Scan bias characteristics at 6.9 GHz (V-pol)
Top: Ocean (scan edge)
Bottom: Land (full scan over Siberia)





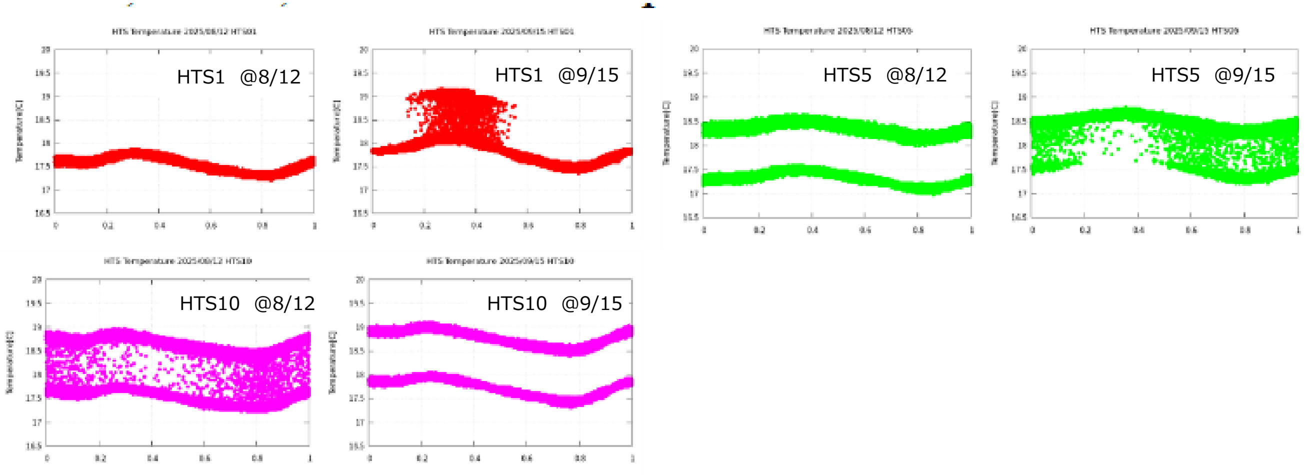
Brightness temperature distribution at 6.9GHz (V-pol)
(Left)Pre-correction;
(Right) Post-correction

HTS Temperature Correction

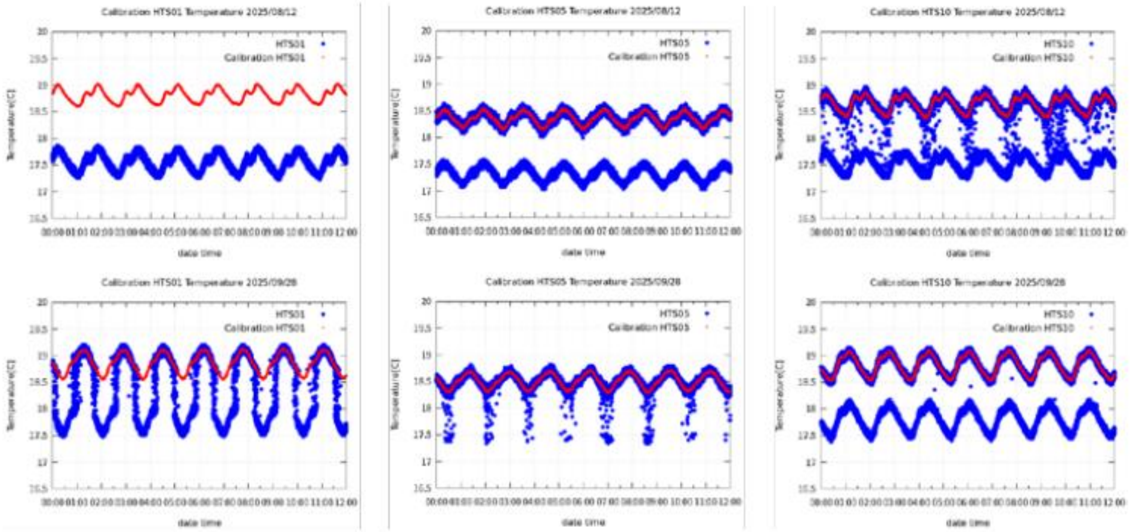
- **Issue**:
  - Step-like transitions between high and low temperature levels across all 10 HTS sensors, with a temperature difference of 1.2 ℃ (lower-left).
- **Action**:
  - Step events correlated with SPC* temperature and corrected in L1 processing by selecting appropriate HTS temperature values based on SPC temperature.

* SPC (Signal Processor of Control unit)

- **Result**:
  - Step-like discontinuities were successfully corrected, and continuous monitoring will be maintained during the nominal calibration phase. (lower-right)



HTS Temperature time series during step events
(Representative examples from HTS1, HTS5, and HTS10)

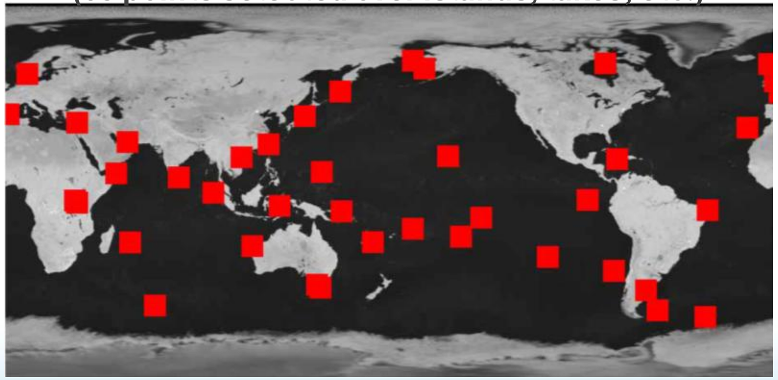


Corrected HTS temperature (Blue: Original, Red: Corrected)
(Representative examples from HTS1, HTS5, and HTS10)

Geometric Calibration

- Geometric Calibration Method
  - ✓ Geolocation errors evaluated using coastline matching
  - ✓ Observed brightness temperature maps ⇔ land-sea fraction patterns (GCP)
- Calibration Parameter for Geometric correction
  - ✓ Rotation offset
  - ✓ Observation start timing
  - ✓ Line-of-sight vectors
  - ✓ (Fixed) Antenna geometry (MREF, SU alignment)
- Results
  - ✓ Post-calibration geometric errors are well within 20% of the IFOV for all channels

Locations of GCPs
(65 points selected over islands, lakes, etc.)



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.

Brightness Temperature Discontinuity at 6.9 GHz (V-pol)

✓ **Issue**:

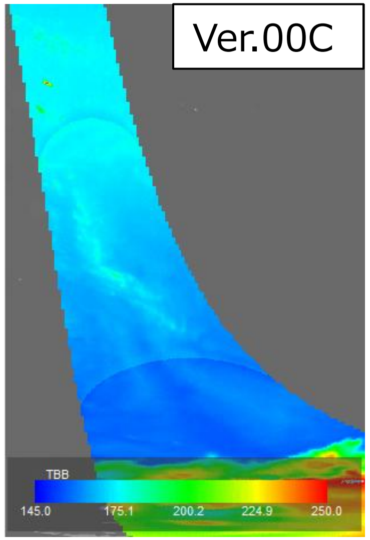
- In Versions 00B and 00C, brightness temperature discontinuities at 6.9 GHz (V-pol) were identified, associated with switching of the receiver gain and offset.

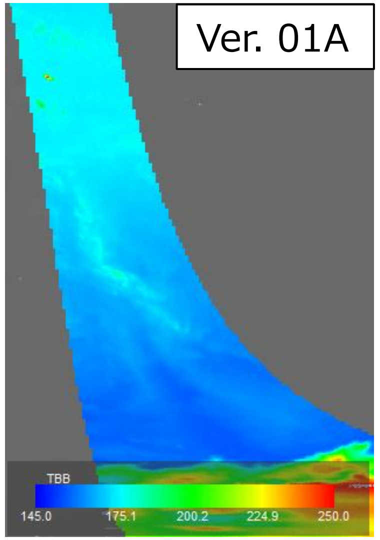
✓ **Action**:

- Improved the count-to-brightness temperature conversion parameters based on analysis of on-orbit data.

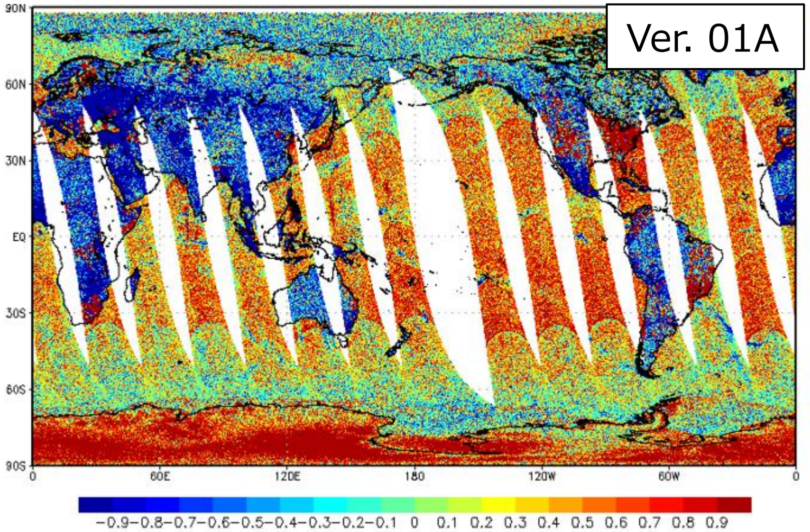
✓ **Result**:

- In Version 01A, brightness temperature discontinuities at 6.9 GHz (V-pol) are reduced.
- However, discontinuities (up to ~0.8 K) are still identified at the timing of gain/offset switching. Therefore, further improvements will be implemented during the nominal calibration phase.





Brightness temperature at 6.9 GHz (V-pol)
March 15, 2026 / Orbit 18 (Ascending)



Difference in Brightness Temperature between 6.9 GHz and 7.3 GHz (V-pol) , May 10, 2026
*Color scale is narrowed to highlight variations. Discontinuities were confirmed over ocean regions.

Level 1R: Brightness Temperature

- Level 1R (L1R) product that matches the center position and size of each footprint in each frequency band by spatial matching process.
- In the AMSR3 Level 1R product, brightness temperatures are provided with spatial resolutions matched to the equivalent frequencies of 6.9 GHz, 10.65 GHz, 23.8 GHz, and 36.42 GHz.
- The frequency channels targeted for the L1R product are listed in the table on the right.

-	FOV06	FOV10	FOV23	FOV36
6.925G V/H	☆			
7.3G V/H	○			
10.25G V/H	○	○		
10.65G V/H	○	☆		
18.7G V/H	○	○	○	
23.8G V/H	○	○	☆	
36.42G V/H	○	○	○	☆
89.0G V/H	○	○	○	○
165.5G V			○	○
183.3±3G V			○	○
183.3±7G V			○	○
spatial resolution (FOV)	6.925GHz-equivalent	10.65GHz-equivalent	23.8GHz-equivalent	36.42GHz-equivalent
observation center position	89GHz A-scan odd-points	89GHz A-scan odd-points	89GHz A-scan odd-points	89GHz A-scan odd-points

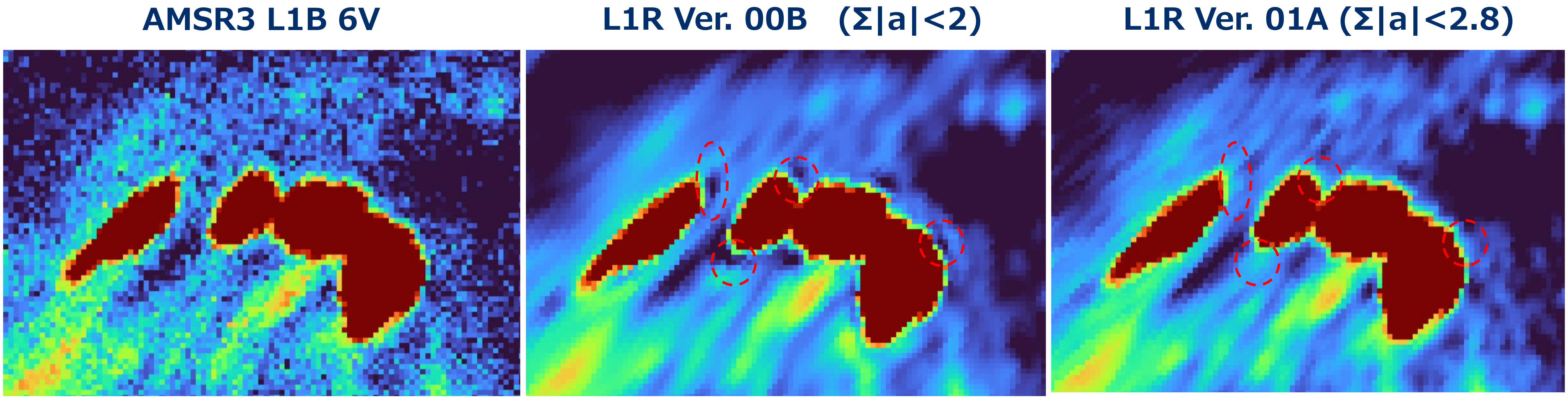
Level 1R: Brightness Temperature

- For the creation of the AMSR3 Level 1R product, we used the Backus–Gilbert (BG) method.
- The smoothing parameter (λ) was selected using the method proposed by Maeda et al. (2016).

$$\lambda = \text{argmin}\ \left\| \mathbf{A}^{\mathrm{T}}\mathbf{w} - \mathbf{a}_{\mathrm{t}} \right\|_1 \qquad \text{s.t.}\ \|\mathbf{w}\|_1 < c$$

$\mathbf{a}_{\mathrm{t}}$: *target AP*
$\mathbf{A}$: foward matrix $\mathbf{w}$: filter coeficients

- In AMSR2 Level 1R, the tolerance value for the noise term (c) is set to 2, which produces strong artifacts in coastal regions.
- Increasing the tolerance from 2.0 to 2.8 suppresses coastal artifacts.
- This change has been applied in AMSR3 L1R Version 1.0.



Level 1R: Brightness Temperature

- We calculated the root sum square of the filter coefficients as a noise factor for all frequency pairs.
- The noise factor is significantly reduced for most pairs, including the repositioning case (i.e., target: 6 GHz, source: 6 GHz).

AMSR3 L1R Noise Factor

Target↓	Source →	6	7	10.3	10.7	18	23	36	89A	89B	165	183±3	183±7
6		0.38	0.38	0.19	0.19	0.15	0.15	0.14	0.07	0.07	–	–	–
10		–	–	0.55	0.55	0.25	0.27	0.22	0.11	0.11	–	–	–
23		–	–	–	–	0.62	0.95	0.37	0.17	0.17	0.33	0.33	0.33
36		–	–	–	–	–	–	0.99	0.34	0.3	0.69	0.65	0.65

Inter-sensor calibration of AMSR3 brightness temperature

- Because validation of brightness temperatures against an absolute truth is inherently difficult, calibration performance is assessed through intercomparison with brightness temperatures observed by other satellite-borne sensors with similar specifications.

