Status of GCOM-W and GOSAT-GW/AMSR3

Misako Kachi (JAXA/EORC)
Shigeru Usuki & Masatoshi Taga (JAXA/SAOC)
Marehito Kasahara & Kazuya Inaoka
(JAXA GOSAT-GW Project Team)

JFY2021 Joint PI WS @ Jan. 20, 2022

History of Passive Microwave Observations

- With experience of development and operation of MSR, JAXA developed 1st 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.
- 2nd generation of AMSR (AMSR2) was launched in 2012 and succeeds AMSR-E observations to establish its data utilization in various areas.
- 3rd generation of AMSR (AMSR3) is being developed and to be launched in JFY2023.

1987

MSR

- 2-channel in 23GHz & 32GHz
- Antenna size: 0.5m
- Spatial resolution: 23-32km
- Swath width: 317km

2002-2011

AMSR

AMSR-E

- 6-frequency, 14-channel
- Antenna size: 1.6m
- Spatial resolution: 6-74km
- Swath width: 1450km

2012-present

Succeed AMSR-E observation

AMSR2

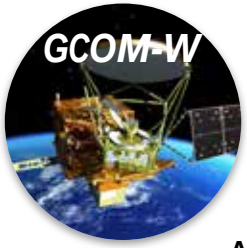
- Improved onboard calibration
- Additional 7GHz channels to mitigate impact of RFIs

after 2023

Continue & improve AMSR-E/AMSR2 observation

AMSR3

- New high-frequency channels for snowfall and NWP
- Additional 10GHz channels with better NEDT for robust SST



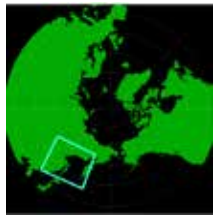
GCOM-W Satellite System Status

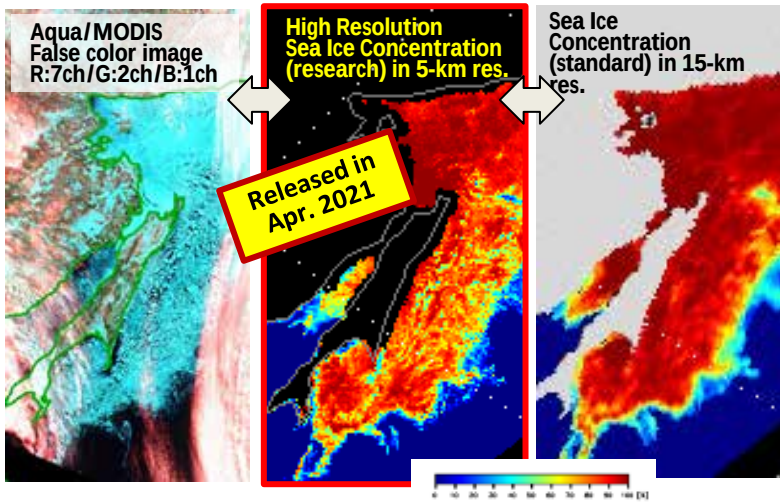
All subsystems are operated normally with primary hardware except AMSR2 SPC.

