



水循環変動観測衛星「しずく」

Global Change Observation Mission-Water "SHIZUKU"

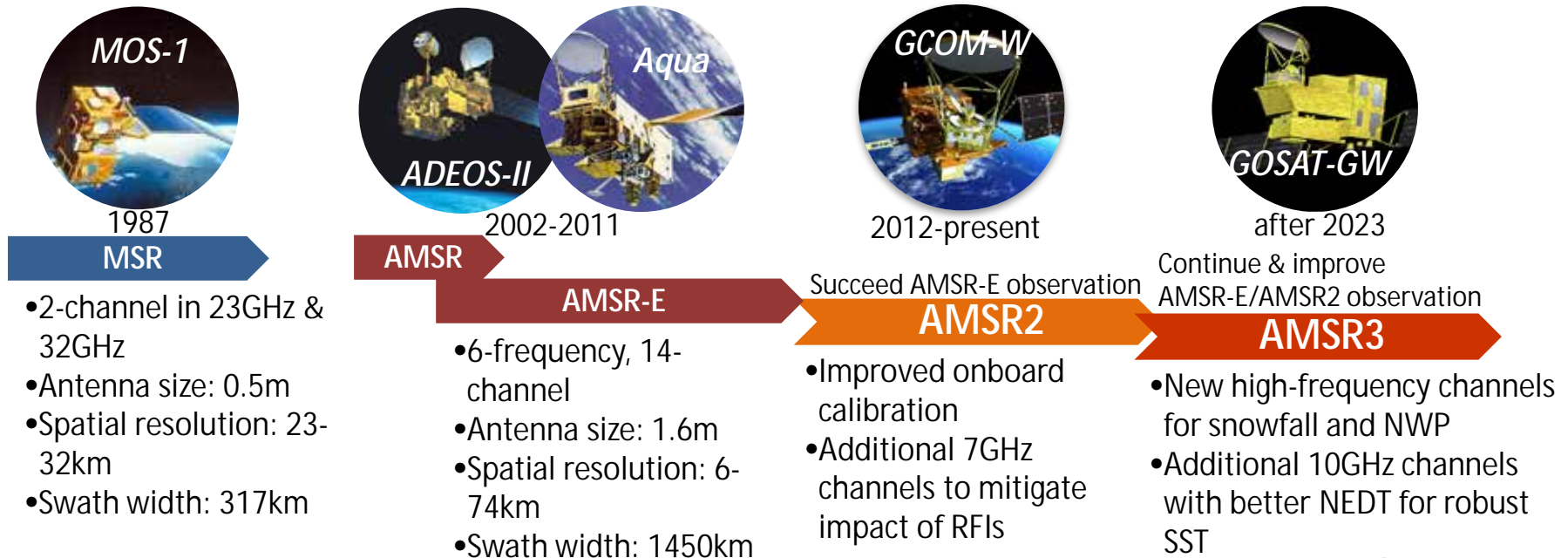
# Status of GCOM-W and GOSAT-GW/AMSR3

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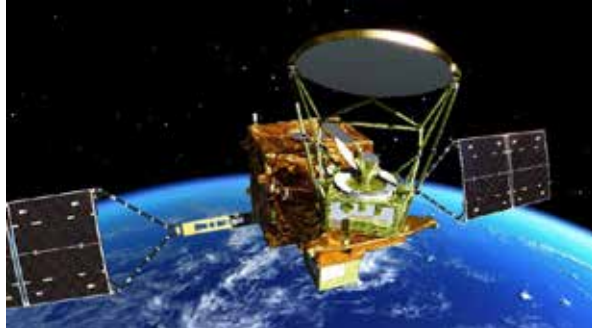
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# History of Passive Microwave Observations

- With experience of development and operation of MSR, JAXA developed 1<sup>st</sup> generation of AMSR (AMSR and AMSR-E) with large antenna size and C-band channels. AMSR-E continuous its science observation about 9.5-year, and its high capabilities enable to expand utilizations in operational and research areas.
- 2<sup>nd</sup> generation of AMSR (AMSR2) was launched in 2012 and succeeds AMSR-E observations to establish its data utilization in various areas.
- 3<sup>rd</sup> generation of AMSR (AMSR3) is being developed and to be launched in JFY2023.



