

JAXA Updates on GCOM-W & AMSR3

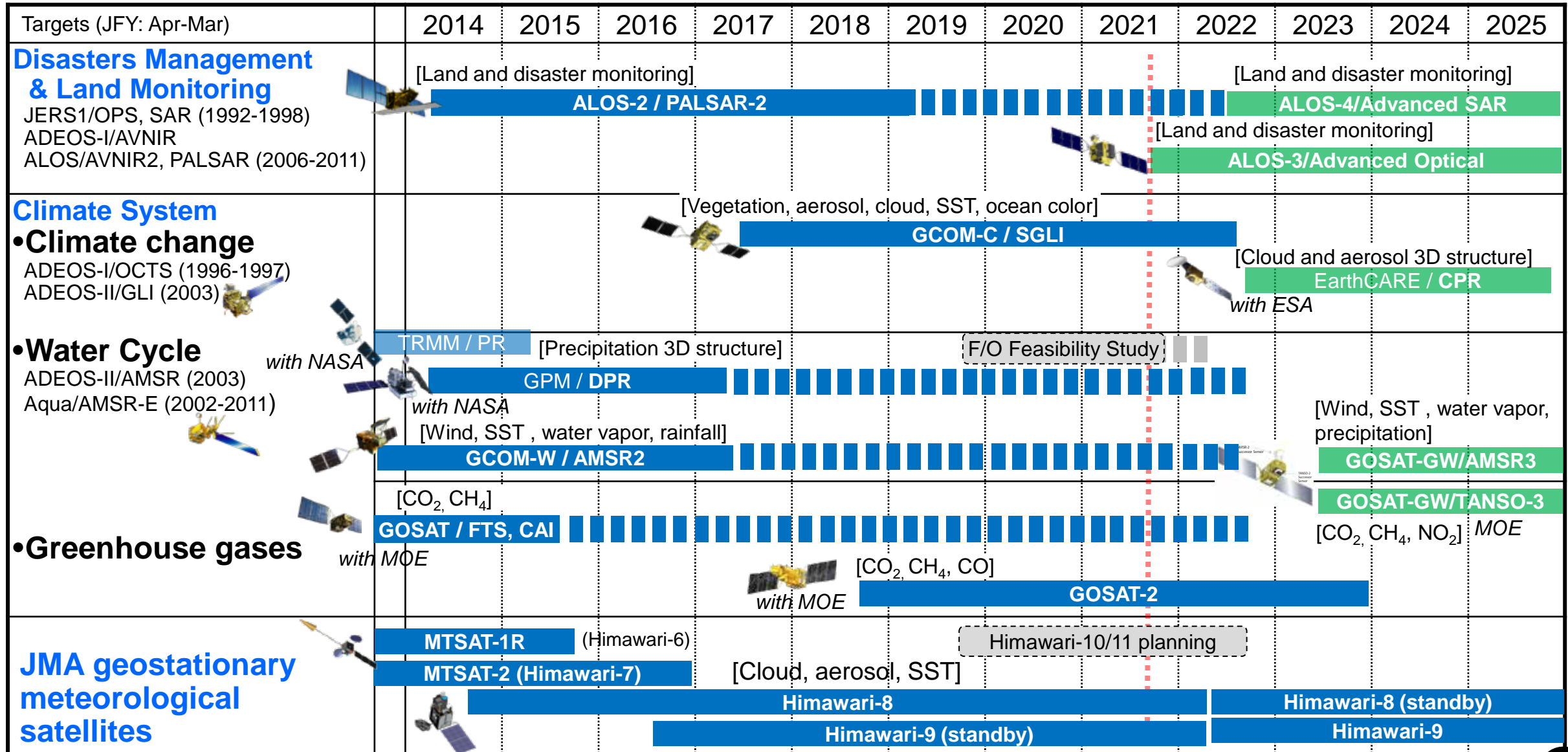
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KASAHARA Marehito, INAOKA Kazuya, KOJIMA Yasushi

