Status of GCOM-W and its Contribution to Climate and Water Studies

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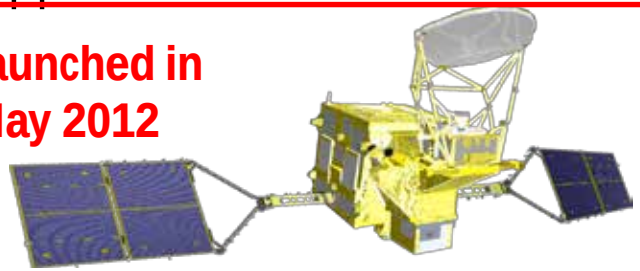
Global Change Observation Mission (GCOM)

- GCOM consists of 2 types of medium-sized satellites that observe geophysical parameters essential to climate studies and operational applications.

Launched in May 2012

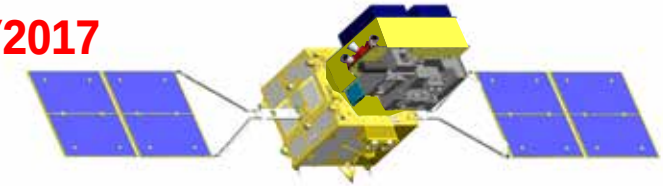


GCOM-W (Water)

Instrument	**Advanced Microwave Scanning Radiometer-2 (AMSR2)**
Orbit	Sun Synchronous orbit (A-train) Altitude：699.6km (on Equator) Inclination: 98.2 degrees Local sun time: 13:30+/-15 min
Launch	18 May 2012 by H-IIA Rocket
Design Life	5-years

High-resolution passive microwave imager with C-band. Observing water-related parameters (SST, rainfall, wind speed, sea ice, soil moisture, etc.).

To be launched in JFY2017

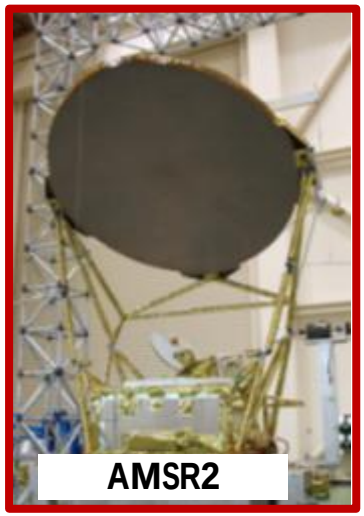


GCOM-C (Climate)

Instrument	**Second-generation Global Imager (SGLI)**
Orbit	Sun Synchronous orbit Altitude：798km (on Equator) Inclination: 98.6 deg. Local sun time: 10:30+/- 15min
Launch	JFY 2016 by H-IIA Rocket
Design Life	5-years

Multi-spectral imager with minimum 250m resolution. Observing climate-related parameters (SST, ocean color, aerosol, clouds, biomass, snow, etc.).

Advanced Microwave Scanning Radiometer 2 (AMSR2)


AMSR2


AMSR-E

- Deployable main reflector system with 2.0m diameter.
- Frequency channel set is identical to that of AMSR-E except 7.3GHz channel for helping RFI mitigation.
- Two-point external calibration with the improved HTS (hot-load).
- Add a redundant momentum wheel to increase reliability.

GCOM-W/AMSR2 characteristics	
Scan and rate	Conical scan at 40 rpm
Antenna	Offset parabola with 2.0m dia.
Swath width	1450km (nominal) 1610km (effective)
Incidence angle	Nominal 55 degrees
Digitization	12bits
Dynamic range	2.7-340K
Polarization	Vertical and horizontal

AMSR2 Channel Set				
Center Freq. [GHz]	Band width [MHz]	Pol.	Beam width [deg] (Ground res. [km])	Sampling interval [km]
6.925/ 7.3	350	V and H	1.8 (35 x 62)	10
10.65	100		1.2 (24 x 42)	
18.7	200		0.65 (14 x 22)	
23.8	400		0.75 (15 x 26)	
36.5	1000		0.35 (7 x 12)	
89.0	3000		0.15 (3 x 5)	5