# AMSR2 on GCOM-W



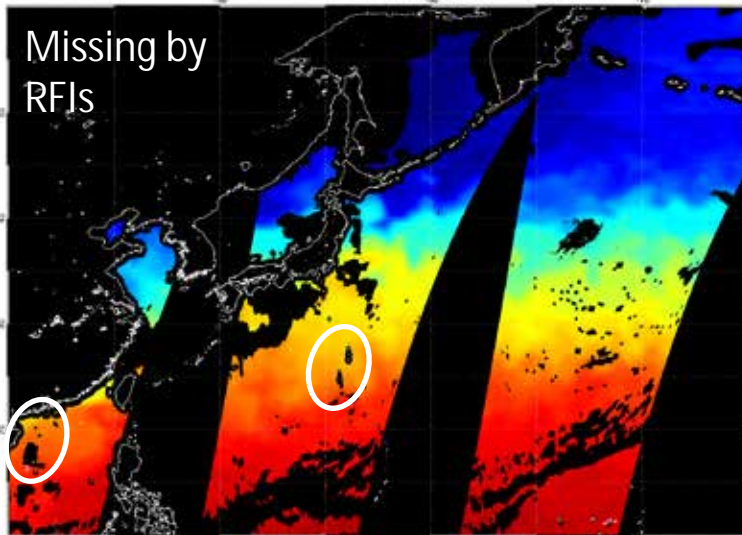
Instrument	Advanced Microwave Scanning Radiometer 2 (AMSR2)
Altitude	705 km
Orbital inclination	98.2 deg
Local sun time at Ascending node	13 :30
Launch vehicle	H-IIA
Launch	May 18, 2012
Designed lifetime	5 years

- ü Successor of Aqua/AMSR-E (launched in May 2002), providing continuous data for climate studies and operational applications
- ü Carrying AMSR2, a multi-polarization and multi-frequency microwave imager
- ü Improving on-board calibration target has resulted reduction of annual TB variation due to calibration and improvement of TB stability
- ü Achieved designed mission life (5-year) on May 18, 2017, and continues observation
- ü Highlights in last year
  - ü Version-up of SST and Sea Surface Wind Speed & release of new research products in Oct. 2020
  - ü Release of AMSR Environment Viewer on web in Jun. 2020
  - ü Capturing TPW & SST variation during heavy rainfalls around Japan in Jul. 2020
  - ü Capturing SST decrease during passing of three typhoons in Aug.-Sep. 2020
  - ü Capturing second minimum sea ice extent in Sep. 2020

