AMSR2/AMSR3 Updates

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Development of AMSR Series

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

MOS-1

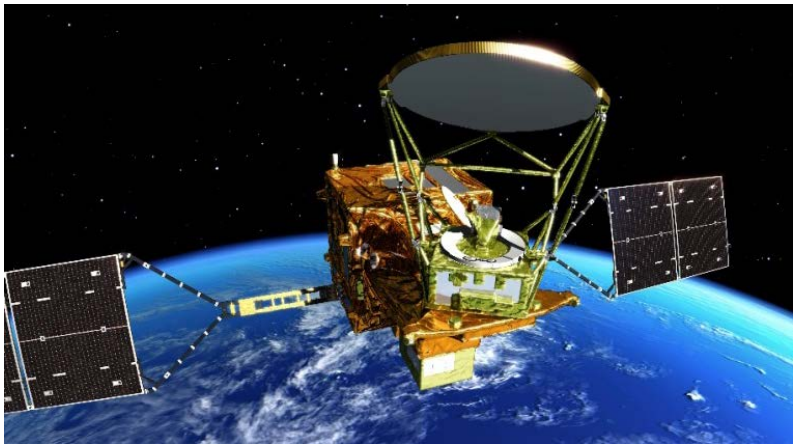
ADEOS-II

Aqua

GCOM-W

AMSR3?

Overview of GCOM-W and AMSR2



Instrument	**Advanced Microwave Scanning Radiometer 2 (AMSR2)**
Altitude	**~700 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**

- ✓Successor of Aqua/AMSR-E (launched in May 2002), providing continuous data for climate studies and operational applications
- ✓Joining A-train constellation (same as Aqua) and also GPM constellation
- ✓Carrying AMSR2, a multi-polarization and multi-frequency microwave imager
- ✓Observing various water-related ECVs at high spatial resolution
- ✓Improving on-board calibration target has resulted reduction of annual TB variation due to calibration and improvement of TB stability
- ✓Achieved designed mission life (5-year) on May 18, 2017, and continues observation
- ✓Enough fuels to keep current orbit for more than 15 years

GCOM-W Operation Status

GCOM-W satellite and AMSR2 instruments are in healthy conditions.

- No major problem in data acquisition and processing
- Data Loss events (except annual inclination adjust maneuvers):
  - Jul. 17, 18, 23, 2012: Calibration activity (half orbit each day)
  - May 10 - 14, 2013 : SEU-induced AMSR2 observation halt #1
  - Dec. 4, 2015: SEU-induced data recorder halt #1 (20 hours)
  - Apr. 15, 2016: SEU-induced AMSR2 observation halt #2 (20 hours)
  - Aug. 3, 2016: Retrograde maneuver (half orbit)
  - Feb. 22, 2017: Retrograde maneuver (half orbit)
  - Jul. 12, 2017: Retrograde maneuver (half orbit)
  - Sep. 27, 2017: SEU-induced data recorder halt #2 (20 hours)
  - Nov. 25, 2017: SEU-induced AMSR2 observation halt #3 (14 hours)
  - Mar. 14, 2018: Retrograde maneuver (half orbit)
  - Dec. 16, 2018: SEU-induced data recorder halt #3 (10 hours)
- Enough fuels to keep current orbit
- Initial indication of aging and degradation of mechanical bearings lubricants of AMSR2