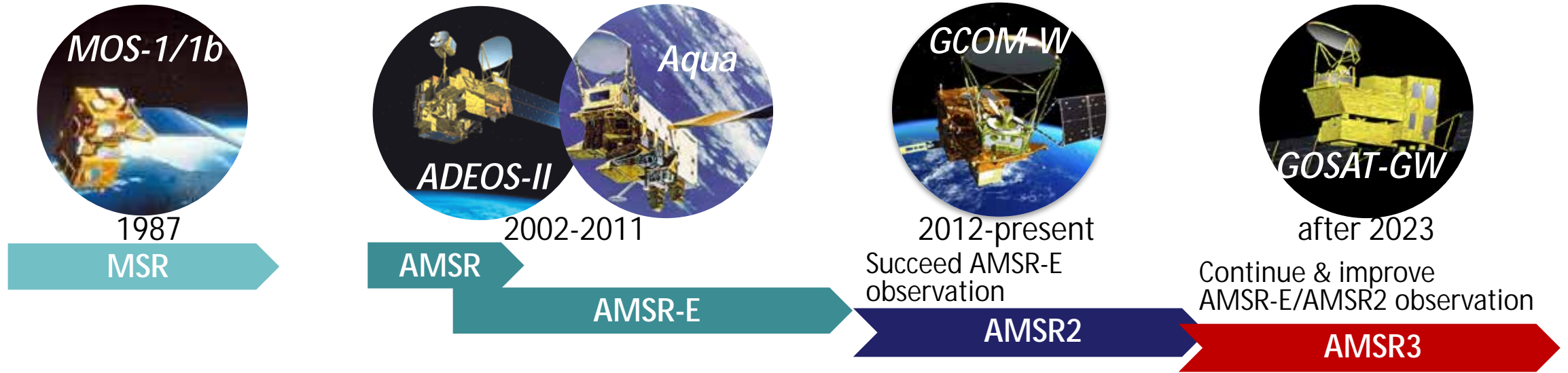
JAXA GOSAT-GW Project Team

Japanese Earth Observation Satellites



Mission status Completed On orbit Development Pre-phase-A

For Continuous Passive Microwave Observations



Sensor	MOS-1/MSR	ADEOS-II/AMSR	Aqua/AMSR-E	GCOM-W/AMSR2	GOSAT-GW/AMSR3
Coverage	Direct receive only	Global			
Swath	317km	1600km	1450km	1617km	> 1530km
Frequencies (GHz)	2 (23,31)	9 (6.9,10,18,23,36,50,52,89)	6 (6.9,10,18,23,36,89)	6 (6.9/7.3,10.65,18,23,36,89)	8 (6.9/7.3,10.25/10.65,18,23,36,89,166,183)
Polarization	Mixed V and H	V and H	V and H	V and H	V and H (166/183 are V only)
Antenna Size	0.5m	2.0m	1.6m	2.0m	2.0m
Spatial Res.	23km@31GHz	8x14km@36GHz	8x14km@36GHz	7x12km@36GHz	7kmx11km@36GHz

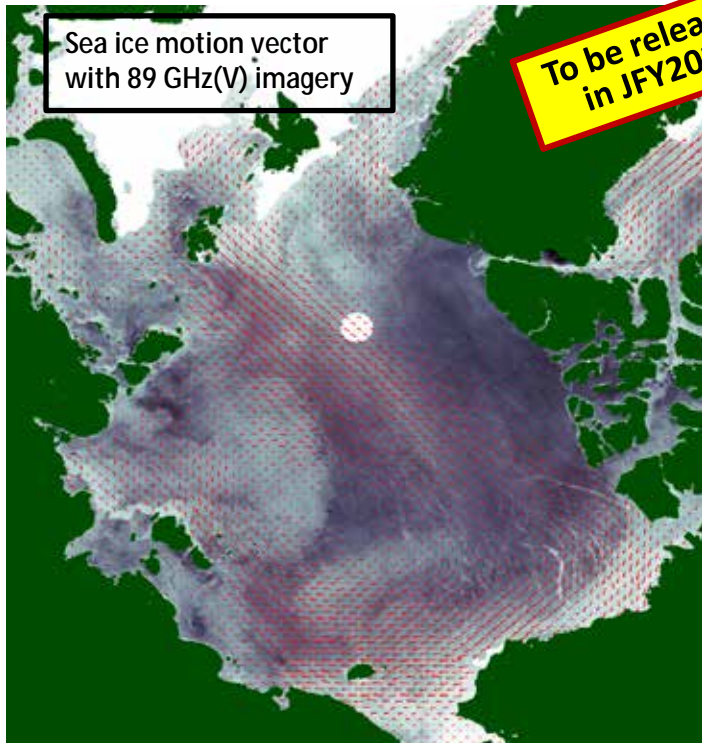
New AMSR2 Research Products

- GCOM-W & AMSR2 continues observation with healthy condition
- Ver.4 products for SST & Sea Surface Wind Speed have been released in Oct. 2020