# New AMSR2 Research Product: Multi-band SST

Ver.4: 6GHz

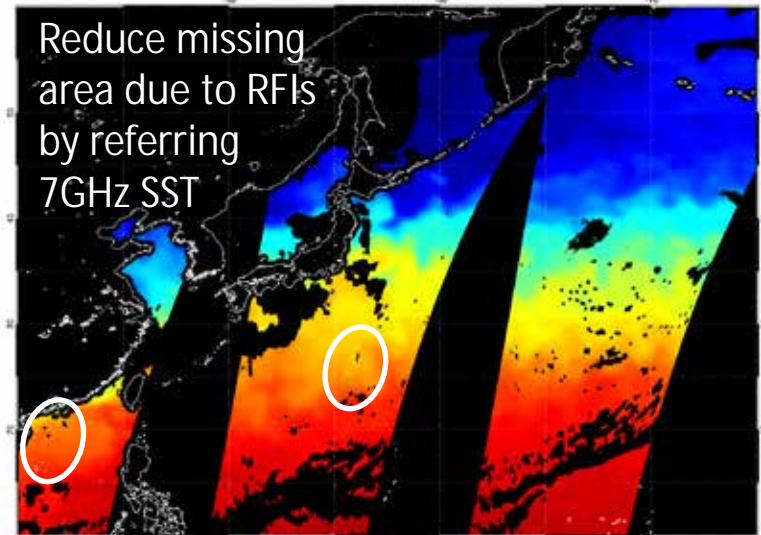
2017/01/18 SST V4 06G



Missing by  
RFIs

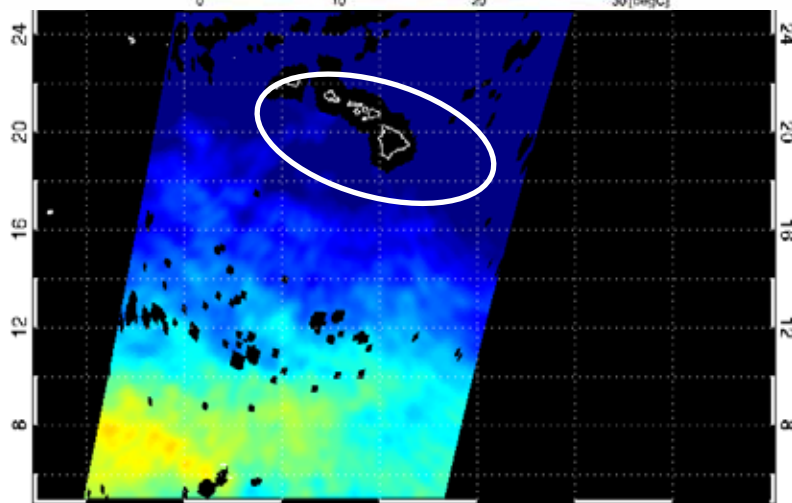
Ver.4: Multi-band

2017/01/18 SST V4 3band

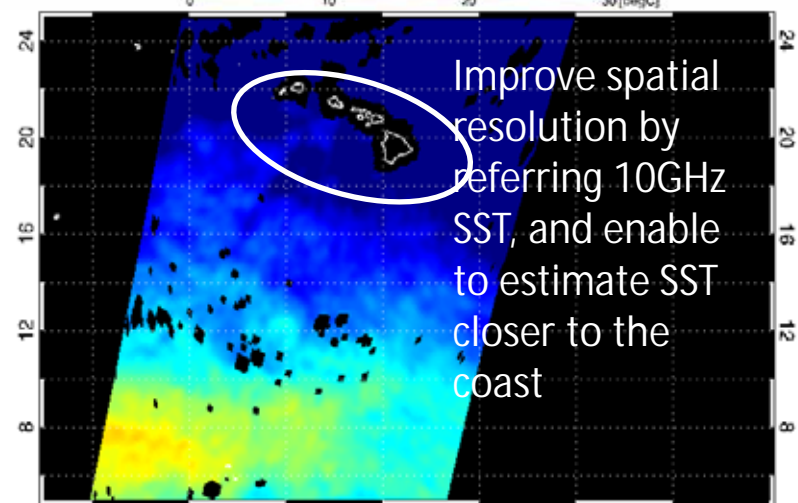


Reduce missing  
area due to RFIs  
by referring  
7GHz SST

2017/1/18



25 26 27 28 29 30[degC]



Improve spatial  
resolution by  
referring 10GHz  
SST, and enable  
to estimate SST  
closer to the  
coast