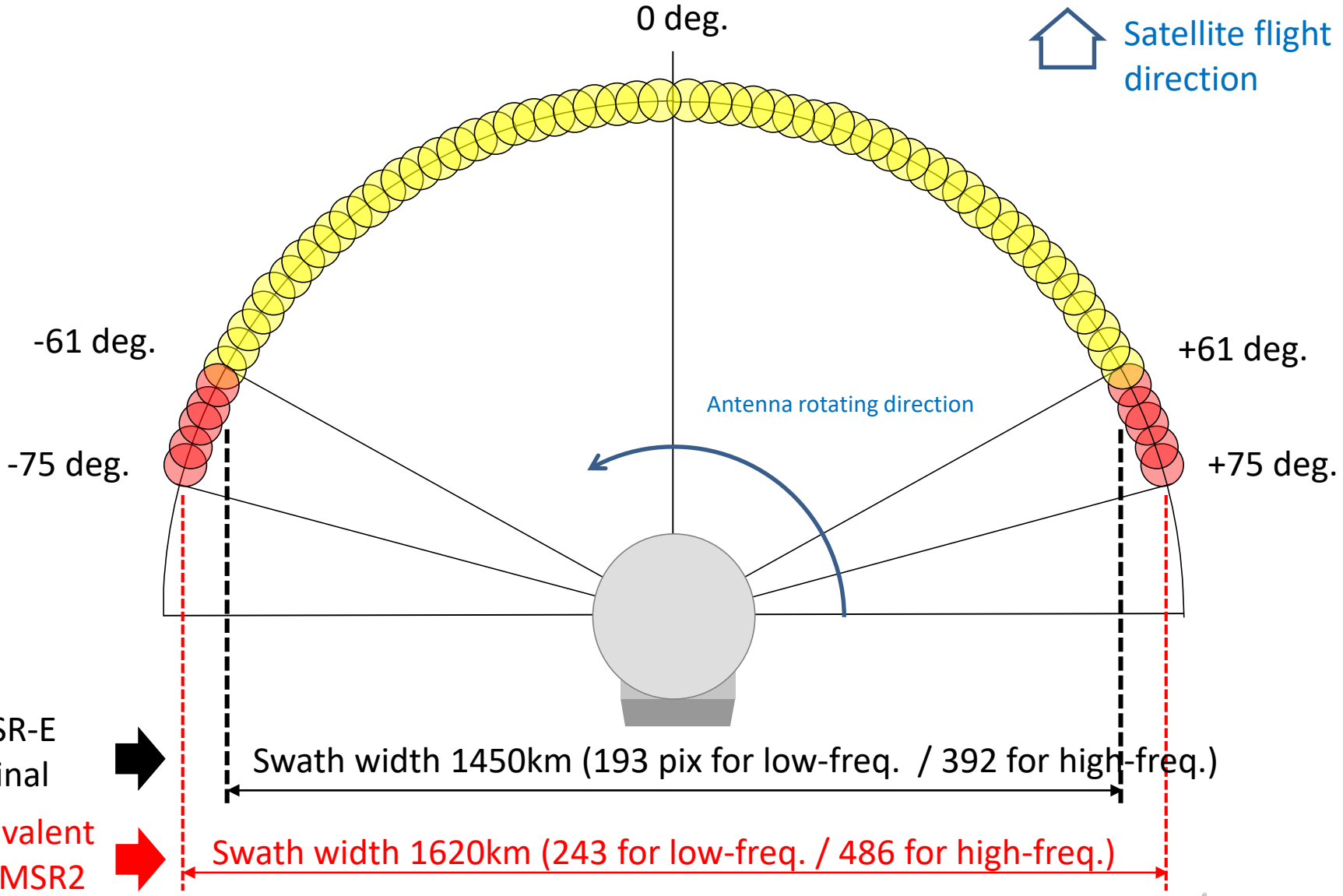
AMSR2/AMSR-E Product Status

- AMSR2
  - Level 1 & 3 (brightness temperature): Ver. 2.2 (Aug. 2016)
  - Level 2 & 3 (geophysical parameters): Ver.2 (Mar. 2015)
    - Total precipitable water, integrated cloud liquid water, precipitation, snow depth
  - Level 2 & 3 (geophysical parameters): Ver.3 (Mar. 2017)
    - SST, sea surface wind speed, sea ice concentration, soil moisture content
  - Level 2 & 3 (research):
    - 10-GHz SST (included in standard SST): Ver.3 (Mar. 2017)
    - All-weather sea surface wind speed: Ver.3 (Jan. 2018)
    - Land surface temperature: Ver.1 (Feb. 2018)
    - Thin ice detection, Total precipitable water over land: Ver. 1 (end of Jan. 2019)
- AMSR-E (in AMSR2 format and algorithms)
  - Level 1 & 3 (brightness temperature): Ver.4 (Apr. 2018)
  - Level 2 & 3 (geophysical parameters): Ver.8 in early JFY2019

AMSR-E L1 Product Ver. 4

- L1 Reprocessing Policy
  - Brightness temperature (TB) between AMSR-E and AMSR2 is not adjusted
  - **Swath width** of AMSR-E (**1450km**, 196 pixels for low-freq. Ch. / 392 for high-freq. Ch.) is extended to **be equivalent to that of AMSR2** (**1620km**, 243 pixels for low-freq. Ch. / 486 for high-freq. Ch.)
  - **AMSR-E L1R (resampling) product**, which is highly requested by users, are newly developed
- Improvements in L1B Algorithm
  - Bias correction of TB is applied to scan edges to extend swath width
  - Improved method to calculate hot load temperature correction by using two orbit paths to resolve gaps between Ascending and Descending orbit products
  - Improved geometric parameters
- AMSR-E L1 products (ver.4) has been released to public through the G-Portal since April 2018.
  - https://www.gportal.jaxa.jp/gp/