- For AMSR3 brightness temperatures, intercalibration with AMSR2 is conducted to ensure continuity of data quality within the AMSR series (AMSR, AMSR-E, AMSR2, and AMSR3). In addition, intercomparison with the GPM Microwave Imager (GMI) is performed, as GMI provides highly accurate and stable calibration and is widely used as a reference standard for microwave radiometers in projects such as the Global Precipitation Measurement (GPM) mission.

- The intercalibration results presented here correspond to AMSR3 L1 Version 00C. Intercalibration for L1 Version 01A will be conducted in future work. However, because no modifications affecting brightness temperatures were introduced between Version 00C and Version 01A, the impact on the intercalibration results is expected to be minimal.

Data and Models

- Duration
  - October 1, 2025 – February 28, 2026

- Brightness temperature (Tb) products for intercalibration
  - AMSR3: Level 1B (Version 00C)
  - AMSR2: Level 1B (Version 220)
  - GMI: Level 1B (Version 07B)

- Radiative transfer model (RTM)
  - RTTOV 13.2 distributed by NWP SAF.
  - Used surface emissivity model/atlas built-in RTTOV 13.2: FASTEM6 for ocean and TELSEM2 for land surface emissivity.

- Ancillary data (Global analysis data)
  - Japan Meteorological Agency (JMA)'s global analysis data (GANAL) and merged satellite SST (MGDSST) were used as atmospheric profile and SST, respectively.

- Calibration method : Double Difference (DD)

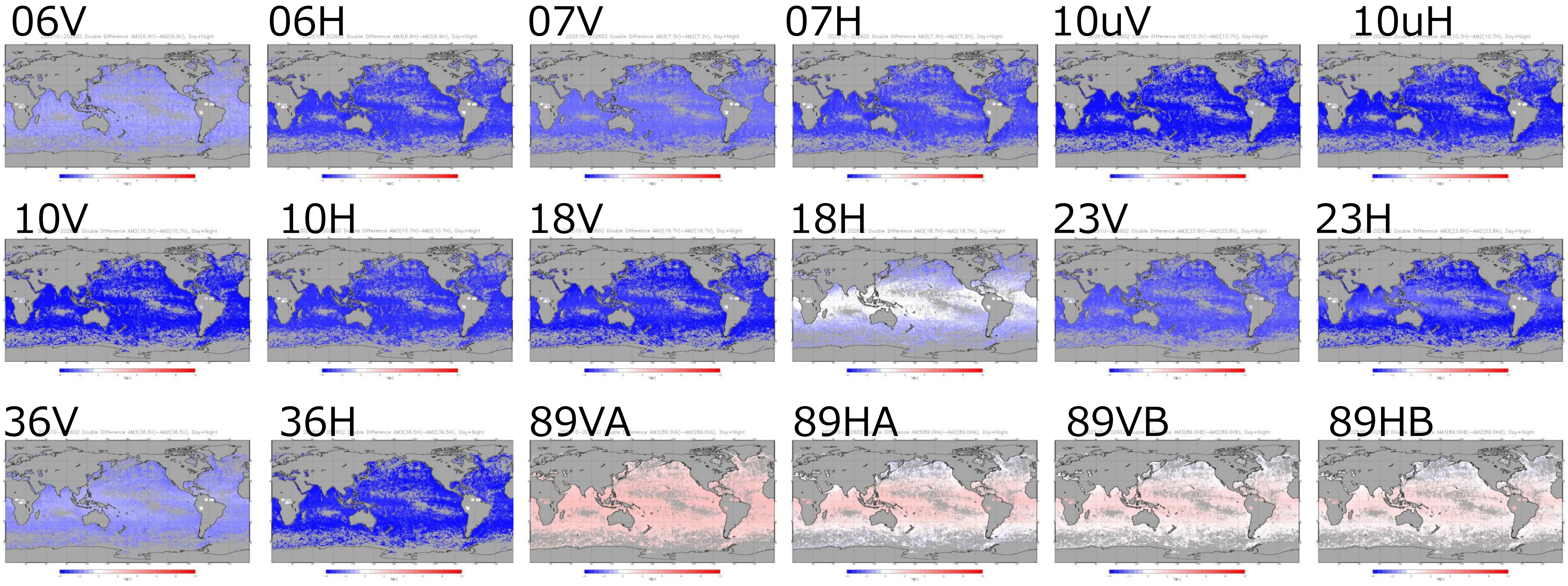
$$DD_{AMSR3\ vs\ AMSR2} = (TB_{AM3obs} - TB_{AM3sim}) - (TB_{AMSR2obs} - TB_{AMSR2sim})$$

$$DD_{AMSR3\ vs\ GMI} = (TB_{AM3obs} - TB_{AM3sim}) - (TB_{GMIobs} - TB_{GMIsim})$$

Intercalibration with AMSR2

Frequency dependency of DD (AMSR3 vs AMSR2)

For Ascending and Descending

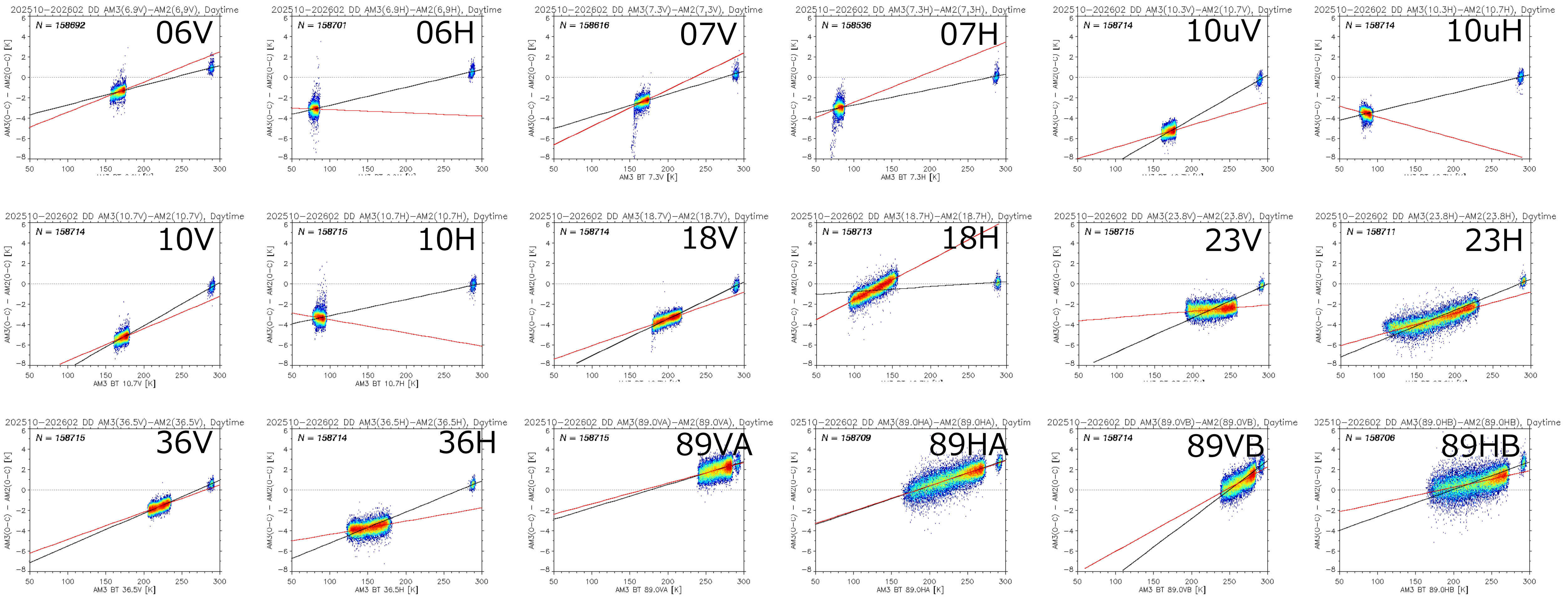


At lower frequencies (≤36 GHz), AMSR3 exhibits a pronounced negative double difference relative to AMSR2, whereas 89 GHz shows a slight positive double difference.

Intercomparison Results AMSR3 vs AMSR2

For Ascending data

Linear Fit —: Ocean and Land, —: Ocean only



Interconversion Coefficients AMSR3 vs AMSR2

For Ascending data

How to Convert AMSR3 TB
to AMSR2 Equivalent TB

$$Tb_{AMSR3toAMSR2}[K] = Tb_{AMSR3}[K] - \Delta Cal\ [K]$$

$$\Delta Cal\ [K] = Tb_{AMSR3}[K] \times slope + intercept$$

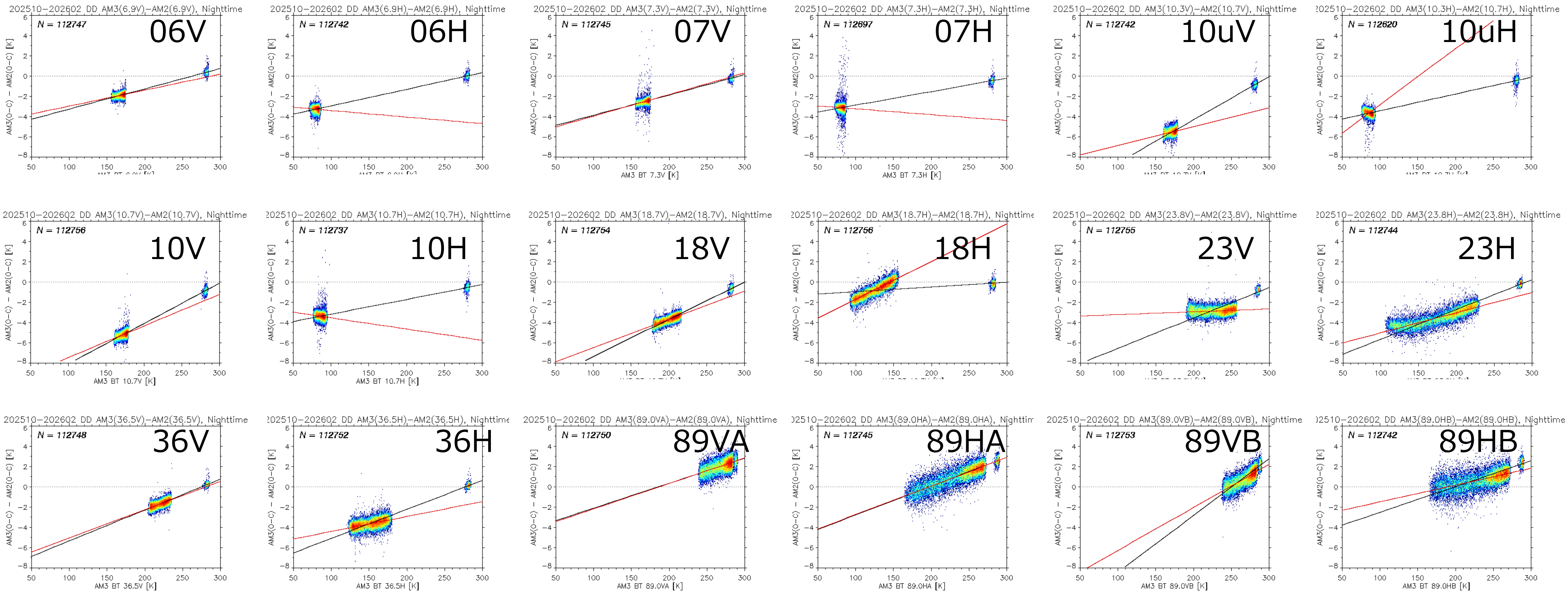
$*\ Tb_{AMSR3toAMSR2}$: Tb_{AMSR3} *Calibrated to* Tb_{AMSR2}

Freq.	①Ocean only		②Ocean and Land		Typical TB		①Ocean only		②Ocan and Land	
	Slope	intercept	Slope	intercept	TB@Ocean	TB@Land	ΔT@Ocean	ΔT@Land	ΔT@Ocean	ΔT@Land
6V	0.02948	−6.33794	0.01931	−4.61913	169.37	289.07	−1.35	2.18	−1.35	0.96
6H	−0.00318	−2.80966	0.01760	−4.48198	80.45	287.04	−3.07	−3.72	−3.07	0.57
7V	0.03600	−8.39921	0.02247	−6.11563	169.03	289.77	−2.31	2.03	−2.32	0.39
7H	0.02947	−5.37545	0.01512	−4.20642	81.58	287.64	−2.97	3.10	−2.97	0.14
10.25V	0.02203	−9.06047	0.04301	−12.67108	172.26	289.63	−5.27	−2.68	−5.26	−0.21
10.25H	−0.02085	−1.75399	0.01773	−5.06046	85.76	288.48	−3.54	−7.77	−3.54	0.05
10.65V	0.03149	−10.67575	0.04228	−12.53897	172.84	289.55	−5.23	−1.56	−5.23	−0.30
10.65H	−0.01303	−2.18863	0.01586	−4.69163	86.69	288.33	−3.32	−5.94	−3.32	−0.12
18V	0.02620	−8.67117	0.03612	−10.63766	199.27	289.62	−3.45	−1.08	−3.44	−0.18
18H	0.03916	−5.45852	0.00506	−1.26348	124.68	288.68	−0.58	5.85	−0.63	0.20
23V	0.00625	−3.91889	0.03362	−10.04324	229.10	290.74	−2.49	−2.10	−2.34	−0.27
23H	0.02110	−7.10063	0.03046	−8.66868	176.91	290.32	−3.37	−0.98	−3.28	0.17
36V	0.02676	−7.51330	0.03226	−8.71759	219.96	288.88	−1.63	0.22	−1.62	0.60
36H	0.01299	−5.63930	0.03047	−8.24123	150.44	288.28	−3.69	−1.89	−3.66	0.54
89VA	0.02028	−3.37321	0.02261	−3.98606	268.27	292.03	2.07	2.55	2.08	2.62
89HA	0.02464	−4.50532	0.02520	−4.62895	233.12	291.87	1.24	2.69	1.25	2.73
89VB	0.04155	−10.17671	0.05647	−14.06832	267.56	292.11	0.94	1.96	1.04	2.43
89HB	0.01599	−2.91234	0.02679	−5.27843	232.73	291.89	0.81	1.75	0.96	2.54