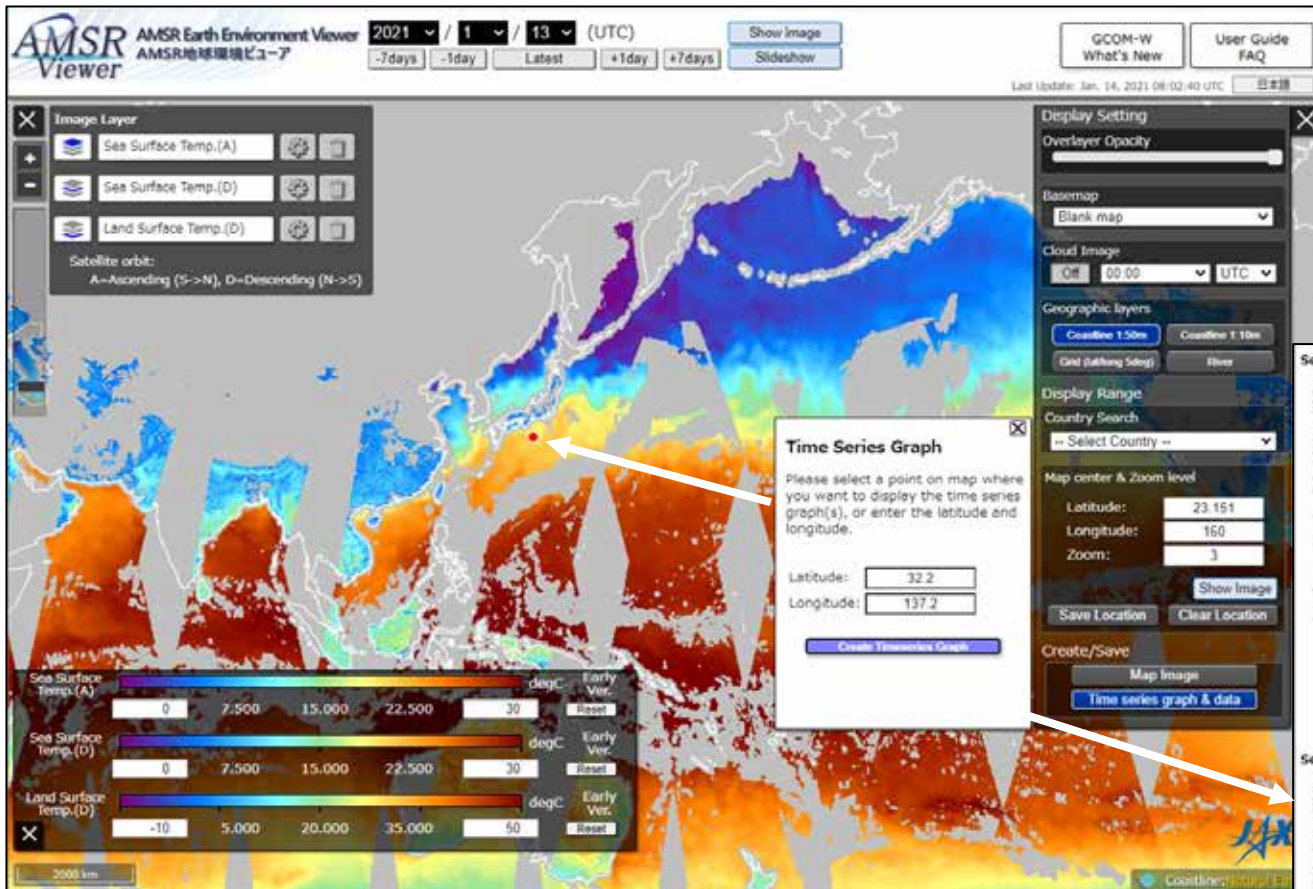
25 26 27 28 29 30[degC]

2017/1/28 064D

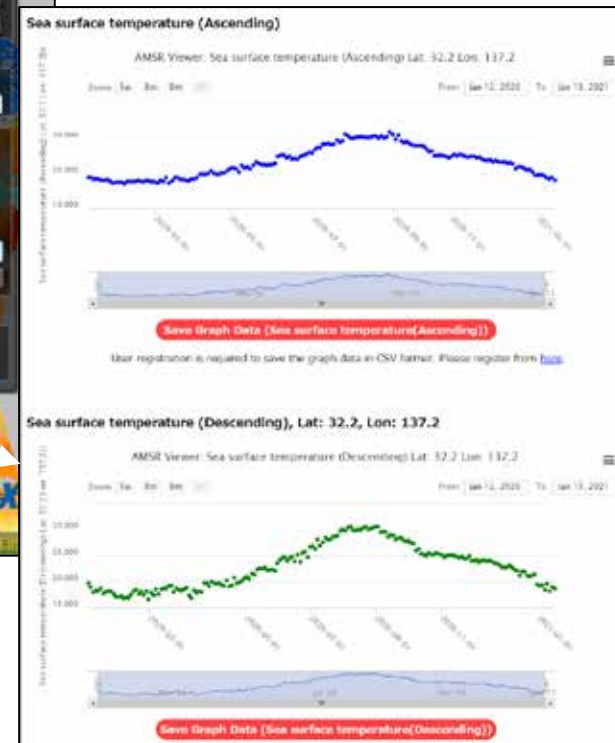


# AMSR Earth Environment Viewer

[https://www.eorc.jaxa.jp/AMSR/viewer/index\\_e.html](https://www.eorc.jaxa.jp/AMSR/viewer/index_e.html)