<https://gportal.jaxa.jp/gpr/>

- Research Products are available via

https://suzaku.eorc.jaxa.jp/GCOM_W/research/resdist.html



Sea ice motion vector with 89 GHz(V) imagery

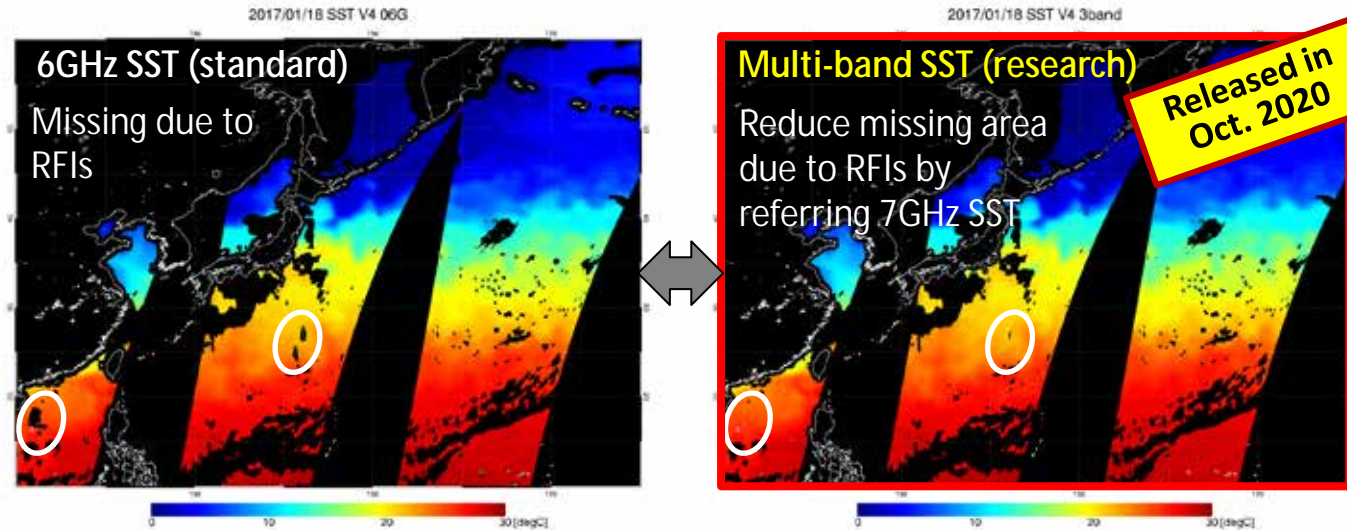
To be released in JFY2021

Data Overview

Spatial resolution : 50 km
Temporal resolution : 1 day
Target Accuracy: ± 6 cm/s

Two products (different algorithm) will be released:

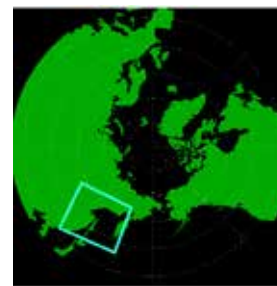
K. SHIMADA (TUMST)
N. KIMURA (Univ. Tokyo)



2017/01/18 SST V4 06G
6GHz SST (standard)
Missing due to RFI

2017/01/18 SST V4 3band
Multi-band SST (research)
Reduce missing area due to RFI by referring 7GHz SST