Intercomparison Results AMSR3 vs AMSR2

For Descending data

Linear Fit —: Ocean and Land, —: Ocean only



Interconversion Coefficients AMSR3 vs AMSR2

For Descending data

How to Convert AMSR3 TB
to AMSR2 Equivalent TB

$$Tb_{AMSR3toAMSR2}[K] = Tb_{AMSR3}[K] - \Delta Cal\ [K]$$

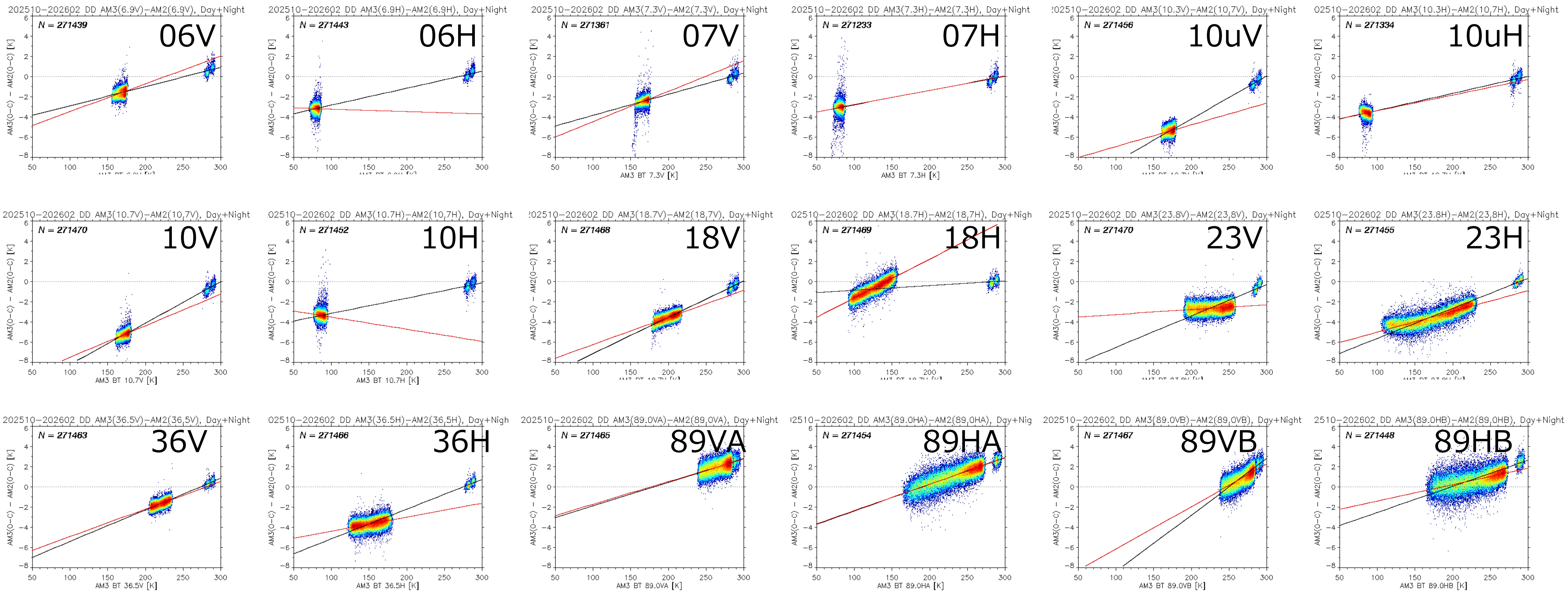
$$\Delta Cal\ [K] = Tb_{AMSR3}[K] \times slope + intercept$$

$*\ Tb_{AMSR3toAMSR2}$: Tb_{AMSR3} $Calibrated\ to\ Tb_{AMSR2}$

Freq.	①Ocean only		②Ocean and Land		Typical TB		①Ocean only		②Ocan and Land	
	Slope	intercept	Slope	intercept	TB@Ocean	TB@Land	ΔT@Ocean	ΔT@Land	ΔT@Ocean	ΔT@Land
6V	0.01577	−4.52184	0.02005	−5.24246	168.60	281.88	−1.86	−0.08	−1.86	0.41
6H	−0.00647	−2.73100	0.01640	−4.55940	79.99	279.94	−3.25	−4.54	−3.25	0.03
7V	0.02133	−6.06875	0.02008	−5.85827	168.69	282.43	−2.47	−0.04	−2.47	−0.19
7H	−0.00574	−2.63507	0.01338	−4.18855	81.26	280.49	−3.10	−4.25	−3.10	−0.43
10.25V	0.01855	−8.69100	0.04261	−12.82014	171.81	281.66	−5.50	−3.47	−5.50	−0.82
10.25H	0.05558	−8.39389	0.01656	−5.06235	85.48	280.70	−3.64	7.21	−3.65	−0.41
10.65V	0.03121	−10.56221	0.03982	−12.04858	172.70	281.66	−5.17	−1.77	−5.17	−0.83
10.65H	−0.01108	−2.39796	0.01457	−4.61385	86.48	280.62	−3.36	−5.51	−3.35	−0.53
18V	0.02782	−9.24717	0.03667	−10.99784	199.26	282.48	−3.70	−1.39	−3.69	−0.64
18H	0.03731	−5.40965	0.00462	−1.38822	124.92	281.66	−0.75	5.10	−0.81	−0.09
23V	0.00280	−3.46432	0.02996	−9.51393	229.29	285.13	−2.82	−2.67	−2.64	−0.97
23H	0.01990	−6.98463	0.02938	−8.56324	177.51	284.77	−3.45	−1.32	−3.35	−0.20
36V	0.02790	−7.79923	0.03051	−8.37033	220.24	282.27	−1.65	0.08	−1.65	0.24
36H	0.01476	−5.85717	0.02864	−7.92828	151.02	281.77	−3.63	−1.70	−3.60	0.14
89VA	0.02512	−4.66971	0.02466	−4.55091	268.09	287.83	2.06	2.56	2.06	2.55
89HA	0.02816	−5.53354	0.02851	−5.60959	233.14	287.67	1.03	2.57	1.04	2.59
89VB	0.04244	−10.51061	0.05591	−13.99343	267.40	287.82	0.84	1.70	0.96	2.10
89HB	0.01652	−3.11319	0.02538	−5.03331	232.96	287.66	0.74	1.64	0.88	2.27

Intercomparison Results AMSR3 vs AMSR2

For Ascending and Descending data Linear Fit —: Ocean and Land, —: Ocean only



Interconversion Coefficients AMSR3 vs AMSR2

For Ascending and Descending data

How to Convert AMSR3 TB
to AMSR2 Equivalent TB

$$Tb_{AMSR3toAMSR2}[K] = Tb_{AMSR3}[K] - \Delta Cal\ [K]$$

$$\Delta Cal\ [K] = Tb_{AMSR3}[K] \times slope + intercept$$

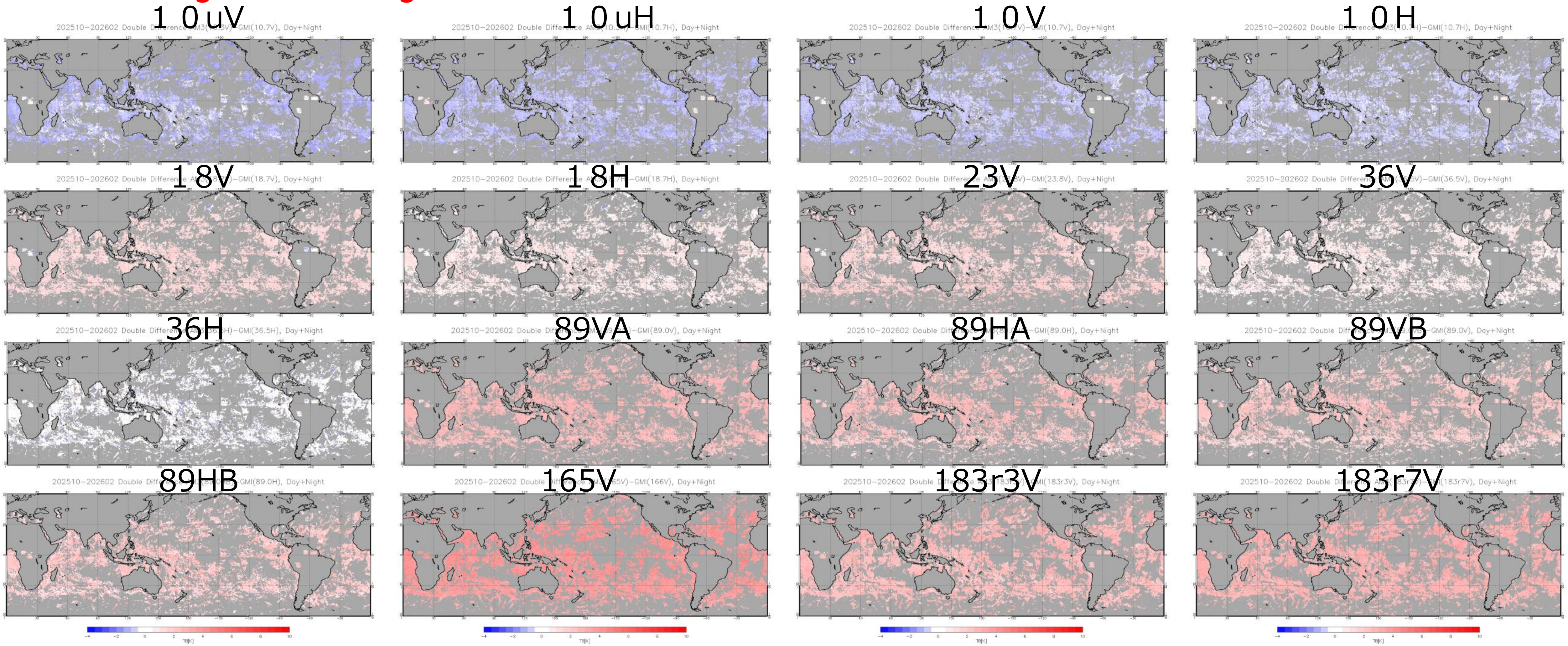
$* \ Tb_{AMSR3toAMSR2}$: Tb_{AMSR3} $Calibrated\ to$ Tb_{AMSR2}

Freq.	①Ocean only		②Ocean and Land		Typical TB		①Ocean only		②Ocan and Land	
	Slope	intercept	Slope	intercept	TB@Ocean	TB@Land	ΔT@Ocean	ΔT@Land	ΔT@Ocean	ΔT@Land
6V	0.02751	−6.20796	0.01908	−4.79071	169.05	284.81	−1.56	1.63	−1.57	0.64
6H	−0.00235	−2.95229	0.01678	−4.49045	80.26	282.83	−3.14	−3.62	−3.14	0.26
7V	0.03006	−7.45598	0.02097	−5.92958	168.89	285.42	−2.38	1.12	−2.39	0.06
7H	0.01421	−4.18249	0.01403	−4.17246	81.45	283.40	−3.02	−0.15	−3.03	−0.20
10.25V	0.02157	−9.07482	0.04251	−12.67933	172.07	284.90	−5.36	−2.93	−5.36	−0.57
10.25H	0.01549	−4.90946	0.01698	−5.04114	85.65	283.87	−3.58	−0.51	−3.59	−0.22
10.65V	0.03128	−10.61263	0.04104	−12.30028	172.79	284.87	−5.21	−1.70	−5.21	−0.61
10.65H	−0.01202	−2.29261	0.01510	−4.64256	86.60	283.75	−3.33	−5.70	−3.33	−0.36
18V	0.02690	−8.91388	0.03600	−10.72088	199.27	285.39	−3.55	−1.24	−3.55	−0.45
18H	0.03833	−5.42903	0.00463	−1.28740	124.78	284.52	−0.65	5.48	−0.71	0.03
23V	0.00472	−3.70572	0.03115	−9.61884	229.18	287.41	−2.62	−2.35	−2.48	−0.67
23H	0.02057	−7.04617	0.02978	−8.58779	177.15	287.03	−3.40	−1.14	−3.31	−0.04
36V	0.02721	−7.62540	0.03127	−8.51987	220.07	284.96	−1.64	0.13	−1.64	0.39
36H	0.01377	−5.73743	0.02949	−8.08162	150.68	284.42	−3.66	−1.82	−3.64	0.31
89VA	0.02238	−3.93667	0.02336	−4.19353	268.20	289.54	2.07	2.54	2.07	2.57
89HA	0.02617	−4.94693	0.02650	−5.02024	233.13	289.38	1.15	2.63	1.16	2.65
89VB	0.04196	−10.32512	0.05594	−13.96033	267.50	289.57	0.90	1.82	1.00	2.24
89HB	0.01621	−2.99640	0.02589	−5.10795	232.83	289.38	0.78	1.70	0.92	2.38

Intercalibration with GMI

Frequency dependency of DD (AMSR3 vs GMI)

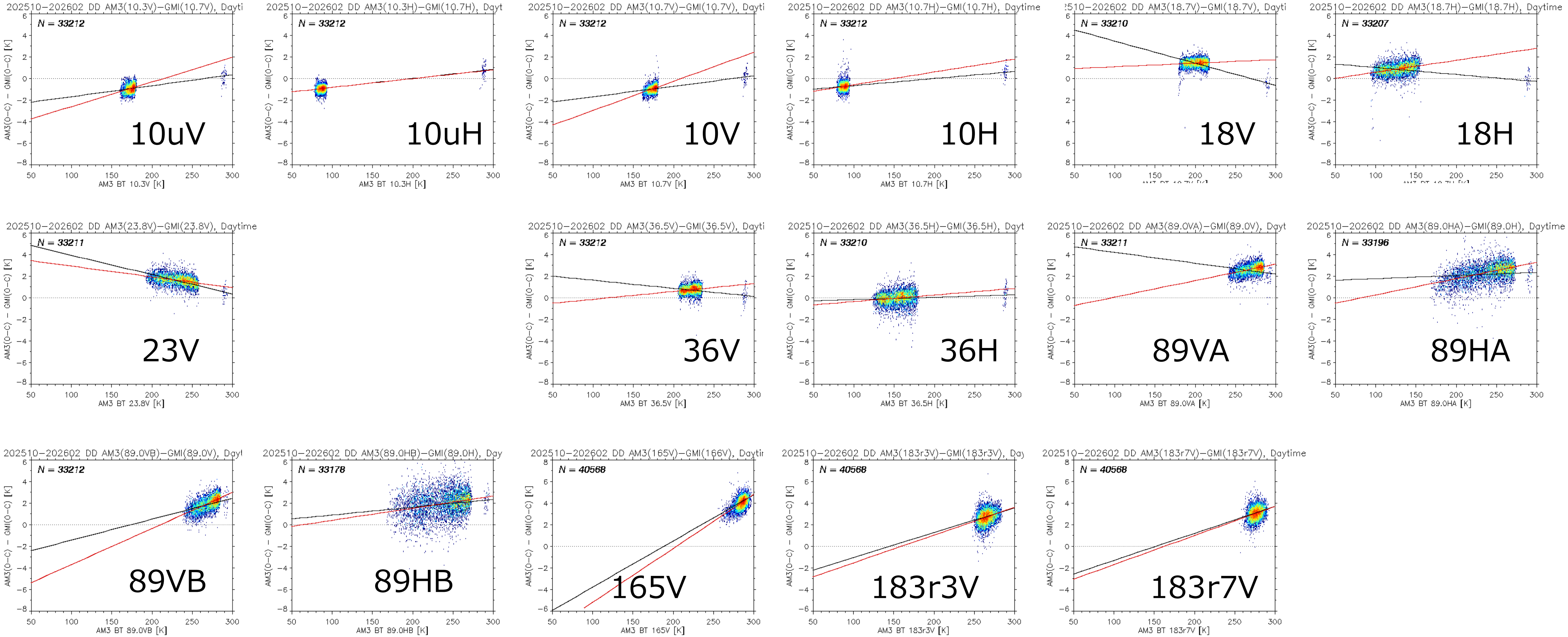
For Ascending and Descending



Below 10 GHz, AMSR3 exhibits a slight negative double difference relative to GMI, whereas above 18 GHz it shows a positive double difference, although the difference is smaller than that between AMSR2 and AMSR3.