GCOM-W Mission Summary

- May 18, 2012: Launch
- June 28, 2012: Injection into A-Train orbit
- July 3, 2012: First scientific observation
- August 10, 2012: Completion of initial checkout
- January 25, 2013 : AMSR2 Level 1 (Tb) Ver.1 products released to public
- May 17, 2013: AMSR2 Level 2 (Geophysical) Ver.1 products released to public
- March 26, 2015: AMSR2 Level 1-3 Ver. 2 update, 10GHz SST research product is included in standard SST product
- October 6, 2015: All-weather sea surface wind speed research product release to public
- August 23, 2016: AMSR2 Level 1 minor version update
- March 1, 2017: AMSR2 Level 2 Ver.3 update for SST, Sea Surface Wind Speed, Sea Ice Concentration and Soil Moisture Content
- *May 26, 2017: GCOM-W Normal Operation Completion review, transition to post-operation phase*

AMSR2 Standard Products and Accuracy

- Ver.3 products for SST, SSW, SIC, and SMC were released on March 1, 2017.

	Product	Release Accuracy	Standard Accuracy	Target Accuracy	Ver.2 Accuracy	Ver.3 Accuracy
GEO	Total Precipitable Water	±3.5 kg/m^2	±3.5 kg/m^2	±2.0 kg/m^2	ROB:2.6 kg/m^2 GPS:1.5 kg/m^2	No update
	Cloud Liquid Water	±0.10 kg/m^2	±0.05 kg/m^2	±0.02 kg/m^2	0.04 kg/m^2	No update
	Precipitation	Ocean ±50 % Land ±120 %	Ocean ±50 % Land ±120 %	Ocean ±20 % Land ±80 %	Ocean 48% Land 84%	No update
	Sea Surface Temperature	±0.8 ºC	±0.5 ºC	±0.2 ºC (zonal mean)	0.6 ºC	0.5 ºC
	Sea Surface Wind Speed	±1.5 m/s	±1.0 m/s	±1.0 m/s	1.1 m/s	1.0 m/s
	Sea Ice Concentration	±10 %	±10 %	±5%	8 %	8 %
	Snow Depth	±20 cm	±20 cm	±10 cm	16 cm	No update
	Soil Moisture	±10 %	±10 %	±5 %	4 %	3 %

Achieve Release Accuracy | Achieve Standard Accuracy | Achieve Target Accuracy

AMSR2 Research Products

- Defined in March 2015.

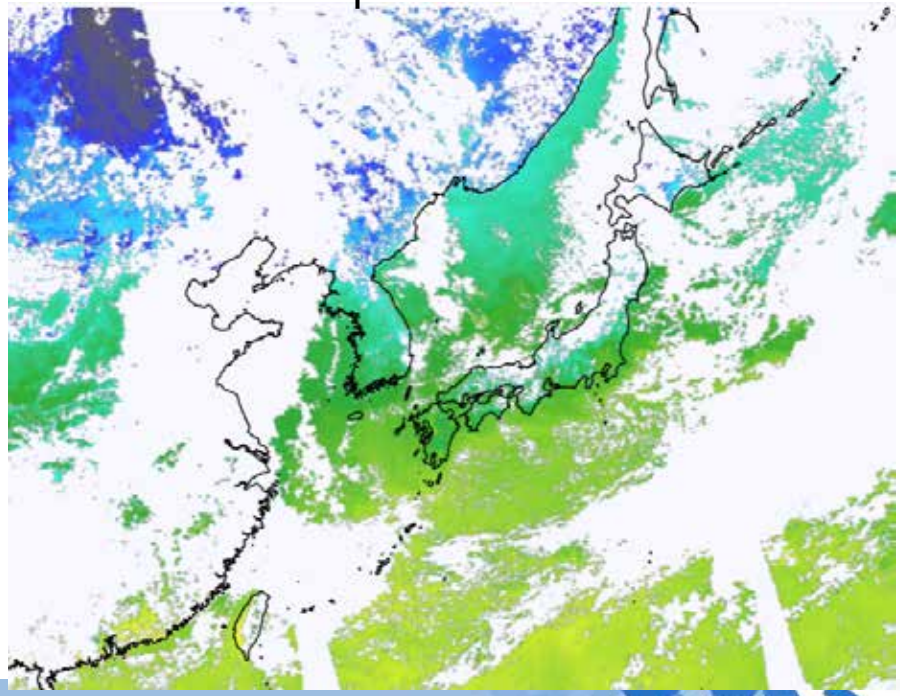
Products	Area	Resolution	Target accuracy	Range	Accuracy
All-weather sea surface wind speed	Ocean	60 km	± 7 m/s for strong wind (>17m/s)	0 - 70 m/s	4.18 m/s
High-resolution (10-GHz) SST	Ocean	30 km	± 0.8 °C	9 – 35 °C	0.55 ° C
Soil moisture and vegetation water content based on the land data assimilation	Africa, Australia	25 km	soil moisture: ± 8% vegetation water: ± 1 kg/m^2	0 – 100 % 0 - 2 kg/m^2	-
Land surface temperature	Land	15 km	forest area: ± 3 °C nondense vegetation: ± 4°C	0-50 °C	-
Vegetation water content	Land	10 km	± 1 kg/m^2	0 – 4 kg/m^2	-
High resolution sea ice concentration	Ocean in high latitude	5 km	± 15 %	0 – 100 %	-
Thin ice detection	Okhotsk sea	15 km	± 80 %	N/A	-
Sea ice moving vector	Ocean in high latitude	50 km	2 components: 3 cm/s	0 - 40 cm/s	-