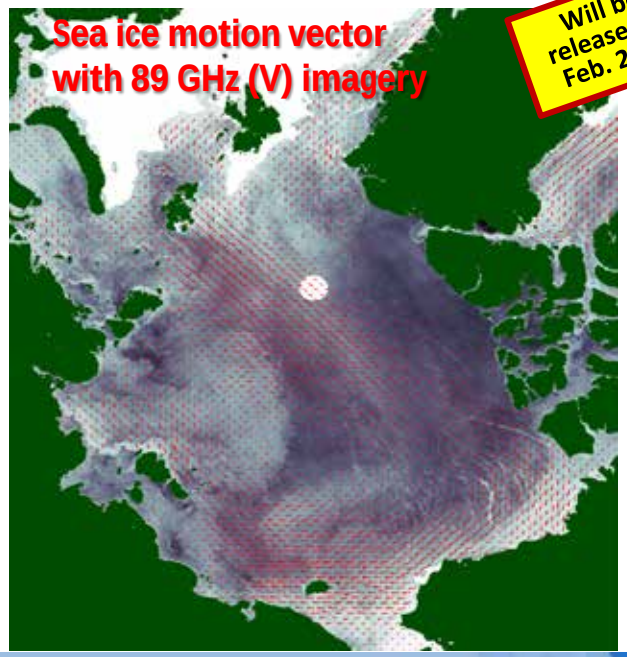
Sub-system	Status	Notes
System	Normal	Maintaining the A-train orbit
TT&C Subsystem	Normal	Data recorder temporarily stopped on Dec. 4, 2015, Sep. 27, 2017, Dec. 16, 2018, and Mar. 17, 2020, due to Single Event Upset
Solar Array Paddle & Electric Power Subsystems	Normal	Solar array paddles generates 4000W. 400W lost on Nov. 15, 2015 probably due to debris. Then 130W lost on Mar. 18, 2018. NO IMPACT on observation operation.
Attitude and Orbit Control Subsystem	Normal	
Reaction Control Subsystem	Normal	Rise the threshold of propellant valve heater due to disconnect of catalyst bed heater. There is no restriction to keep the A-train orbit.
Thermal Control Subsystem	Normal	The Heater Control Electronics A (HCE-A) has been switched off, but operation is continuing with the secondary system (HCE-B). No effect on mission continuation.
Mission Data Handling Subsystem	Normal	
AMSR2	Normal	SPC (Signal Processor of Control unit) had automatically switched three times between the primary unit (SPC-A) and the redundant unit (SPC-B), on May 10, 2013, on April 15, 2016 and on November 25, 2017. Currently, SPC-B is working.

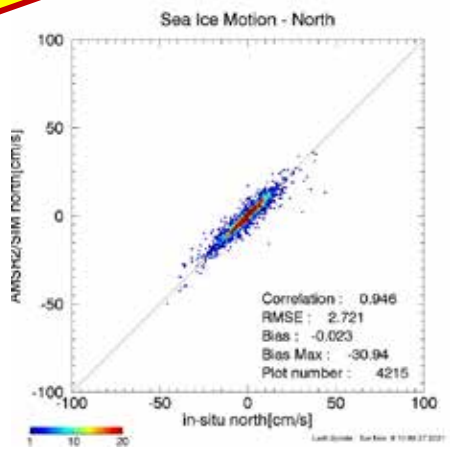
New AMSR2 Research Products

- Total Precipitable Water and Cloud Liquid Water V2.2 standard products were released in Jun. 2021
- Precipitation Ver.3 and SST V4.1 standard products are currently preparing for release in the end of JFY2021
- High-resolution Sea Ice Concentration (HSI) (over N.H.) research product (by G. Heygster) was released in Apr. 2021
- Two Sea Ice Motion Vector (SIM) (over N.H.) research products (by K. Shimada and N. Kimura) will be released in Feb. 2022









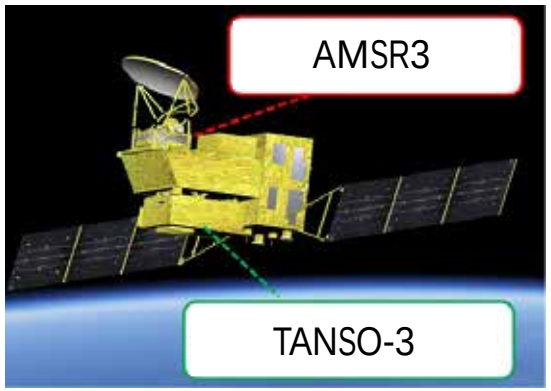
SIM comparison VS floating buoy velocity (2013-2015, winter)