Intercomparison Results AMSR3 vs GMI

For Ascending data



Interconversion Coefficients AMSR3 vs GMI

How to Convert AMSR3 TB
to GMI Equivalent TB

$$Tb_{AMSR3toGMI}[K] = Tb_{AMSR3}[K] - \Delta Cal\ [K]$$

$$\Delta Cal\ [K] = Tb_{AMSR3}[K] \times slope + intercept$$

$*\ Tb_{AMSR3toGMI}$: Tb_{AMSR3} $Calibrated\ to\ Tb_{GMI}$

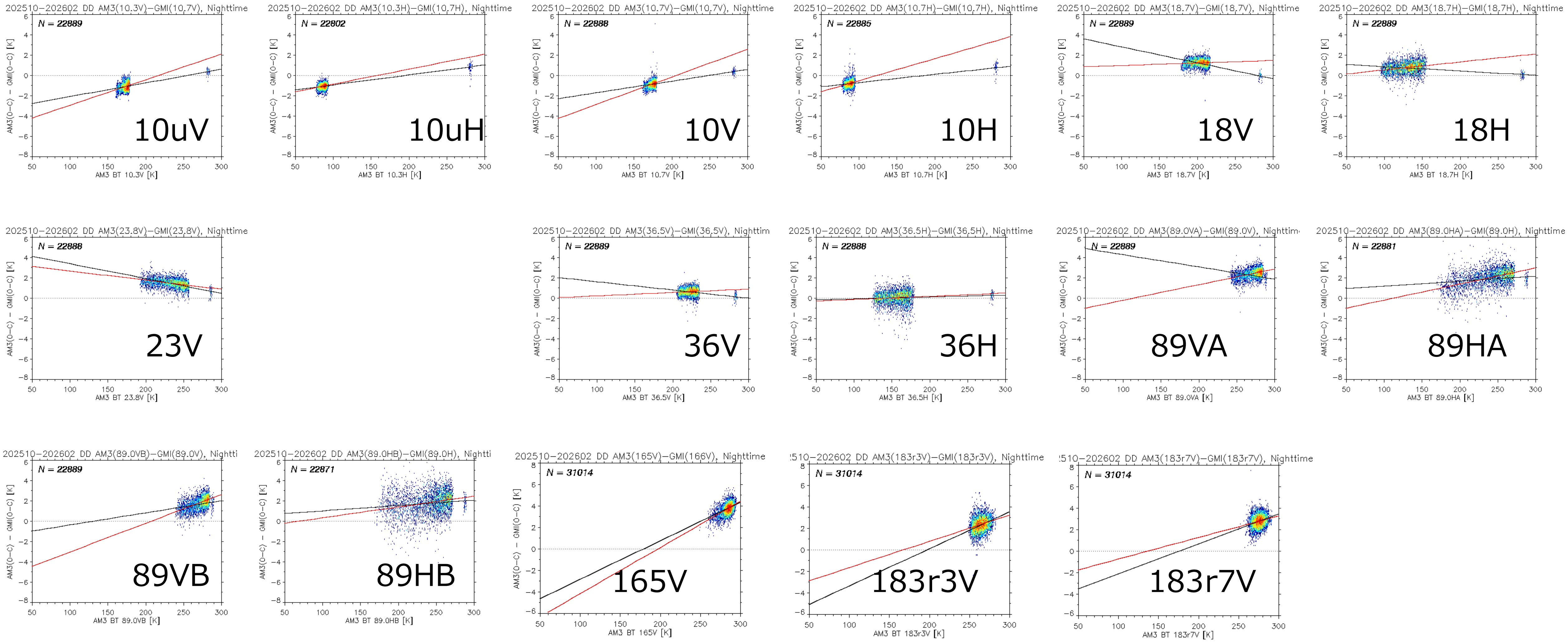
For Ascending data

Feq.	①Ocean only		②Ocean and Land		Typical TB		①Ocean only		②Ocan and Land	
	Slope	intercept	Slope	intercept	TB@Ocean	TB@Land	ΔT@Ocean	ΔT@Land	ΔT@Ocean	ΔT@Land
10.25V	0.02283	−4.86537	0.01018	−2.67923	173.18	289.34	−0.91	1.74	−0.92	0.27
10.25H	0.00820	−1.62111	0.00832	−1.63233	86.23	288.20	−0.91	0.74	−0.92	0.76
10.65V	0.02701	−5.63735	0.00970	−2.63563	173.70	289.26	−0.95	2.18	−0.95	0.17
10.65H	0.01190	−1.74847	0.00653	−1.28263	87.15	288.04	−0.71	1.68	−0.71	0.60
18V	0.00332	0.79096	−0.02058	5.56285	200.86	289.23	1.46	1.75	1.43	−0.39
18H	0.01112	−0.51009	−0.00650	1.69720	126.81	288.26	0.90	2.70	0.87	−0.18
23V	−0.01000	3.96703	−0.01792	5.76129	231.81	290.29	1.65	1.06	1.61	0.56
36V	0.00730	−0.84670	−0.00748	2.40070	221.17	288.52	0.77	1.26	0.75	0.24
36H	0.00609	−0.93874	0.00220	−0.35639	152.31	287.85	−0.01	0.82	−0.02	0.28
89VA	0.01530	−1.44763	−0.01012	5.25139	270.38	291.62	2.69	3.01	2.51	2.30
89HA	0.01510	−1.22018	0.00292	1.51483	237.69	291.41	2.37	3.18	2.21	2.36
89VB	0.03343	−7.01327	0.01947	−3.35425	269.69	291.71	2.00	2.74	1.90	2.33
89HB	0.01126	−0.69481	0.00723	0.20175	237.29	291.45	1.98	2.59	1.92	2.31
165V	0.05001	−10.17713	0.04293	−8.06823	284.92	283.07	4.07	3.98	4.16	4.08
183r3V	0.02571	−4.08429	0.02315	−3.34382	265.18	258.25	2.73	2.56	2.79	2.63
183r7V	0.02697	−4.37229	0.02508	−3.79300	276.39	270.60	3.08	2.93	3.14	2.99

Intercomparison Results AMSR3 vs GMI

For Descending data

Linear Fit —: Ocean and Land, —: Ocean only



Interconversion Coefficients AMSR3 vs GMI

How to Convert AMSR3 TB
to GMI Equivalent TB

$$Tb_{AMSR3toGMI}[K] = Tb_{AMSR3}[K] - \Delta Cal\ [K]$$

$$\Delta Cal\ [K] = Tb_{AMSR3}[K] \times slope + intercept$$

$* \ Tb_{AMSR3toGMI}$: Tb_{AMSR3} $Calibrated\ to\ Tb_{GMI}$

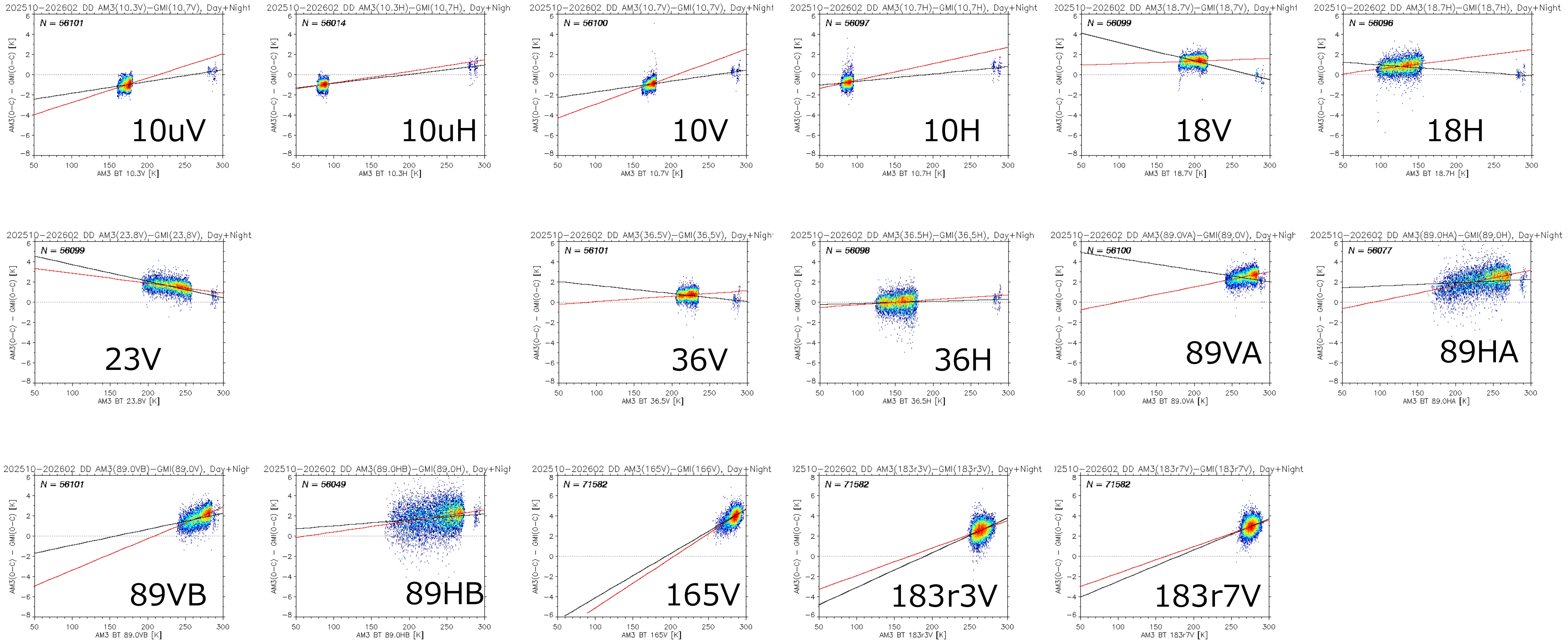
For Descending data

Feq.	①Ocean only		②Ocean and Land		Typical TB		①Ocean only		②Ocan and Land	
	Slope	intercept	Slope	intercept	TB@Ocean	TB@Land	ΔT@Ocean	ΔT@Land	ΔT@Ocean	ΔT@Land
10.25V	0.02516	−5.42857	0.01345	−3.40463	173.03	282.15	−1.08	1.67	−1.08	0.39
10.25H	0.01480	−2.31812	0.00982	−1.89005	86.07	281.08	−1.04	1.84	−1.05	0.87
10.65V	0.02718	−5.56247	0.01149	−2.83817	173.84	282.18	−0.84	2.11	−0.84	0.41
10.65H	0.02172	−2.67221	0.00808	−1.48528	87.07	281.02	−0.78	3.43	−0.78	0.78
18V	0.00250	0.76574	−0.01571	4.41328	201.53	283.05	1.27	1.47	1.25	−0.03
18H	0.00786	−0.21685	−0.00425	1.31458	128.06	282.11	0.79	2.00	0.77	0.12
23V	−0.00895	3.59950	−0.01457	4.87982	233.28	285.53	1.51	1.04	1.48	0.72
36V	0.00336	−0.07758	−0.00809	2.45046	221.99	282.75	0.67	0.87	0.65	0.16
36H	0.00316	−0.41238	0.00189	−0.21934	153.82	282.17	0.07	0.48	0.07	0.31
89VA	0.01547	−1.73729	−0.01207	5.51721	271.07	288.07	2.46	2.72	2.25	2.04
89HA	0.01586	−1.75236	0.00493	0.71376	239.74	287.91	2.05	2.81	1.90	2.13
89VB	0.02835	−5.84553	0.01195	−1.53902	270.44	288.02	1.82	2.32	1.69	1.90
89HB	0.01069	−0.71006	0.00522	0.52363	239.54	287.88	1.85	2.37	1.77	2.03
165V	0.04299	−8.44445	0.03595	−6.40190	283.85	281.89	3.76	3.67	3.80	3.73
183r3V	0.02450	−4.07836	0.03452	−6.77958	263.95	257.09	2.39	2.22	2.33	2.10
183r7V	0.02009	−2.72247	0.02788	−4.87912	275.26	269.71	2.81	2.70	2.79	2.64

Intercomparison Results AMSR3 vs GMI

For Ascending + Descending data

Linear Fit —: Ocean and Land, —: Ocean only



Interconversion Coefficients AMSR3 vs GMI

How to Convert AMSR3 TB
to GMI Equivalent TB

$$Tb_{AMSR3toGMI}[K] = Tb_{AMSR3}[K] - \Delta Cal\ [K]$$

$$\Delta Cal\ [K] = Tb_{AMSR3}[K] \times slope + intercept$$

$* \ Tb_{AMSR3toGMI}\ :\ Tb_{AMSR3}\ Calibrated\ to\ Tb_{GMI}$

For Ascending and Descending data

Feq.	①Ocean only		②Ocean and Land		Typical TB		①Ocean only		②Ocan and Land	
	Slope	intercept	Slope	intercept	TB@Ocean	TB@Land	ΔT@Ocean	ΔT@Land	ΔT@Ocean	ΔT@Land
10.25V	0.02408	−5.14785	0.01169	−3.00165	173.12	285.29	−0.98	1.72	−0.98	0.33
10.25H	0.01150	−1.95800	0.00903	−1.74434	86.16	284.18	−0.97	1.31	−0.97	0.82
10.65V	0.02727	−5.64036	0.01075	−2.76842	173.75	285.27	−0.90	2.14	−0.90	0.30
10.65H	0.01631	−2.16033	0.00731	−1.37607	87.12	284.08	−0.74	2.47	−0.74	0.70
18V	0.00266	0.84636	−0.01835	5.05203	201.13	285.74	1.38	1.61	1.36	−0.19
18H	0.00963	−0.37105	−0.00538	1.51955	127.32	284.79	0.86	2.37	0.83	−0.01
23V	−0.00973	3.85560	−0.01649	5.39117	232.40	287.60	1.59	1.06	1.56	0.65
36V	0.00540	−0.46793	−0.00794	2.46501	221.50	285.26	0.73	1.07	0.71	0.20
36H	0.00504	−0.74668	0.00213	−0.30856	152.92	284.65	0.02	0.69	0.02	0.30
89VA	0.01505	−1.47735	−0.01162	5.53226	270.66	289.62	2.59	2.88	2.39	2.17
89HA	0.01515	−1.37411	0.00329	1.29001	238.52	289.44	2.24	3.01	2.07	2.24
89VB	0.03110	−6.46844	0.01577	−2.46356	269.99	289.63	1.93	2.54	1.79	2.10
89HB	0.01090	−0.67205	0.00594	0.43629	238.20	289.44	1.93	2.48	1.85	2.15
165V	0.04904	−10.01284	0.04389	−8.49586	284.46	282.43	3.94	3.84	3.99	3.90
183r3V	0.02722	−4.61743	0.03431	−6.49872	264.65	257.61	2.59	2.39	2.58	2.34
183r7V	0.02627	−4.28550	0.03097	−5.56499	275.90	270.11	2.96	2.81	2.98	2.80

GOSAT-GW/AMSR3 Standard Product Validation Result (Geophysical Product)

Earth Observation Research Center
Japan Aerospace Exploration Agency
June 30, 2026

1. Introduction

- This document presents the validation results conducted in preparation for the data release of standard products (higher-level geophysical parameter products) derived from brightness temperatures observed by the Advanced Microwave Scanning Radiometer 3 (AMSR3) onboard the Greenhouse Gases and Water Cycle Observation Technology Satellite (GOSAT-GW).
- The validation activities are carried out by leveraging the experience and achievements of validation work for the AMSR series. As validation data, operational datasets acquired by meteorological and oceanographic agencies in various countries, as well as datasets obtained through diverse scientific programs, are utilized to the maximum extent possible. Based on the experience of the AMSR series, issues and validation items for each geophysical parameter are identified, and validation is conducted efficiently by focusing on these aspects.
- It should be noted that this evaluation is based on pre-release brightness temperature products. Therefore, if improvements applied at the time of release result in changes to the evaluation results, this document will be updated accordingly.
- For details of the algorithms and limitations of each product, please also refer to the AMSR3 Algorithm Theoretical Basis Document (ATBD).