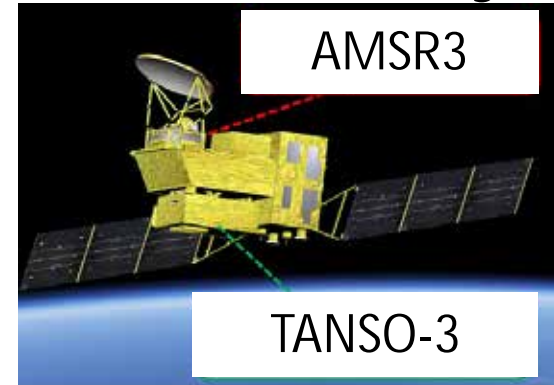
Temporal variation of past 1-year (or 1-week, 3-month, 6-month)



- Browse all AMSR-E & AMSR2 products with zoom-in & -out
- Display 3 products of same UTC day (Asc. & Dsc.) at same time
- Display & download time series graph of specific point
- Scalable color bars, etc.

# 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 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)
- Mission targets of AMSR3
  - To produce long-term continuous data record
  - To enhance operational utilization of near-real time data
    - weather forecast including hurricane analysis
    - fishery in coastal area
    - navigational assistance on arctic shipping route
    - New geophysical parameter products



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)	

# Current Status of AMSR3

- Dec. 2019: Started GOSAT-GW Project
- Jun. 2020 - Preliminary Design Review (PDR) of GOSAT-GW Satellite System
  - To be completed by the end of JFY2020 (Mar. 2021)
  - Ø Aug. 26, 2020: Completed AMSR3 PDR
- Changed the specification of Ka-band passband to reduce the future risk of RF interference from 5-G mobile communication system
- Being coordinated major characteristics and performances of G-band
- Being conducted manufacture and test of engineering models of AMSR3 component (ex. G-band antenna sub-system, Receivers)

## Future Plan

- Critical Design Review (CDR) of AMSR3 in first half of JFY2021
- Completion of AMSR3 Development in 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.

# 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	> 1530m
Quantization	12 bit
Incidence angle	55 deg. except 89GB, 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

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)
36.5→ 36.42	H/V	1000→ 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 (TBD)	0.3 ° (TBD) (6km x 10km) → (4km x 9km)
183.31 ± 7	V	2000 × 2	< 1.50 K (TBD)	0.28 (TBD)→0.27 ° (5km x 9km) → (4km x 8km)
183.31 ± 3	V	2000 × 2	< 1.50 K (TBD)	0.28 (TBD)→0.27 ° (5km x 9km) → (4km x 8km)

Additional channels from AMSR2 in red

Changes from JFY 2019 joint PI Meeting in blue



# List of AMSR3 Products

Standard Product
Brightness Temperature (6-183GHz) (L1B)
Resampled Brightness Temperature (6-183GHz) (L1R)
Total Precipitable Water (over ocean & land)
Integrated Cloud Liquid Water Content (over ocean)
Precipitation (liquid & solid)
Sea Surface Temperature (6GHz & 4-frequency)
Sea Surface Wind Speed
All Weather Sea Surface Wind Speed
Sea Ice Concentration
High-resolution Sea Ice Concentration
Soil Moisture Content
Snow Depth (snow depth & SWE)

Research Product
FOV-center Matched Brightness Temperature (L1C)
High-resolution Brightness Temperature (L1H)
High-resolution Sea Surface Temperature (20km res.)
Sea Ice Motion Vector
Land Surface Temperature
Vegetation Water Content
Thin Ice Detection
Soil Moisture Content & Vegetation Water Content by Land Data Assimilation (L4)
Climate Data Record (CDR) for each parameter

(as of Oct. 2020)

Red indicates differences from AMSR2

Blue indicates changes from JFY2019 workshop