	RMSE [cm/s]	
	Eastward	Northward
Shimada	2.97	2.72
Kimura	3.72	3.15

Research Products are available via
https://suzaku.eorc.jaxa.jp/GCOM_W/research/resdist.html

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)
- Project Status
  - Jun. 2018: Mission Definition Review (MDR)
  - Jul. 2018: Project Readiness Review (management review)
  - Dec. 2018: System Requirement Review (SRR)
  - ~ Selection of the prime contractor ~
  - Oct. 2019: System Definition Review (SDR)
  - Nov. 2019: Project Approval Review (management review)
  - Dec. 2019: Started GOSAT-GW Project
  - Mar. 2021: Preliminary Design Review(PDR)
  - Critical Design phase (Phase C) is in the process



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**

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)**

Red: Changes from AMSR2 including additional CHs

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, 10GHz & 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)

(as of Dec. 2021)

Research Product
FOV-center Matched Brightness Temperature (L1C)
High-resolution Brightness Temperature (L1H)
High-resolution Sea Surface Temperature (20km res.)
Sea Ice Motion Vector (Level 3)
Land Surface Temperature
Vegetation Water Content
Thin Ice Detection
Soil Moisture Content & Vegetation Water Content by Land Data Assimilation (Level 4)
Climate Data Record (CDR) for each parameter (Level 3)

Red indicates differences from AMSR2

File format will be “HDF5-compatible” NetCDF4.

EASE-GRID2 projection product will be introduced to Level 3 products along with equal-latitude-longitude and polar-stereo grids.

Status of AMSR3

- Based on the results of the critical design and development tests, the AMSR3 CDR was held in October 2021, and the flight model is now being manufactured and tested.
  - Development test activity for some components have been still continued in parallel including newly-added G-band antenna subsystem.
  - Integration and test of AMSR3 proto-flight model will start in the middle of the next Japanese fiscal year.
  - After the proto-flight test completed, AMSR3 PFM will installed on GOSAT-GW spacecraft along with TANSO-3.
- CDR of AMSR3 Mission Operation System is in progress.
  - Prior to the CDR, calibration algorism for level-1 brightness temperature product, design of level-1 product format and processing software was reviewed in parallel with AMSR3 CDR.
  - After the CDR is completed in next week, software production will be implemented.

AMSR Series Web Site

released in November 2021

- New website to integrate information of AMSR, AMSR-E, AMSR2, and AMSR3 (AMSR series) .
- This website has been started as a portal site to EORC's AMSR/AMSR-E and GCOM-W web sites as the first step. We plan to migrate the contents of these homepages sequentially.
- Information about AMSR3 research will be posted on this website.
- Newly developed content
  - AMSR Data Catalog
  - AMSR Viewer (released in June 2020)

https://www.eorc.jaxa.jp/AMSR/

Site Map

·Monitoring
- AMSR Earth Environment Viewer
- JASMES for Water Cycle
- Sea Ice Extent Trends
- JASMES Greenland Monitor
- Sea Ice Distribution in the Sea of Okhotsk
- All-Weather Sea Surface Wind Speed
- Tropical Cyclone Monitoring
- Tropical Cyclone Database
- JAXA GLOBAL RAINFALL WATCH (GSMaP)
- JAXA GHRSST Server (SST)
- EL Niño Watch
- AMSR Data Product Catalog
- GCOM-W Validation Web
- Observation Area of AMSR2

·Learning
- About AMSR
- Quick Guide to AMSR
- AMSR Utilization
- Enjoy AMSR!
- About MW Remote Sensing
- AMSR in the World
- Retrieval Algorithm
- Calibration $ validation
- Reading Materials
- Publication List
- Science Plan
- Related Projects

·Resources
- Data Product Type
- Data Format
- Tools
- Data Handling
- Reference Web Sites
- TB Calibration
- Product Validation
- Satellite/Sensor Status

·Downloads
- Data Catalog
- Standard Product
- Research product

·News & Events
- News
- Operation Information
- Events
- Research Announcement

·Contact us

·Site Policy