RELEASED

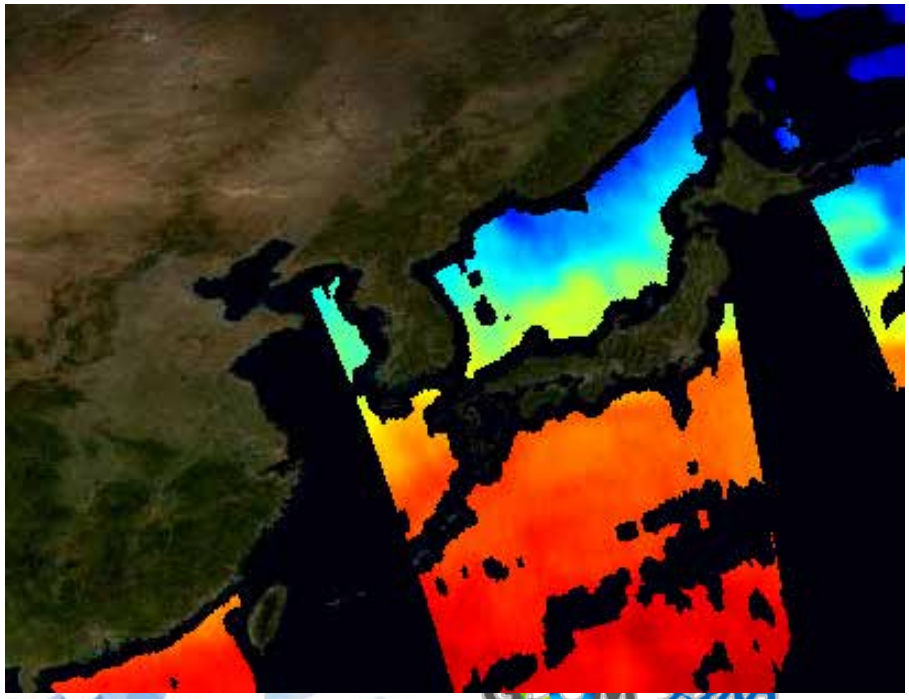
All-Weather Microwave SST

- 7GHz channels are indispensable for retrieving global sea surface temperature and soil moisture. All-weather, frequent measurements enables analyses of rapid changes of SST.
- Time-proven infrared measurement and microwave observations are in complementary situation in terms of spatial resolution and error sources.
- AMSR2 and various infrared sensor data are merged by objective analysis to obtain cloud-free high-resolution SST image in many meteorological agencies.