2. Required Accuracies of the Standard Product

- Release and Standard accuracy of the AMSR3 Standard Products

Product		Area	Release	Standard	detail
Total Precipitable Water	Ocean	Global Ocean	**3.5 kg/m²**	3.0 kg/m²	P.3-4
	Land	Global Land	**6.5 kg/m²**	3.5 kg/m²	
Integrated Cloud Liquid Water Content		Global Ocean	**0.10 kg/m²**	0.05 kg/m²	P.5-6
Precipitation	Liquid	Global	**Ocean: 50 % Land: 120 %**	Ocean: 50 % Land: 120 %	P.7-8
	Solid		**Ocean: 130 % Land: 200 %**	Ocean: 130 % Land: 200 %	P.9-13
Sea Surface Temperature	6 GHz	Global Ocean	**0.8 ˚C**	0.5 ˚C	P.14-15
	10 GHz Multi-band			0.6 ˚C	
Sea Surface Wind Speed		Global Ocean	**1.5 m/s**	1.0 m/s	P.16-17
All-weather Sea Surface Wind Speed		Global Ocean	**7 m/s**	5 m/s	P.18-19
Sea Ice Concentration		Polar Ocean	**10%**	10%	P.20-21
High-resolution Sea Ice Concentration		Polar Ocean	**15%**	15%	P.22-23
Snow Depth		Global Land	**20 cm**	10 cm	P.24-25
Soil Moisture Content		Global Land	**10%**	5%	P.26-27
Sea Ice Motion Vector		Polar Ocean	**6 cm**	6 cm	P.28-29

3. Validation Result

(1) Total Precipitable Water - TPW

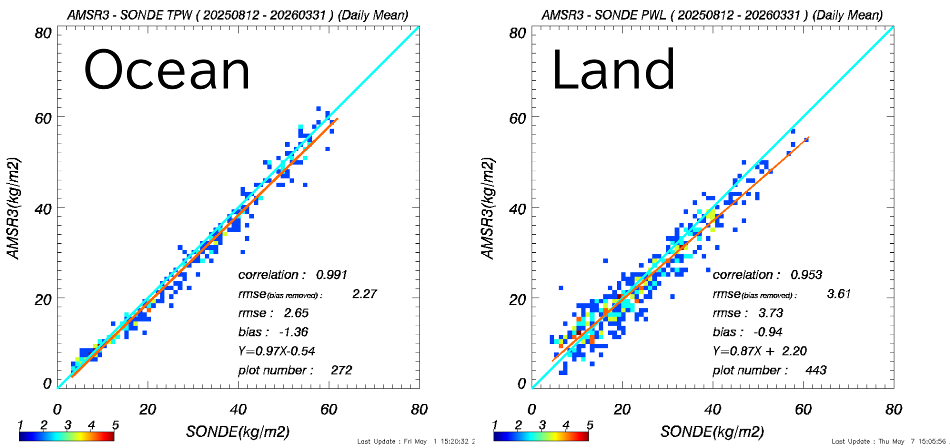
- Validation method
  - The Total Precipitable Water (TPW) calculated from radiosonde and GPS receiver data is compared with the estimated TPW by AMSR3 for both offshore and onshore sites, and the root squared error (RMSE) of instantaneous values at about 15 km horizontal resolution is calculated.
- Validation data and comparison condition
  - The time difference between radiosonde and AMSR3 observation is within 1 hour and within 30 km from the observation site.
  - The time difference between GPS and AMSR3 observation is within 5 minutes and within 30 km from the observation point. The AMSR3 TPW meeting the matchup conditions must be 5 points or more, and the difference between the maximum and minimum values must be less than 5 kg/m^2.
- Validation period
  - From August 11, 2025 to March 31, 2026

3. Validation Result

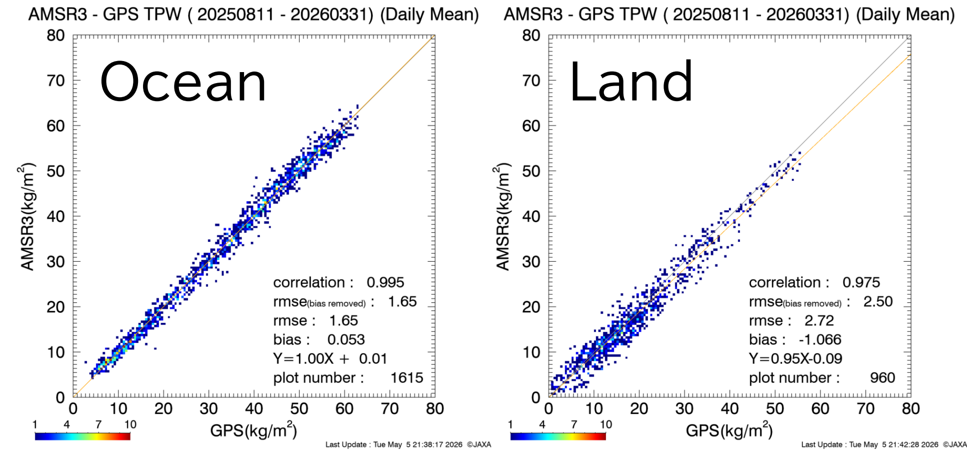
(1) Total Precipitable Water - TPW

- Validation result

vs Radiosonde



vs GPS



Release Accuracy	Validation Result	note
Ocean:3.5 kg/m^2 Land:6.5 kg/m^2	Ocean:vs Radiosonde 2.65 kg/m^2, vs GPS 1.65 kg/m^2 Land:vs Radiosonde 3.73 kg/m^2, vs GPS 2.72 kg/m^2	Extend the period and conduct ongoing validation

Achieved the release accuracy

3. Validation Result

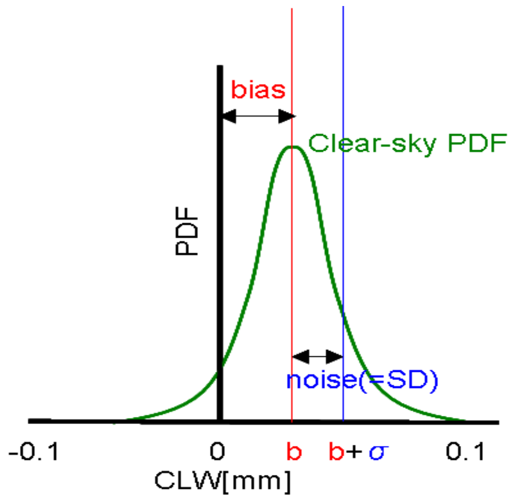
(2) Cloud Liquid Water Content - CLW

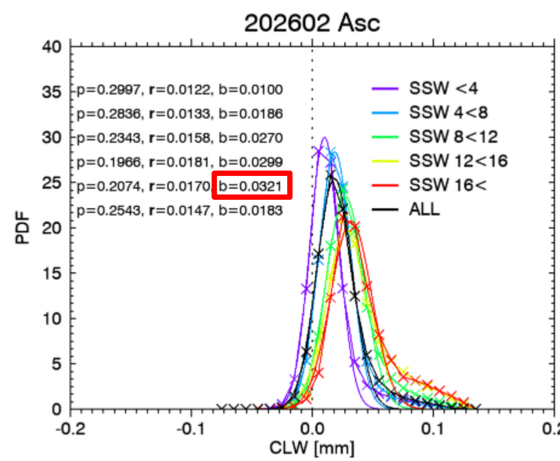
- Validation method
  - Using clear sky area information (cloud flag information) from simultaneous observation of visible and infrared observation data such as MODIS and VIIRS, Cloud Liquid Water Content (CLW) observation data by AMSR3 is compared in histograms to evaluate the variation from zero in AMSR3 CLW in clear sky region.
- Validation data and comparison condition
  - After extracting clear sky regions using VIIRS cloud flag data with a one-hour time difference, the probability density function (PDF) of CLW was used to calculate the bias and noise (standard deviation) for each month.
  - CLW accuracy (including dependencies) is calculated using the largest noise (worst std.) and bias (worst bias) when there are 1000 or more effective observation points in the clear weather region CLW bias.
- Validation period
  - From August 11, 2025 to March 31, 2026

3. Validation Result

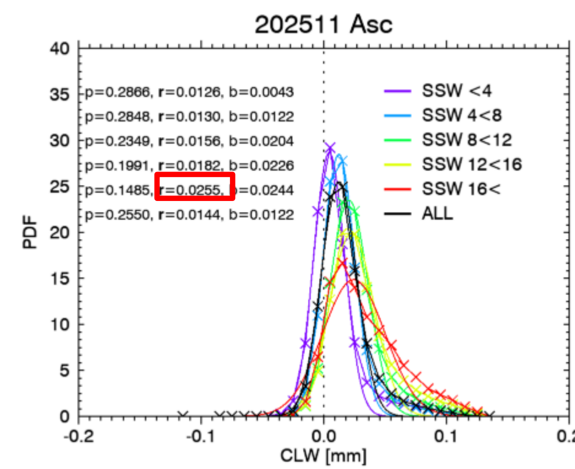
(2) Cloud Liquid Water Content - CLW

- Validation result





worst bias count:11963



worst std count:6352

Release Accuracy	Validation Result	note
0.1 kg/m^2	worst std :0.0255（SSW>16m/s Nov2025） worst bias :0.0321（SSW>16m/s Feb2026） worst(std+bias) :0.058	Continue to revise the algorithm to achieve standard accuracy (0.05 kg/m^2).

Achieved the release accuracy

3. Validation Result

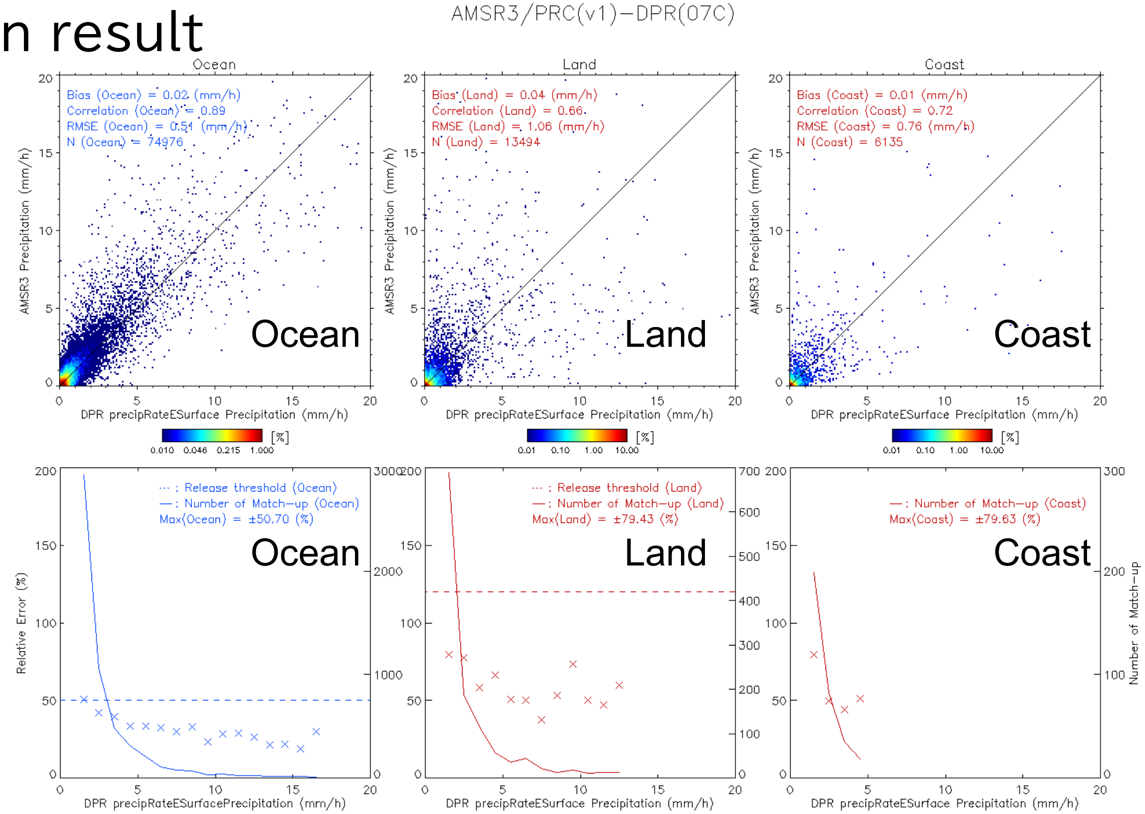
(3) Precipitation (Liquid) - PRC

- Validation method
  - AMSR3 Precipitation (PRC) will be compared with the PRC product derived from GPM/DPR. Using instantaneous values equivalent to 0.5 degrees of grids, the relative error relative to DPR measurements is calculated and verified using these values.
- Validation data and comparison condition
  - Estimated rainfall values for DPR and AMSR3 matched within a 10-minute interval were averaged to the equivalent of a 0.5-degree grid and compared.
  - Only matchups where either DPR or AMSR3 precipitation is greater than 0 mm/h and correspond to 0≦ DPR and AMSR3 <20.5 (mm/h) are used
- Validation period
  - From September 1, 2025 to February 28, 2026

3. Validation Result

(3) Precipitation (Liquid) - PRC

- Validation result



Release Accuracy	Validation Result	note
0.5-degree grid equivalent Relative error compared to GPM/DPR Ocean 50% Land 120%	Ocean: 44.72% Land: 72.45% (Coast: 64.98%)	Extend the period and conduct ongoing validation