Released in Oct. 2020

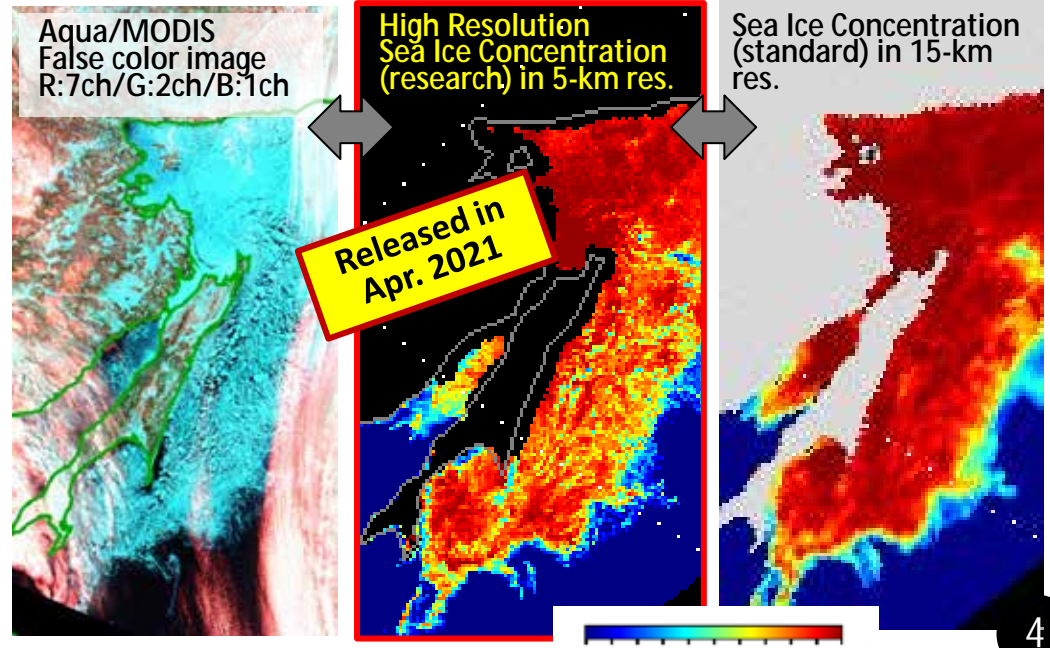


Aqua/MODIS False color image
R:7ch/G:2ch/B:1ch

High Resolution Sea Ice Concentration (research) in 5-km res.

Sea Ice Concentration (standard) in 15-km res.

Released in Apr. 2021



AMSR3 on GOSAT-GW: Global Observation SATellite for Greenhouse gases and Water cycle

- GOSAT-GW will carry two instruments, AMSR3 and TANSO-3.
 - AMSR3, led by JAXA, will succeed AMSR series observations adding new high-frequency channels for solid precipitation retrievals and water vapor analysis in NWP.
 - TANSO-3, led by Japanese Ministry of the Environment (MOE) and National Institute of Environment Studies (NIES), will improve observation capability of greenhouse gases from GOSAT-2/TANSO-2.
 - Target launch is JFY2023 (Apr. 2023 - Mar. 2024)
- Current Status
 - Dec. 2019: Started GOSAT-GW Project
 - Aug. 2020: Completed AMSR3 Preliminary Design Review (PDR)
 - Dec. 2020: Completed TANSO-3 PDR
 - Mar. 2021: Completed PDR of GOSAT-GW Satellite System
 - Oct. 2021: Completed AMSR3 CDR
 - Being coordinated major characteristics and performances of new G-band and conducted manufacture and test of engineering models of AMSR3 component (ex. G-band antenna sub-system, Receivers)



GOSAT-GW Satellite Specifications

Orbit	Type	Sun-synchronous, Sub-recurrent orbit
	Altitude	666km, recurrent cycle 3days (same as GOSAT)
	MLTAN	13:30 ± 15min (same as GCOM-W)
Mass	2.6 ton (Including propellant)	
Power	> 5.3 kW	
Design life	> 7 years	
Launch vehicle	H-IIA rocket	
Mission data downlink rate	Direct transmission with X-band: 400 Mbps Direct transmission with S-band: 1 Mbps (Only for AMSR3)	
Instrument	TANSO-3 (for GHG) AMSR3 (for Water Cycle)	