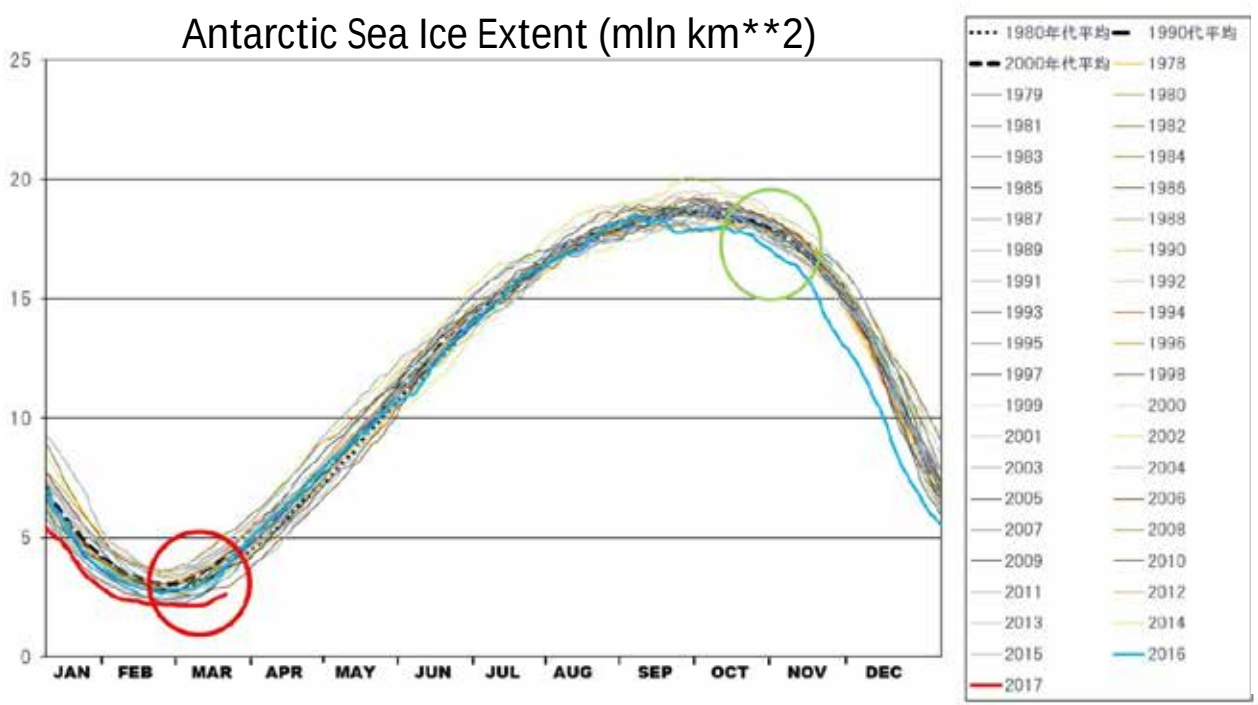
Aqua/MODIS

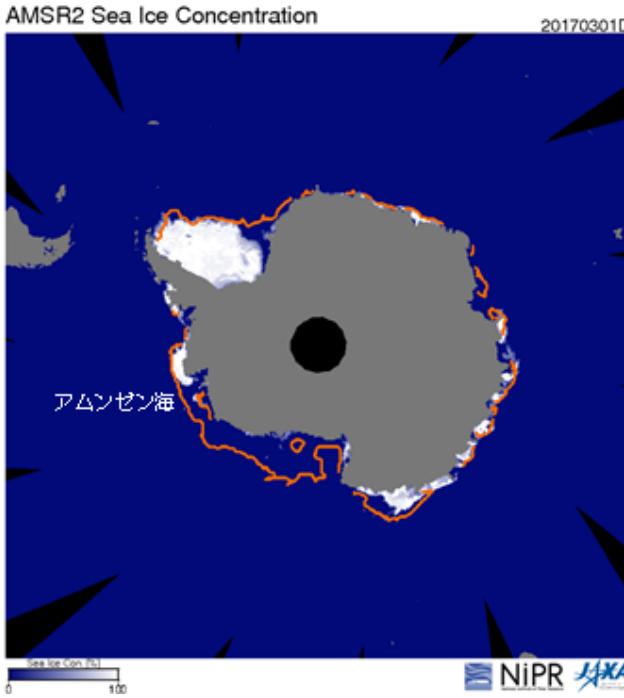


GCOM-W/AMSR2



AMSR2 Captures Minimum Sea Ice Extent over Antarctic in Februarv 2017





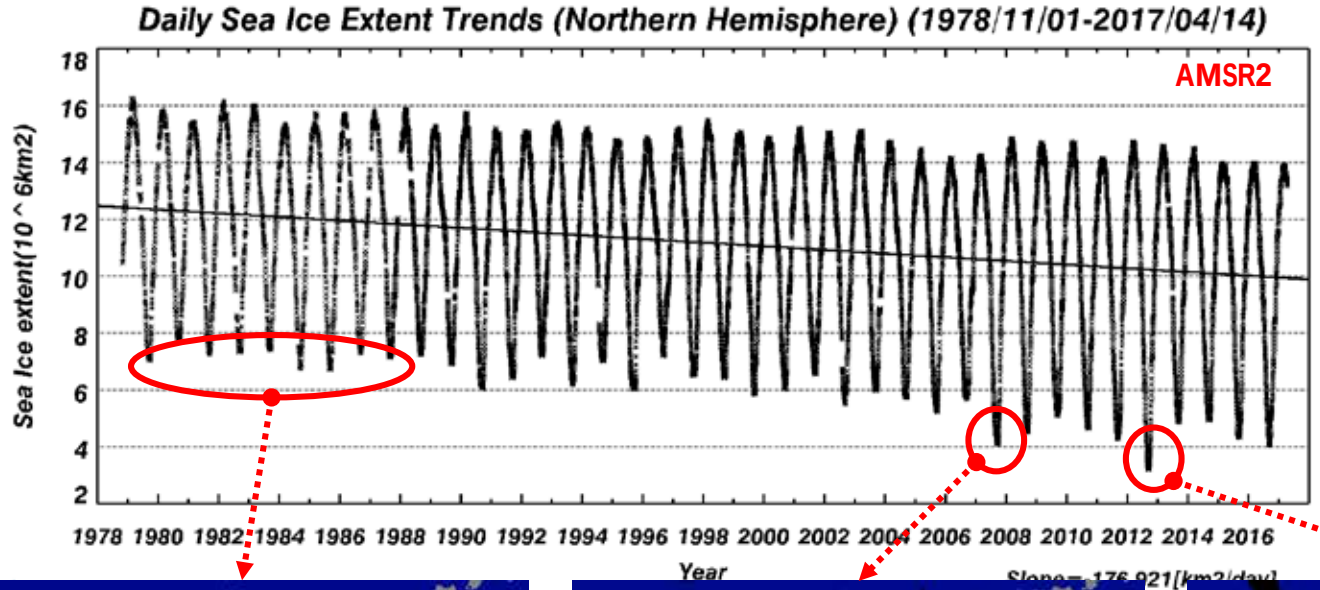
Seasonal variation of Sea Ice Extent over Antarctic. Each line indicates each year. Light blue: 2016, Red: 2017.

Sea Ice Concentration on Mar. 10, 2017, desc. orbit