Achieved the release accuracy

3. Validation Result

(3) Precipitation (Solid) - PRC

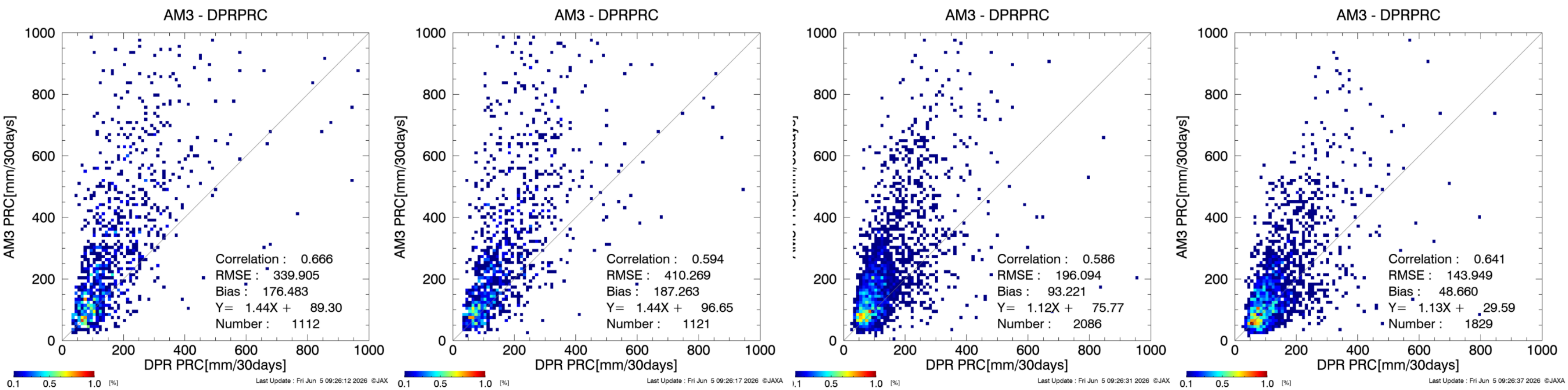
- Validation method
  - AMSR3 Precipitation (PRC) will be compared with the PRC product derived from GPM/DPR. The relative error of the DPR measurements of monthly integrated snowfall on a 0.5-degree grid is calculated and validated using that value.
- Validation data and comparison condition
  - Using DPR and AMSR3 observations matched within a 10-minute time difference.
  - If all AMSR3 observations within the 0.5-degree grid are confirmed as snowfall, that grid is considered snowfall.
  - For each estimated value of AMSR3 and DPR, calculate the monthly integrated snowfall for each grid, and compare using data of 1mm/month or more.
  - The incident angle differs between the A and B horns, and in the AMSR-E, only the A horn failed during the mission, so individual accuracy and integrity evaluation between A and B are conducted.
- Validation period
  - From September 1, 2025 to February 28, 2026

3. Validation Result

(3) Precipitation (Solid) - PRC

- Validation result (monthly integrated)

	Land		Ocean	
	A horn	B horn	A horn	B horn
Relative error:	109.05[%]	111.06 [%]	88.67 [%]	63.02 [%]



Release Accuracy	Validation Result	note
Relative error for GPM/DPR equivalent to a 0.5-degree grid. Ocean 130%* Land 200%* (* over 1mm/month, monthly integrated value evaluation)	**Ocean:88.67%(A horn), 63.02%(B horn)** **Land:109.05%(A horn), 111.06%(B horn)**	**For weak snow, the comparison with EarthCARE/CPR snowfall will be conducted.**

Achieved the release accuracy

3. Validation Result

Additional evaluation

(3) Precipitation (Solid) - PRC

- Since snowfall is a new product, in addition to the monthly integrated values defined in the mission requirement, instantaneous values (average snowfall per grid [mm/h]) and their histograms were compared as references.
- The validation period, comparison conditions, and snowfall determination criteria are the same as those for monthly integrated evaluation.

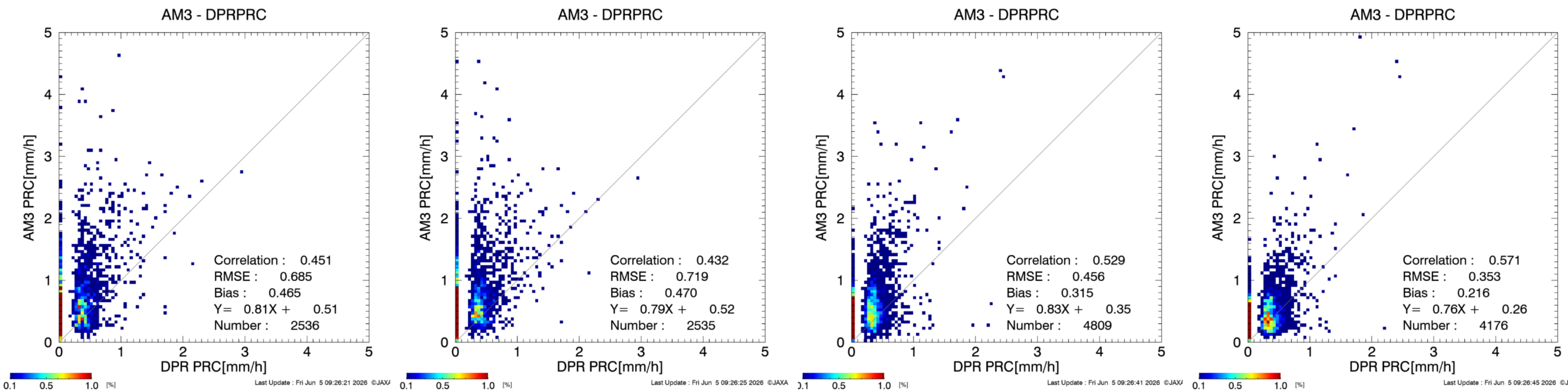
3. Validation Result

Additional evaluation

(3) Precipitation (Solid) - PRC

- Comparison of instantaneous snowfall values between AMSR3 and DPR (average snowfall per 0.5 grids [mm/h])

	Land		Ocean	
	A horn	B horn	A horn	B horn
Relative error:	102.79 [%]	104.22 [%]	85.15 [%]	60.87 [%]



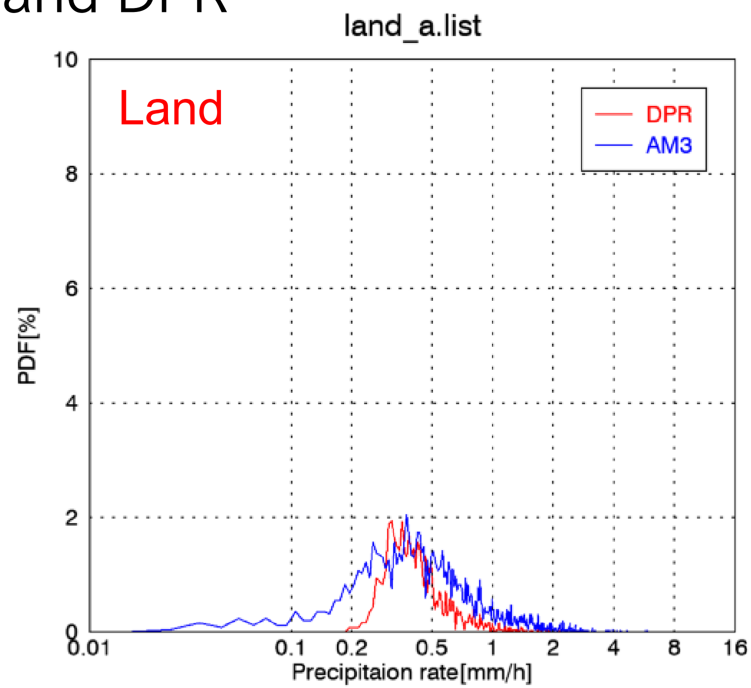
Validation Result
For snowfall products, we also evaluated the relative error of instantaneous values at 0.5-degree grids versus GPM/DPR. It was shown that the accuracy of instantaneous values is equivalent to that of monthly integrated values. The reason why the accuracy of the Offshore A horn is slightly lower than that of the B horn is considered to be due to the conversion factor of brightness temperature (from AMSR3 to GMI equivalent), and we are currently considering a solution. Additionally, evaluations by GSMaP have confirmed that AMSR3 has an issue where the snowfall area and amount are excessively large than expected, but the cause has been identified (mainly due to regime determination and will be fixed in the next version update).

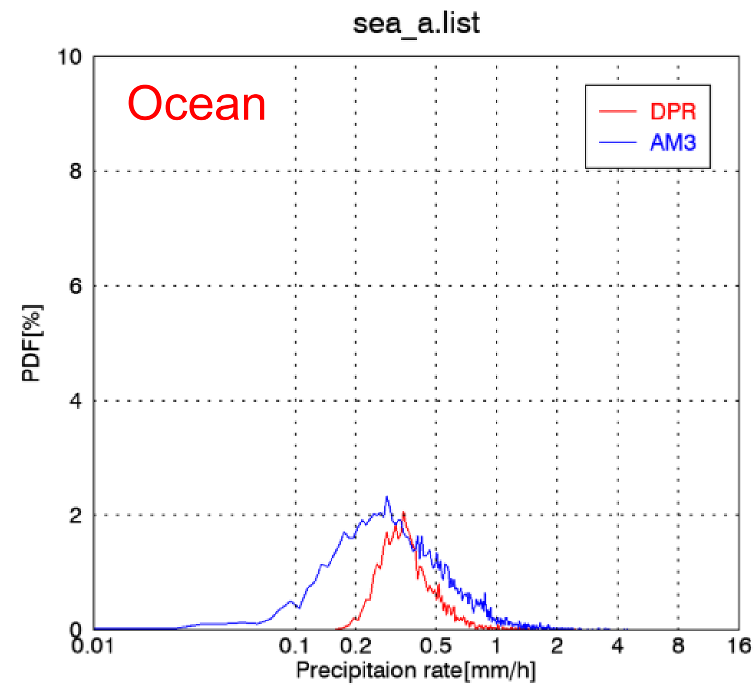
3. Validation Result

Additional evaluation

(3) Precipitation (Solid) - PRC

- Comparison of Snowfall Frequency Distributions Between AMSR3 and DPR





Validation Result
We compared the frequency distribution of snowfall between AMSR3 and GPM/DPR. Both AMSR3 and DPR peak around 0.4 mm/h, and their positions and strengths are roughly identical. At this intensity, a similar amount of snowfall is estimated. However, in cases of snowfall heavier than the peak, AMSR3 snowfall frequency is excessively high compared to DPR, which is considered related to the cause of overestimation in monthly and instantaneous values, so further evaluation will be pursued in the future. DPR is less sensitive to weaker snowfall compared to AMSR3, so the frequency of DPR snowfall drops sharply. Also, the total number of snowfall in the DPR is low because it is 0 mm/h and cannot be displayed on the logarithmic line. To verify weak snowfall, we are conducting snowfall comparisons and verification using EarthCARE/CPR observations.

3. Validation Result

(4) Sea Surface Temperature (6 GHz, 10 GHz, Multi-band) - SST

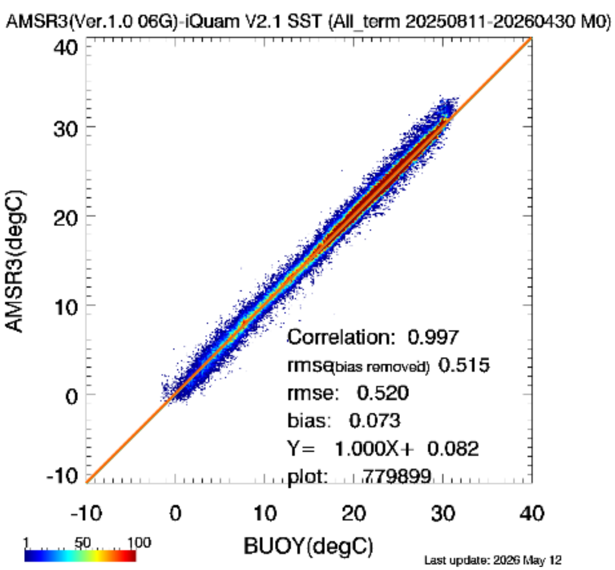
- Validation method
  - Water temperature data (iQuam) of GTS mooring/drifting buoys provided by NOAA that have applied quality control are compared with AMSR3 estimates of Sea Surface Temperature (SST), and the root mean square error (RMSE) is calculated.
- Validation data and comparison condition
  - For iQuam, AMSR3 observation points within 2 hours and within 30 km are searched for and used for validation of the nearest point data.
  - For 6 GHz and multi-band SST, the AMSR3 quality flag is 0, and for 10 GHz SST, the quality flag is 0 plus 1 (below 9°C) for data validation.
- Validation period
  - August 11, 2025 to April 30, 2026

3. Validation Result

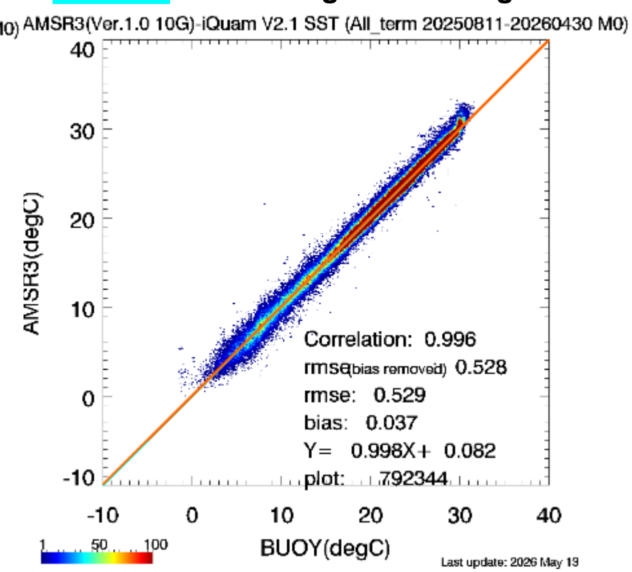
(4) Sea Surface Temperature (6 GHz, 10 GHz, Multi-band) - SST

- Validation result

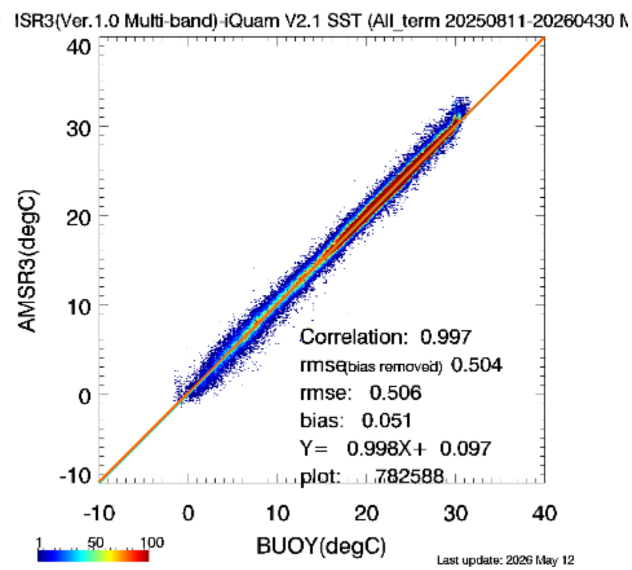
6 GHz: Ascending/Descending



10 GHz: Ascending/Descending



Multi-band: Ascending/Descending



Release Accuracy	Validation Result	note
Root Mean Square Error (RMSE) for Buoys 0.8℃	SST6GHz: RMSE = 0.52 ℃ SST10GHz: RMSE = 0.53 ℃ SSTmulti: RMSE = 0.51 ℃	Continue to revise the algorithm to achieve standard accuracy (6 GHz: 0.5℃, 10 GHz&Multi-band: 0.6℃).