Specification of AMSR3 Instrument

AMSR3 Sensor Characteristics

Sensor type	Conical scanning total power microwave radiometer
Antenna	Off-set parabolic antenna (φ2.0m aperture)
Swath width	> 1530km
Quantization	12 bit
Incidence angle	55 deg. except 89G-B, 166G, 183G
X-polarization	< -20dB
Beam efficiency	> 90%
Range	2.7-340K
Sampling interval	5-10km
Data rate	87.4 kbps (average)
Life time	7 years

Red: Changes from AMSR2 including additional CHs

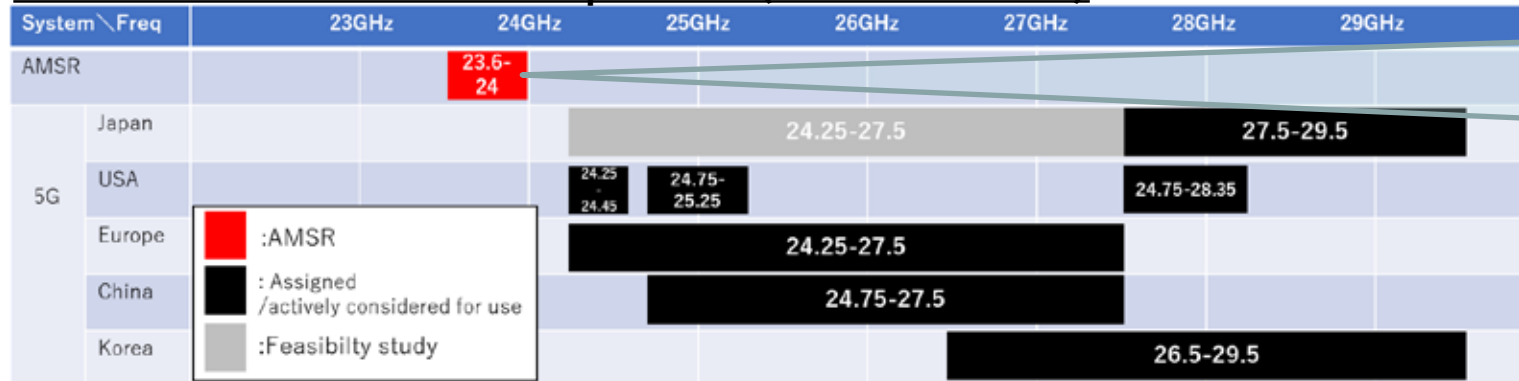
AMSR3 Channel Sets

Center frequency [GHz]	Polarization	Band width [MHz]	NEDT (1σ)	Beam width (spatial resolution)
6.925 7.3	H/V	350	< 0.34 K	1.8 ° (34km x 58km)
10.25	H/V	500	< 0.34 K	1.2 ° (22km x 39km)
10.65	H/V	100	< 0.70 K	1.2 ° (22km x 39km)
18.7	H/V	200	< 0.70 K	0.65 ° (12km x 21km)
23.8	H/V	400	< 0.60 K	0.75 ° (14km x 24km)
36.42	H/V	840	< 0.70 K (TBD)	0.35 ° (7km x 11km)
89.0 A/B	H/V	3000	< 1.20 K	0.15 ° (3km x 5km)
165.5	V	4000	< 1.50 K	AZ=0.23 ° / EL=0.30 ° (4km x 9km)
183.31 ± 7	V	2000 × 2	< 1.50 K	AZ=0.23 ° / EL=0.27 ° (4km x 8km)
183.31 ± 3	V	2000 × 2	< 1.50 K	AZ=0.23 ° / EL=0.27 ° (4km x 8km)