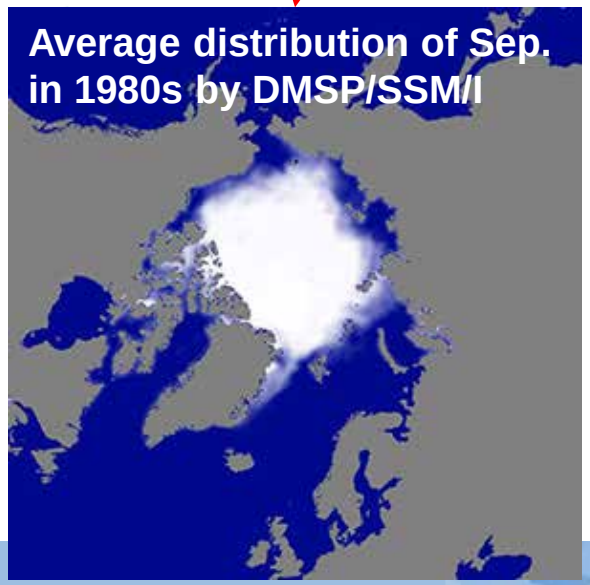
During October to November 2016, sea ice extent maximum value in the year is also recorded minimum value.

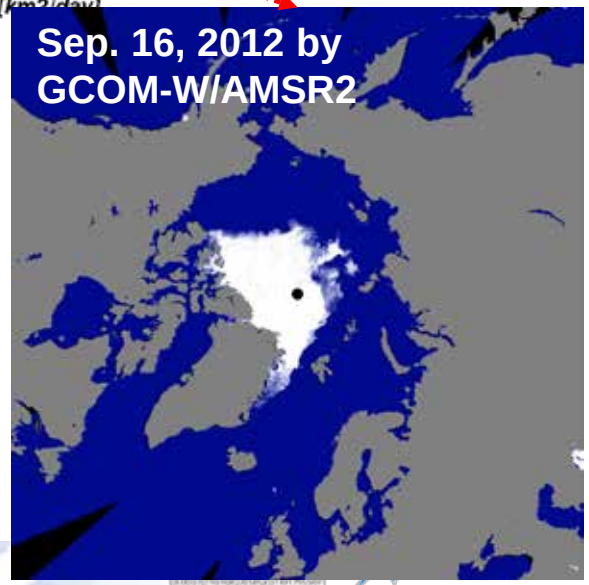
Long-term Monitoring of Sea Ice by AMSR2, AMSR-E and other Microwave Imagers

Daily sea ice concentration dataset by SMMR, SSM/I, AMSR-E, Windsat and AMSR2.