Achieved the release accuracy

3. Validation Result

(5) Sea Surface Wind Speed - SSW

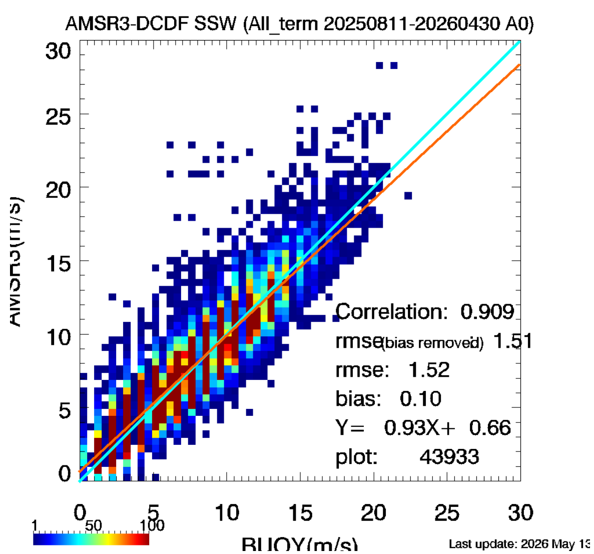
- Validation method
  - Sea Surface Wind Speed (SSW) observed by mooring buoys is compared with the estimated SSW by AMSR3, and the root mean square error (RMSE) is calculated.
- Validation data and comparison condition
  - For mooring buoy data, 10 AMSR3 observation points with a time difference of 2 hours or less and a distance difference within 30 km are searched, and the difference between the maximum and minimum values of the 10 points is 3 m/s or less (where the isotropy of AMSR3 offshore winds is guaranteed) is targeted.
  - If the above conditions are satisfied, the AMSR3 data at the nearest point is validated against the buoy.
- Validation period
  - August 11, 2025 to April 30, 2026

3. Validation Result

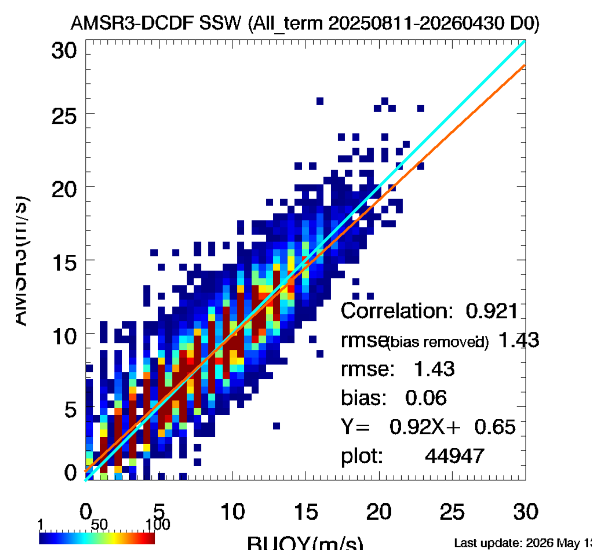
(5) Sea Surface Wind Speed - SSW

- Validation result

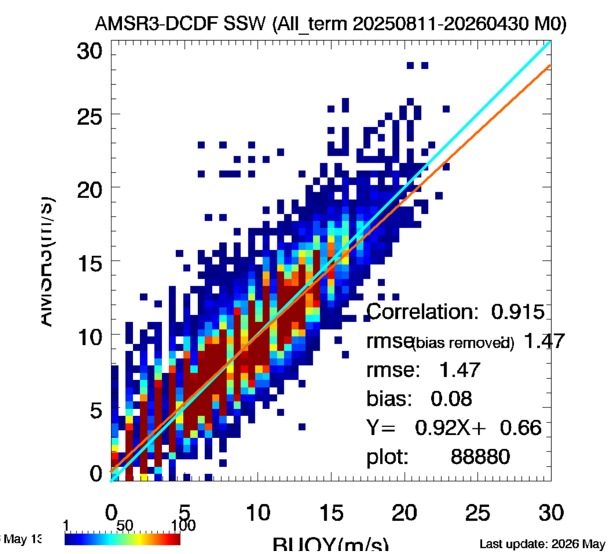
Ascending node



Descending node



Ascending&Descending node



Release Accuracy	Validation Result	note
Root Mean Square Error (RMSE) for Buoys 1.5 m/s	RMSE = 1.5 m/s	Continue to revise the algorithm to achieve standard accuracy (1.0m/s).

Achieved the release accuracy

3. Validation Result

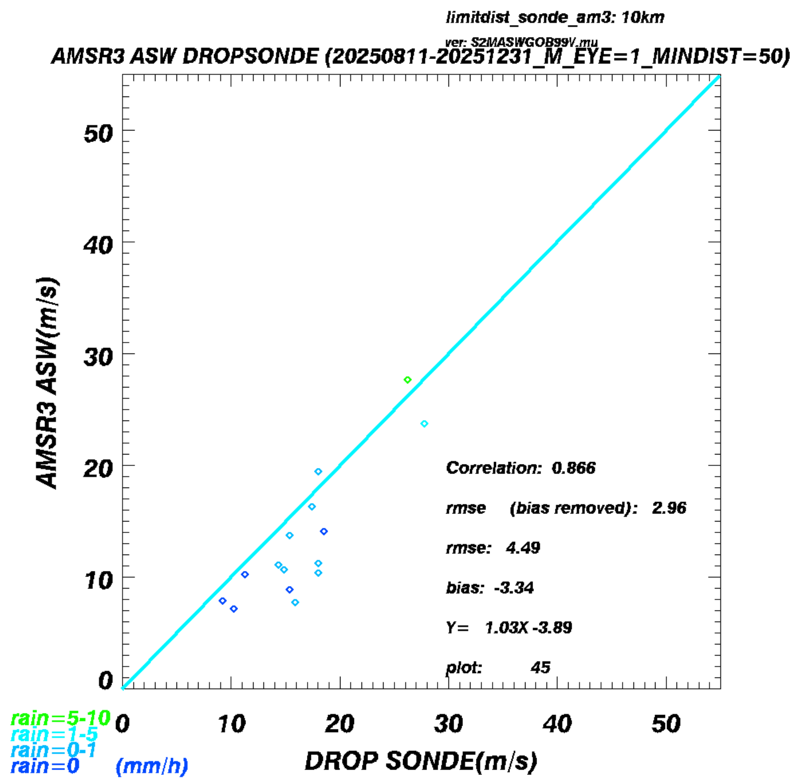
(6) All-weather Sea Surface Wind Speed - ASW

- Validation method
  - Sea Surface Wind Speed observed at drop sonde within typhoon/hurricane regions are compared with All-weather Sea Surface Wind Speed (ASW) derived from AMSR3 to calculate the root mean square error (RMSE).
- Validation data and comparison condition
  - Extracts cases where the time difference is within 6 hours and distance difference within 500 km compared to the best typhoon track. However, data from the eye of the typhoon and its surrounding convective zones are not used.
  - Validation is conducted on drop sonde data when AMSR3 observation points within 1.5 hours and within 10 km of distance, and when the average AMSR3 precipitation is 30 mm/h or less. If the above conditions are satisfied, the AMSR3 data at the nearest point is validated.
- Validation period
  - August 11, 2025 to April 30, 2026

3. Validation Result

(6) All-weather Sea Surface Wind Speed - ASW

- Validation result



※ During the AMSR3 observation period, the available drop sonde observations are limited. Therefore, although the mission requirements define the verification range as "wind speed 15 m/s," the entire range was covered.

Release Accuracy	Validation Result	note
Root Mean Square Error (RMSE) for Sonde 7 m/s	RMSE = 4.5 m/s	Continue to revise the algorithm to achieve standard accuracy (5.0m /s).

Achieved the release accuracy

3. Validation Result

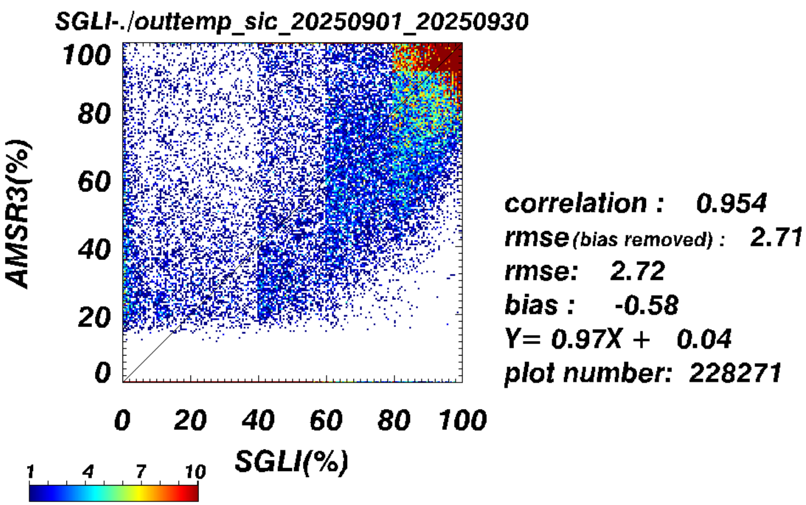
(7) Sea Ice Concentration - SIC

- Validation method
  - Validation of Sea Ice Concentration (SIC) is conducted by comparing with optical sensors and similar devices. From the reflectance data of optical sensors, sea ice regions are identified for non-cloud regions, and SIC is calculated from the sea ice ratio within the AMSR3 observation grid, with root mean square error (RMSE) calculated.
- Validation data and comparison condition
  - GCOM-C/SGLI LTOA, CLFG Product
  - Ice-chart data is also used to evaluate non-cloud areas
  - Use synchronized observation data within 30 minutes of observation time
- Validation period
  - September 1, 2025 to September 30, 2025

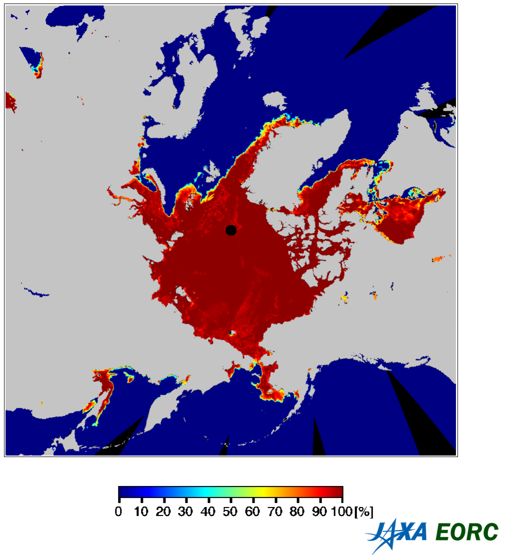
3. Validation Result

(7) Sea Ice Concentration - SIC

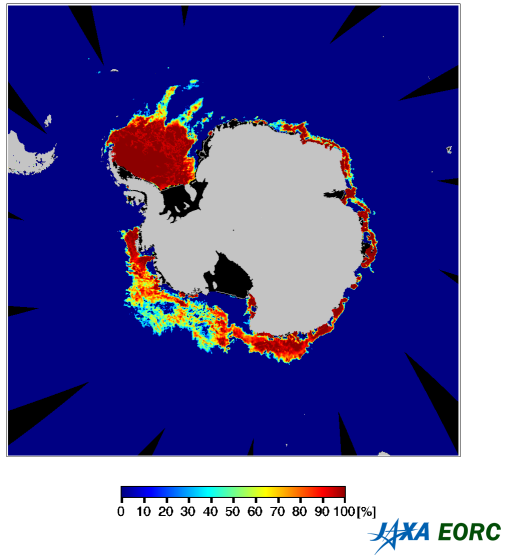
- Validation result



Sea Ice distribution of Northern Hemisphere



Sea Ice distribution of Southern Hemisphere



Release Accuracy	Validation Result	note
10%	vs SGLI 2.72%	Extend the period and conduct ongoing validation.

Achieved the release accuracy

3. Validation Result

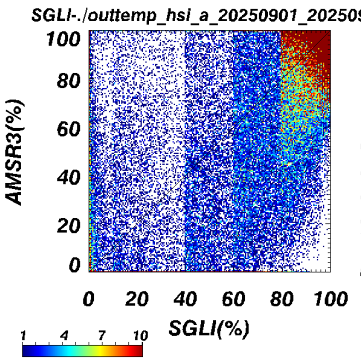
(8) High-resolution Sea Ice Concentration - HSI

- Validation method
  - Validation of High-resolution Sea Ice Concentration (HSI) is conducted by comparing with optical sensors and similar devices. From the reflectance data of optical sensors, sea ice regions are identified for non-cloud regions, and HSI is calculated from the sea ice ratio within the AMSR3 observation grid, with root mean square error (RMSE) calculated.
- Validation data and comparison condition
  - GCOM-C/SGLI LTOA, CLFG Product
  - Ice-chart data is also used to evaluate non-cloud areas
  - Use synchronized observation data within 30 minutes of observation time
- Validation period
  - September 1, 2025 to September 30, 2025

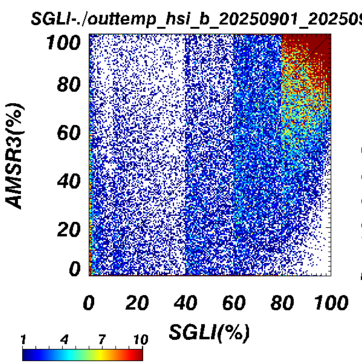
3. Validation Result

(8) High-resolution Sea Ice Concentration - HSI

- Validation result

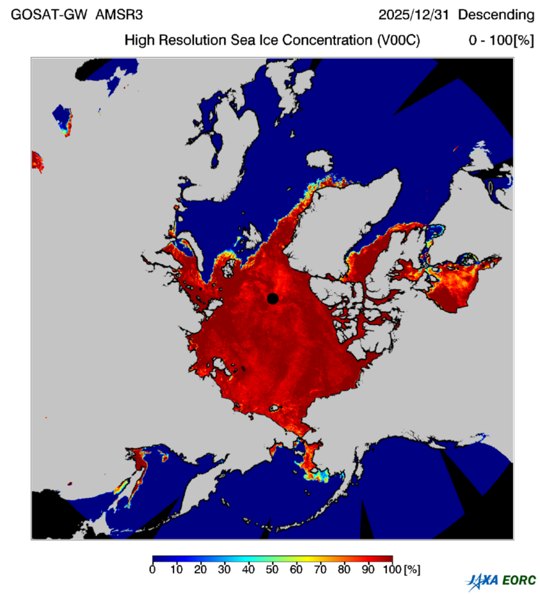


correlation : 0.923
rmse (bias removed) : 3.76
rmse: 3.80
bias : -2.28
Y= 0.91X + 0.07
plot number: 349783

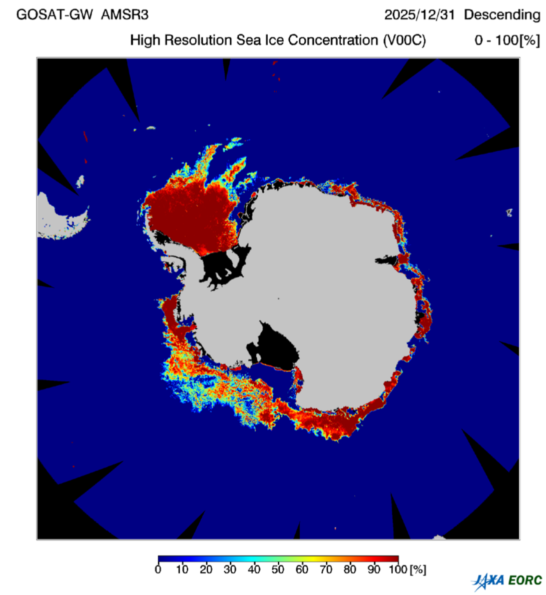


correlation : 0.924
rmse (bias removed) : 3.72
rmse: 3.75
bias : -2.10
Y= 0.92X + 0.11
plot number: 348259

Sea Ice distribution of Northern Hemisphere



Sea Ice distribution of Southern Hemisphere



Release Accuracy	Validation Result	note
15%	vs SGLI A horn: 3.80%, B horn: 3.75%	Extend the period and conduct ongoing validation.