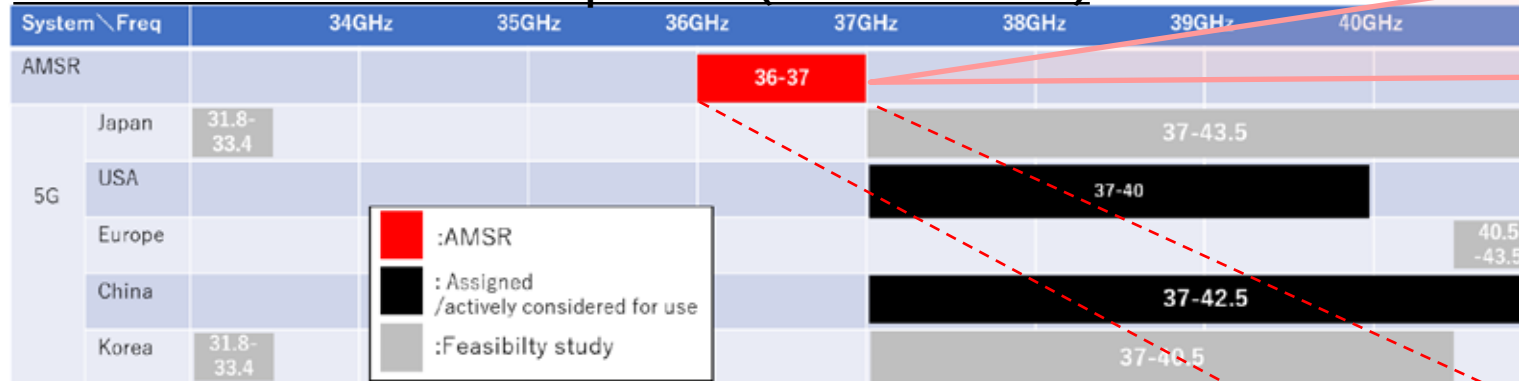
Change of Bandwidth for 36GHz

AMSR3 and 5G allocated frequencies (22GHz ~ 30GHz)



AMSR3 and 5G frequencies have a buffer band of 250 MHz (24.0 to 24.25 GHz). Its impact will be negligible by improving the out-of-band frequency characteristic.

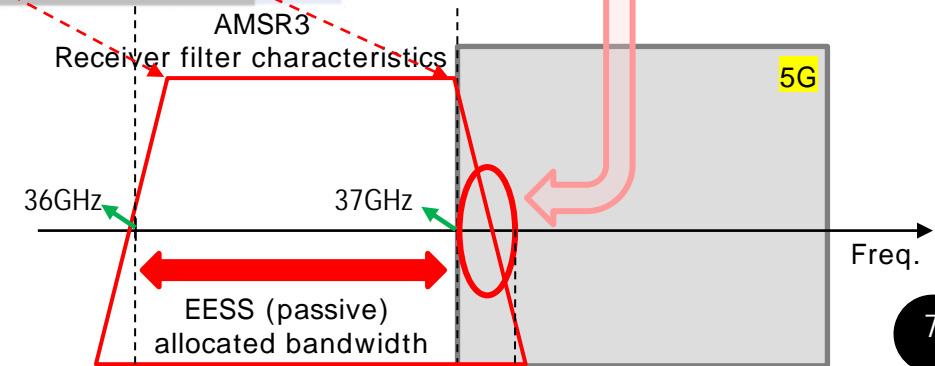
AMSR3 and 5G allocated frequencies (33GHz ~ 41GHz)



AMSR3 and 5G frequencies are adjacent to each other with no buffer band. Its impact cannot be avoided by improving the out-of-band frequency characteristics while maintain the bandwidth.

As a result of the study to minimize the reduced bandwidth, the bandwidth of 36 GHz was changed from 1000MHz to 840 MHz.

As for the temperature resolution, the value will remain unchanged, but with TBD, and will be fixed with critical design results.





Summary and Future Plan

- GCOM-W/AMSR2

- AMSR2 and GCOM-W are in health condition to continue science mission
- New research products, multi-band SST and high-resolution sea ice concentration, are released
- Update of Precipitation product (Ver.3) is scheduled in JFY2021
- Planning release of further research products in JFY2021

- GOSAT-GW/AMSR3

- Algorithm development for AMSR3 is ongoing
- Ground systems including Mission Operation System are under development
- RFI detection method for X-band (10.25/10.65 GHz) is currently being discussed based on that for C-band
- Cross-calibration plan, especially for new high-frequency channels with GMI, is also being discussed
- To complete AMSR3 development in the second half of JFY2022
- Launch of GOSAT-GW Satellite in JFY2023
 - Ø AMSR3 Product will be released to the public about one year after the launch, but may be released earlier to the PIs and partner agencies during CAL/VAL phase
 - Ø Near-real-time data distribution will be available (regional data at direct receiving stations & global data with latency of 2-3 hrs)