AMSR2 captured the smallest sea ice extent in the record in 2012, and AMSR-E captured the 2nd smallest in 2007.

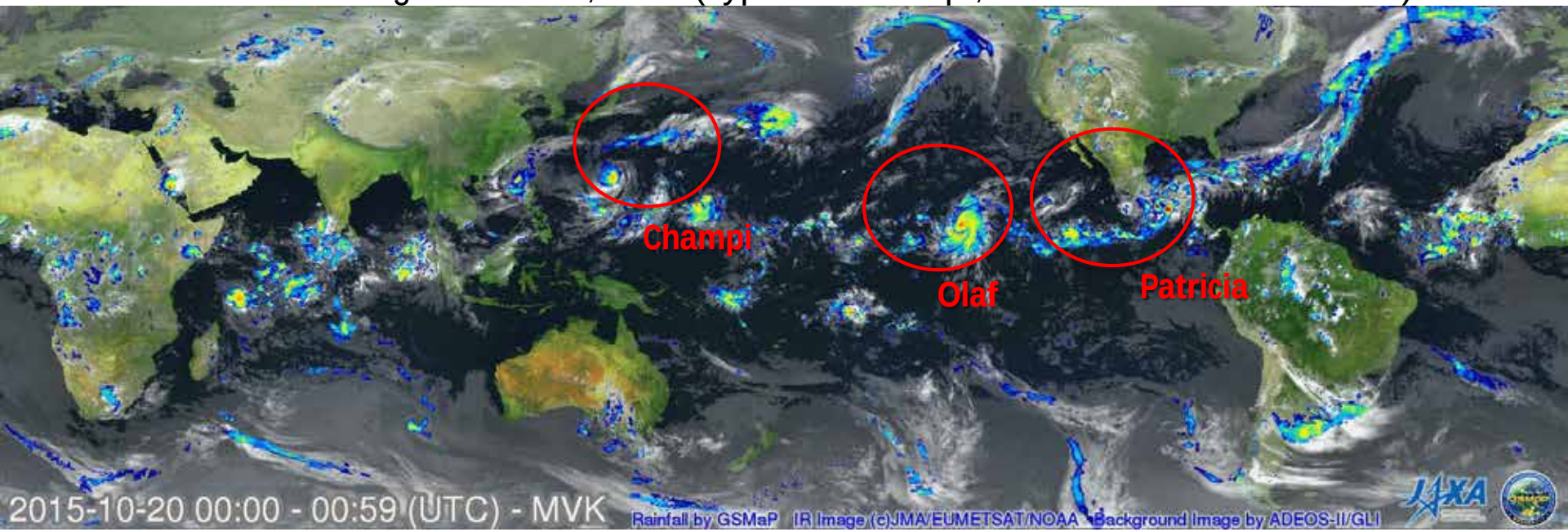




http://sharaku.eorc.jaxa.jp/GSMaP

Global Satellite Mapping of Precipitation (GSMaP)

1-hr Animation during Oct. 20-24, 2015 (Typhoon Champi, Hurricanes Olaf & Patricia)



- GSMaP is a blended Microwave-IR product and has been developed in Japan for the Global Precipitation Measurement (GPM) mission (Core and Constellations).
  - Processing and distributing global rainfall data in near real time basis (4-hour after observations) by merging multi-satellite data. Hourly product in 0.1x0.1deg. lat/lon grid.
- GCOM-W is one of constellations, and AMSR2 precipitation algorithm is provided to GSMaP and extended to other microwave imagers. Latest Version 4 was released in Jan. 2017.
- GSMaP Realtime version (GSMaP_NOW) over Himawari area (0-hr latency) has been available since Nov. 2016.