Achieved the release accuracy

3. Validation Result

(9) Soil Moisture Content - SMC

- Validation method
  - Using ground observation data, the mean absolute error (MAE) of the product relative to ground observations is calculated, and this value is used for verification.
- Validation condition

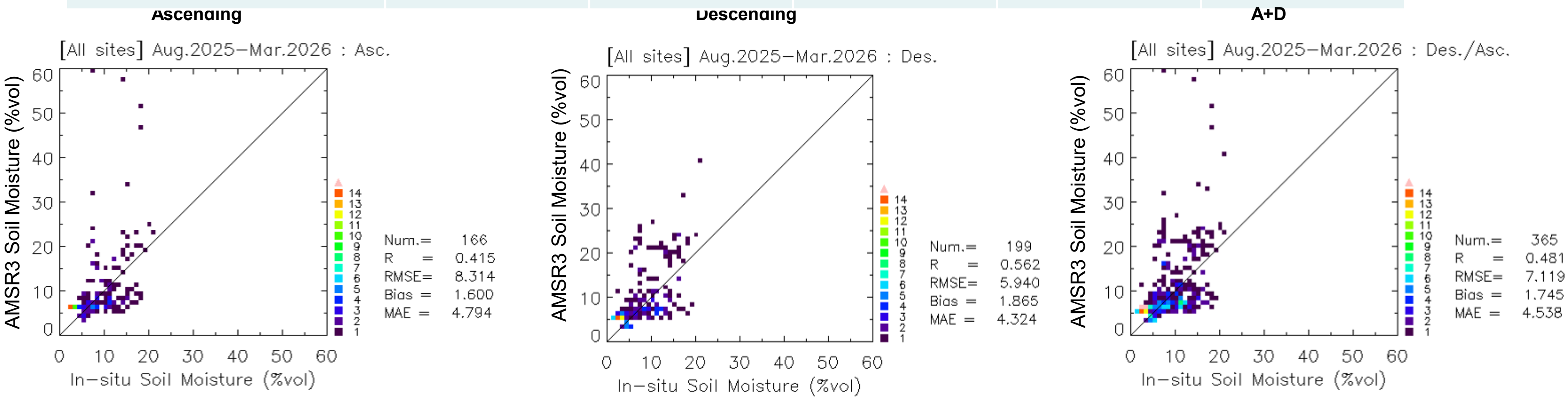
	Mongolia	Australia	Little River (SCAN)
Period	August – October 2025	August – November 2025	August – December 2025
Number of sites	6 sites (3 cm depth)	2 sites (3 cm depth)	1 site (5 cm depth)
Spatial condition (AMSR3)	The average of data within the same AMSR3 path within the rectangular region of N45.9~N46.9 and E106.5~E107.1 is used.	Among the two points (T1, Y10), point T1 is used as the center, and within 7 km of that point, data from the nearest point on the same AMSR3 path is used.	Within 7 km of the target point, data from the nearest point within the same AMSR3 path is used.
Spatial condition (in-situ)	Data from within one hour of AMSR3 observations are used, and the average of data obtained at four or more locations (up to 40% missing) at the same time is used.	Data from within 5 minutes of AMSR3 observations are used, and the average of data obtained at two locations at the same time is used.	Data within 30 minutes of AMSR3 observations were used.
Vegetation condition	Sparse (NDVI below 0.5)	Medium (NDVI around 0.5)	Dense (NDVI over 0.5)
note	Multiple points within a range corresponding to the footprint size of AMSR3 are used.	Since there are only two adjacent sites, the heterogeneity of soil moisture according to the footprint size of AMSR3 may not be considered.	Since there is only one site, the heterogeneity of soil moisture corresponding to the footprint size of AMSR3 may not be considered. Also, since the ground measurement depth is 5 cm, deeper than the 3 cm depth in Mongolia and Australia, it may be difficult to capture with AMSR products, which are more susceptible to surface soil moisture.

3. Validation Result

(9) Soil Moisture Content - SMC

- Validation result (at 3 points)

Results	Sample number	Correlation	RMSE [%]	Bias [%]	MAE [%]
Ascending node	166	0.42	8.31	1.60	4.79
Descending node	199	0.56	5.94	1.87	4.32
A+D	**365**	**0.48**	**7.12**	**1.75**	**4.54**



Release Accuracy	Validation Result	note
Mean absolute error relative to ground observations (MAE): 10 %	**MAE = 4.54 %**	Continue Validation at other sites

Achieved the release accuracy

3. Validation Result

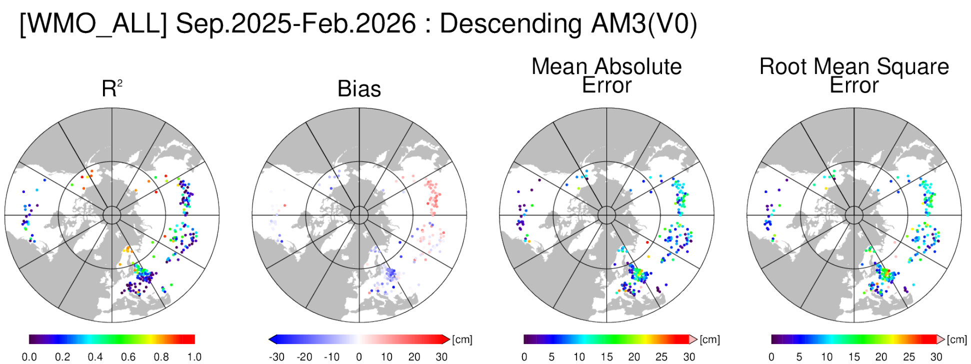
(10) Snow depth - SND

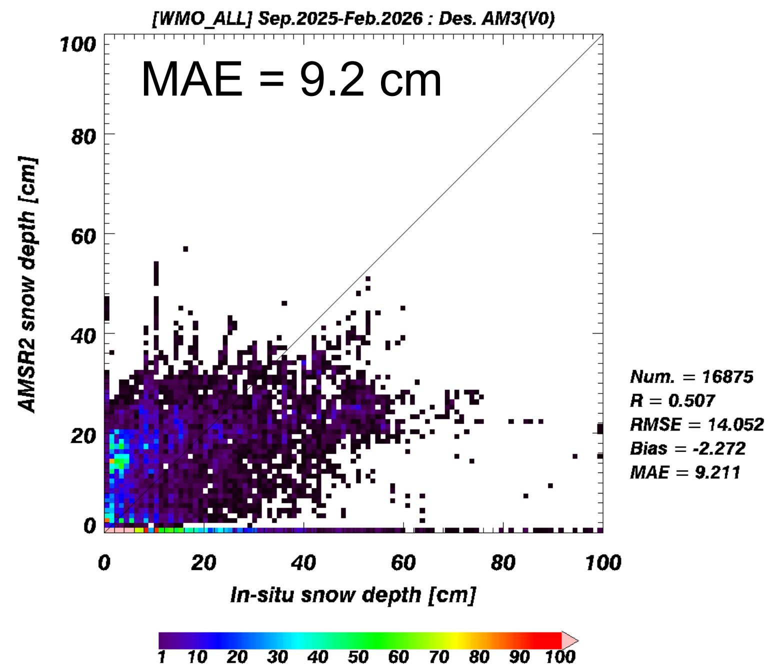
- Validation method
  - For global land snow depth, excluding ice sheets and dense forests, the absolute mean error (MAE) of instantaneous differences at about 25 km horizontal resolution is calculated from simultaneous observations using AMSR3 and snow depth in-situ observation data.
- Validation data and comparison condition
  - For the Global Historical Climatology Network daily (GHCNd) snow depth data provided by the NOAA National Environment Center (NCDC), water areas within 40 km account for less than 10%, and the number of measurement gaps were considered. Observations at each point were collected and compared with AMSR3 data from the nearest neighbors within a one-hour time difference and 7 km.
- Validation period
  - September 1, 2025 to February 28, 2026

3. Validation Result

(10) Snow depth - SND

- Validation result





Release Accuracy	Validation Result	note
20 cm	vs GHCNd MAE = 9.2 cm	Extend the period and conduct ongoing validation.

Achieved the release accuracy

3. Validation Result

(11) Sea Ice Motion Vector - SIM

- Validation method
  - From the estimated sea ice velocity provided by the International Arctic Buoy Programme (IABP) and Sea Ice Motion Vector by AMSR3 the root mean square error (RMSE) is calculated.
- Validation data and comparison condition
  - AMSR3 observation data is validated using data from the nearest neighbor within a 6-hour time difference and within 25 km of observation time compared to the IABP buoy.
  - If IABP exceeds 2m/s, it is excluded from validation as an anomaly.
- Validation period
  - August 11, 2025 to April 30, 2026

3. Validation Result

(11) Sea Ice Motion Vector - SIM

- Validation result

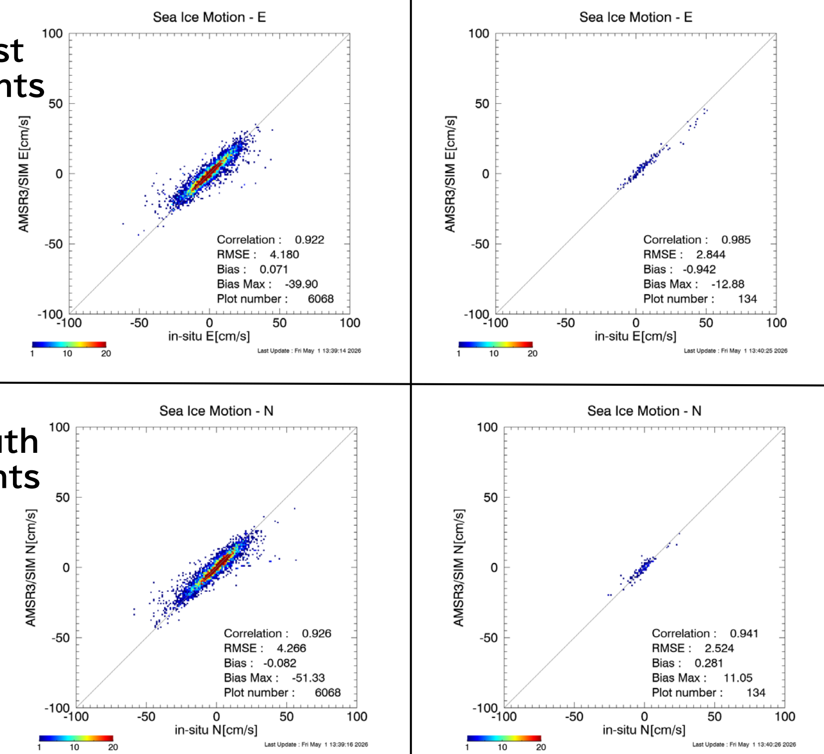
Target Area		NH	SH※
Sample number		6068	134
Correl.	EW	0.92	0.99
	NS	0.93	0.94
RMSE [cm/s]	EW	4.2	2.8※
	NS	4.3	2.5※
Bias [cm/s]	EW	0.07	-0.06
	NS	-0.94	0.28
Release Accuracy: 6 cm/s (EW/NS components)			

※SIM accuracy tends to be higher in winter than in summer. Because the Southern Hemisphere has only available field data during winter, the calculations are highly accurate.

Northern Hemisphere | Southern Hemisphere

East-West Components

North-South Components



Release Accuracy	Validation Result
Root Mean Square Error (RMSE) for Buoys 6 cm/s	East-West Components: RMSE = 4.2 cm/s North-South Components: RMSE = 4.3 cm/s

Achieved the release accuracy

4. Summary

Product		Area	Release	Validation Result
Total Precipitable Water	Ocean	Global Ocean	3.5 kg/m^2	vs Sonde:2.65 kg/m^2 vs GPS:1.65 kg/m^2
	Land	Global Land	6.5 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	0.058 kg/m^2
Precipitation	Liquid	Global	Ocean: 50 % Land: 120 %	Ocean:44.7% Land:72.5%
	Solid		Ocean: 130 % Land: 200 %	Ocean:88.7% Land:109.1%
Sea Surface Temperature	6 GHz	Global Ocean	0.8 °C	0.52 °C
	10 GHz Multi-band			10 GHz:0.53 °C Multi-band:0.51 °C
Sea Surface Wind Speed		Global Ocean	1.5 m/s	1.47 m/s
All-weather Sea Surface Wind Speed		Global Ocean	7 m/s	4.61 m/s
Sea Ice Concentration		Polar Ocean	10%	2.72%
High-resolution Sea Ice Concentration		Polar Ocean	15%	3.80%
Snow Depth		Global Land	20 cm	9.2 cm
Soil Moisture Content		Global Land	10%	4.54%
Sea Ice Motion Vector		Polar Ocean	6 cm	EW:4.2 cm, NS:4.3 cm

4. Summary

- Validation of all eleven standard products (higher-level geophysical parameter products) has been completed, and the results confirm that **all standard products achieved the required release accuracy**.

- Following the product release, validation activities will continue, and feedback will be provided to algorithm development to further improve and achieve the target accuracy. In addition, efforts will be made to maintain a continuous validation framework and to further expand validation datasets through field campaigns.
- From the perspective of long-term observations, consistency with AMSR2 will be continuously evaluated. Emphasis will also be placed on verifying product stability and inter-sensor consistency, ensuring the continued development and validation of consistent and reliable products.

- **[CAUTION]** In the Level-3 statistical products, a degradation in quality attributable to the revisit cycle of GOSAT-GW has been identified.
  - While its predecessor, GCOM-W, had a revisit cycle of 16 days, GOSAT-GW has been shortened to 3 days. This reduction in revisit cycle decreases the number of available orbit combinations, resulting in longitudinal (zonal) biases in the number of observations used for monthly composite.
  - In ocean products (SST, SSW, ASW), regions affected by sun glint tend to become spatially fixed, leading to persistent data gaps. As a consequence, missing data may remain in the Level-3 products even after monthly composite.