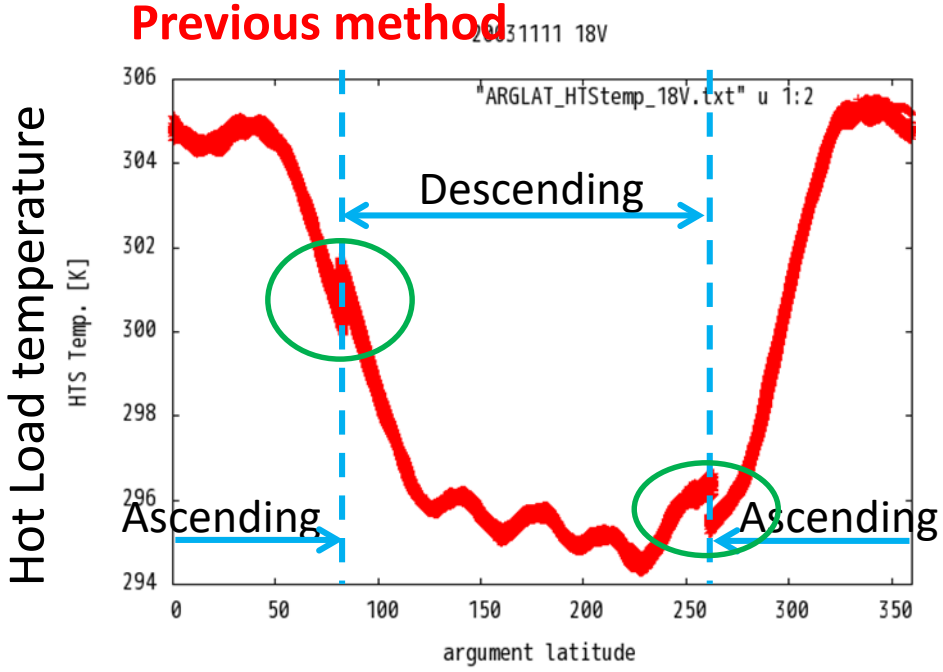
AMSR-E L1 Ver.4: Extend Swath Width



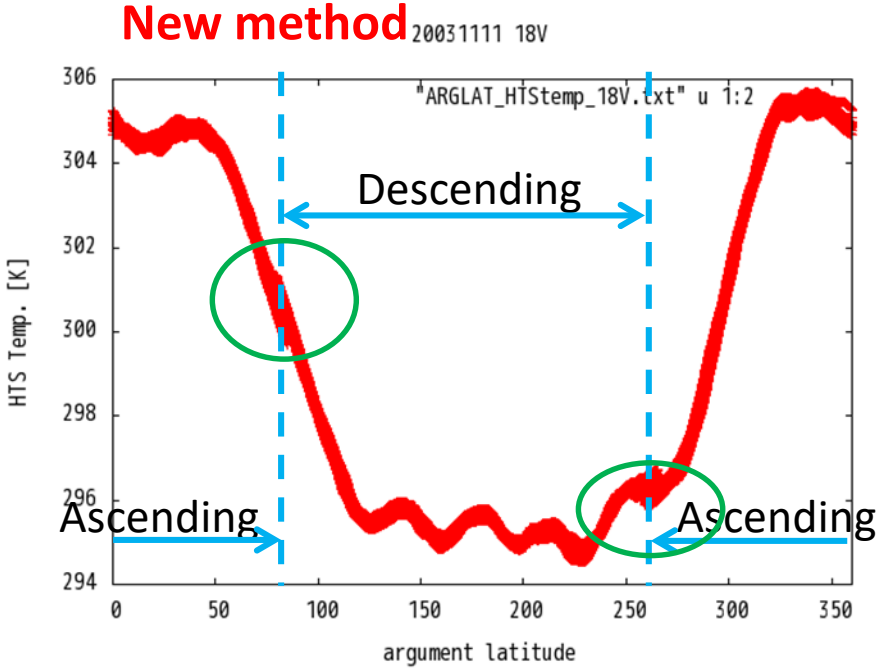
AMSR-E L1 Ver.4: Hot Load Correction

- Parameters to correct hot load temperature are calculated using half orbit data previously, but gaps are found at boundary of A/D products.
- In new version, two orbits path data (1 orbit before and after) are used for calculation and gaps are resolved.