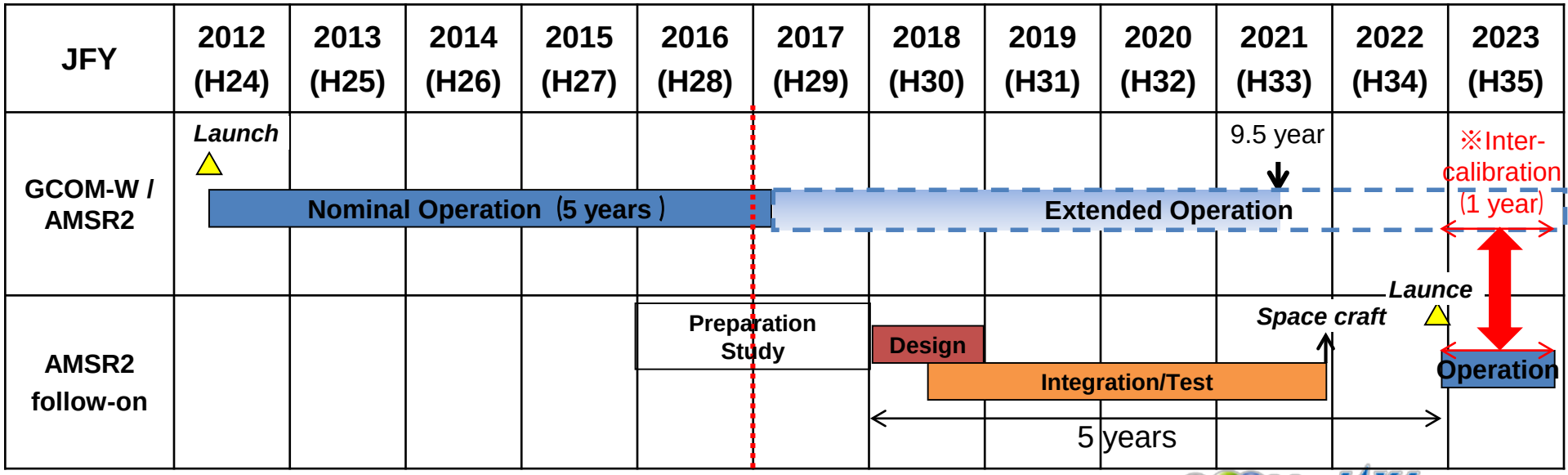
Status of AMSR2 follow-on mission

- Continuity of AMSR Series Data Record

ü In the next May, AMSR2 will reach design life of 5 years. Observation operation will be continued as long as it can survive.

ü There is a high risk of gap between AMSR2 and the follow-on, even if development of AMSR2 follow-on starts from JFY2018.

ü Small budget is accepted to conduct research on hosted payload capability of AMSR2 follow-on onto GOSAT-3 in JFY2017 in corresponding to revision of the roadmap for the Basic Plan on Space Policy. JAXA discussed with scientists on scientific synergies between two missions.



Summary

- GCOM-W and AMSR2 are both in healthy condition with excellent data acquisition about 99.6%, and enough fuels remain for extended mission life more than 10 years.
- L2 standard product Version 3 (SST, SSW, SIC, SMC) has been released to public since March 1, 2017. All product achieved standard accuracy required as mission success criteria, and some products achieved target accuracy.
- Research products, all-weather sea surface wind speed and 10GHz SST, are also available to public.
- Cloud-penetrating capability, especially for SST and sea ice concentration, is strong tool for climate, weather, and water cycle studies.
- AMSR-E products applying AMSR2 format and algorithms are currently processed and will be available this year.
- Small budget is accepted to conduct research on hosted payload capability of AMSR2 follow-on onto GOSAT-3. JAXA started discussion on scientific synergies between two missions.

How to get AMSR2 Data

- Standard Products (standard, NRT, L1A)
  - GCOM-W Data Providing Service System (DPSS)
    - https://gcom-w1.jaxa.jp/auth.html
    - To get standard products, register from the web site.
    - To get L1A and NRT products, submit special user request (request form is available on the web site)
- Research Products
  - GCOM-W Research Product Providing Service
    - http://suzaku.eorc.jaxa.jp/GCOM_W/research/resdist.html
    - To get data, register from the web site.
    - AMSR2 all-weather sea surface wind speed product and AMSR-E slow rotation mode product (L1S) are available. (10GHz SST is included in standard SST product)
- DPSS transition to GPortal-R (new G-Portal)
  - Scheduled in autumn to winter 2017. Overlaps 2-3 months.
  - Details will be announced to registered users in autumn.