Previous method

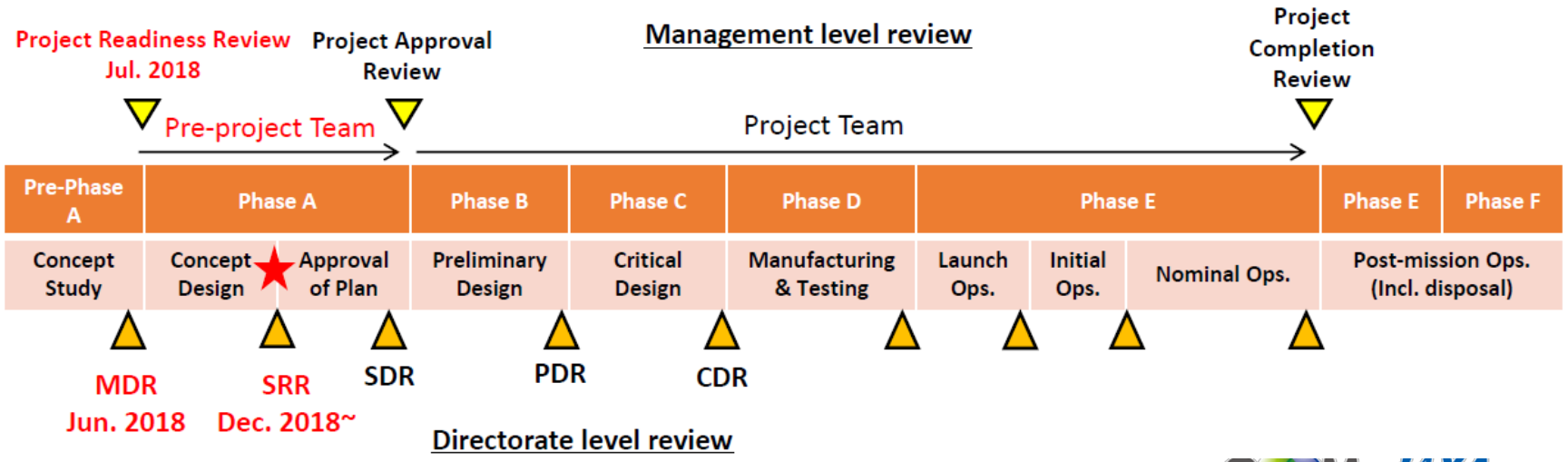


New method



Status of AMSR2 follow-on mission

- "Development of the AMSR2's successor sensor (Launch on the GOSAT-3 satellite)" is mentioned on The Roadmap for the Basic Plan on Space Policy revised December, 2018.
  - AMSR2 follow-on instrument will share satellite bus with greenhouse-gas observation instrument developed by Ministry of Environment for a follow-on mission of Greenhouse-gas Observation Satellite 2 (GOSAT-2).
- JAXA proceeds with internal process to launch development project.
  - Mission Definition Review (MDR) and project readiness reviews were completed in Jun. 2018.
  - GOSAT-3 pre-project team takes charge of Project Preparation Phase (Phase-A) activities from Sep. 1, 2019.
  - System Requirement Review (SRR) was completed in Jan. 2019.



AMSR2 follow-on specification

- Specification of the AMSR2 follow-on instrument
  - Almost equivalent to AMSR2
  - A few high frequency channels (**166 GHz and 183 GHz**) is considered for approval.
- Orbit will be **666 km altitude** (same as GOSAT-1) and **13:30 LT in Ascending node** (same as GCOM-W)
  - Finer FOV (5% less), narrower swath width (1535km)
- Targets of the follow-on mission
  - 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
- New standard products for the mission above
  - solid precipitation, water vapor over land, high-resolution sea surface temperature, all-weather sea surface wind speed and high-resolution sea ice concentration

Summary

- JAXA's GCOM-W mission is now flying more than 6-years without any serious problem. Satellite and sensor (AMSR2) is in healthy condition.
  - AMSR2 products are distributed to public via internet. Transfer to G-Portal (https://www.gportal.jaxa.jp/gp/) has completed in June 2018
  - 8 standard geophysical parameters and 3 research products are now available, and 2 research products are close to release
- AMSR-E reprocessing products applying AMSR2 format and algorithms are in preparation, expecting contribution to CDRs
  - L1B and L1R (resampling: new) products are already available at G-Portal
  - L2 products are now validated and show accuracy equivalent to AMSR2
- AMSR2 follow-on sensor (AMSR3) and TANSO-2 successor sensor will be joint mission and JAXA has initiated pre-project team phase Sep. 1, 2018.
  - Orbit is defined to keep AMSR2 LT observation (13:30 ATAN), but altitude is lower than GCOM-W (699km -> 666km: same as GOSAT orbit)
  - Sensor specification of AMSR3 will be equivalent to AMSR2 except additional 166/183 GHz channels for solid precipitation retrievals and water vapor analysis in NWP