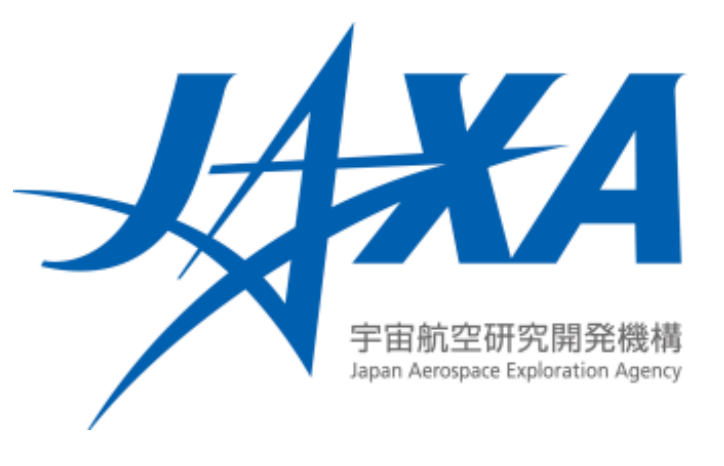




JMA and JAXA



Kozo Okamoto¹, Misako Kachi² and Kotaro Bessho¹

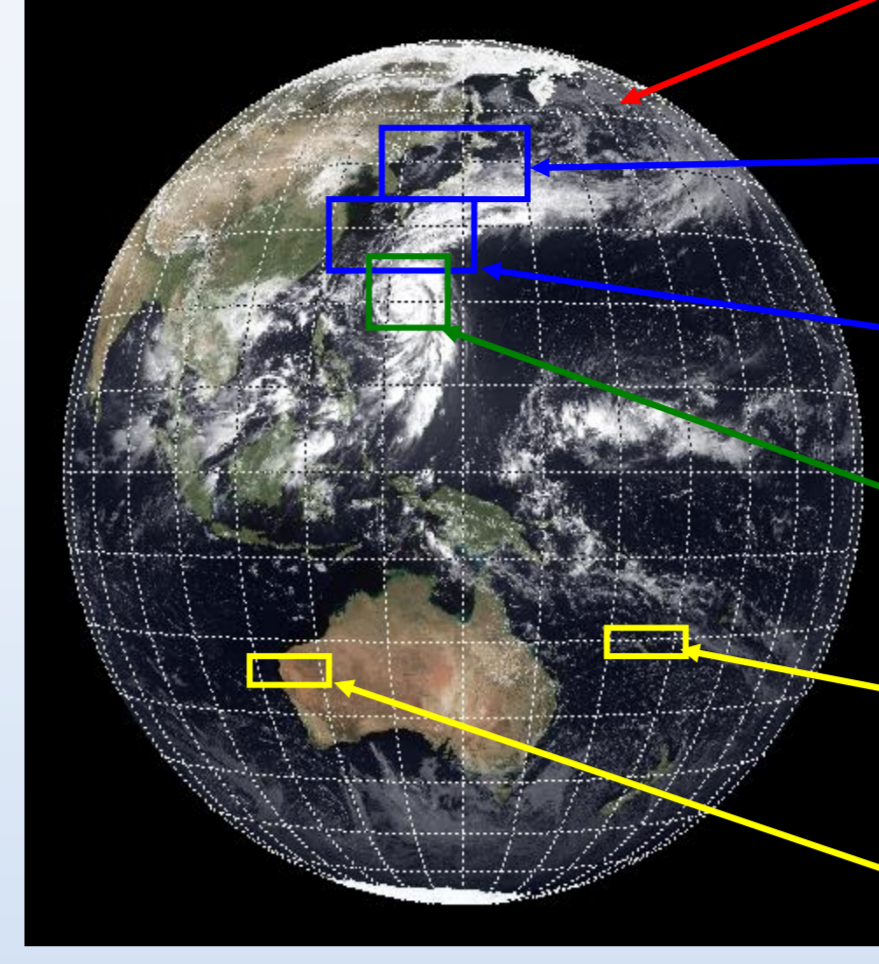
1:JMA, 2:JAXA

JMA

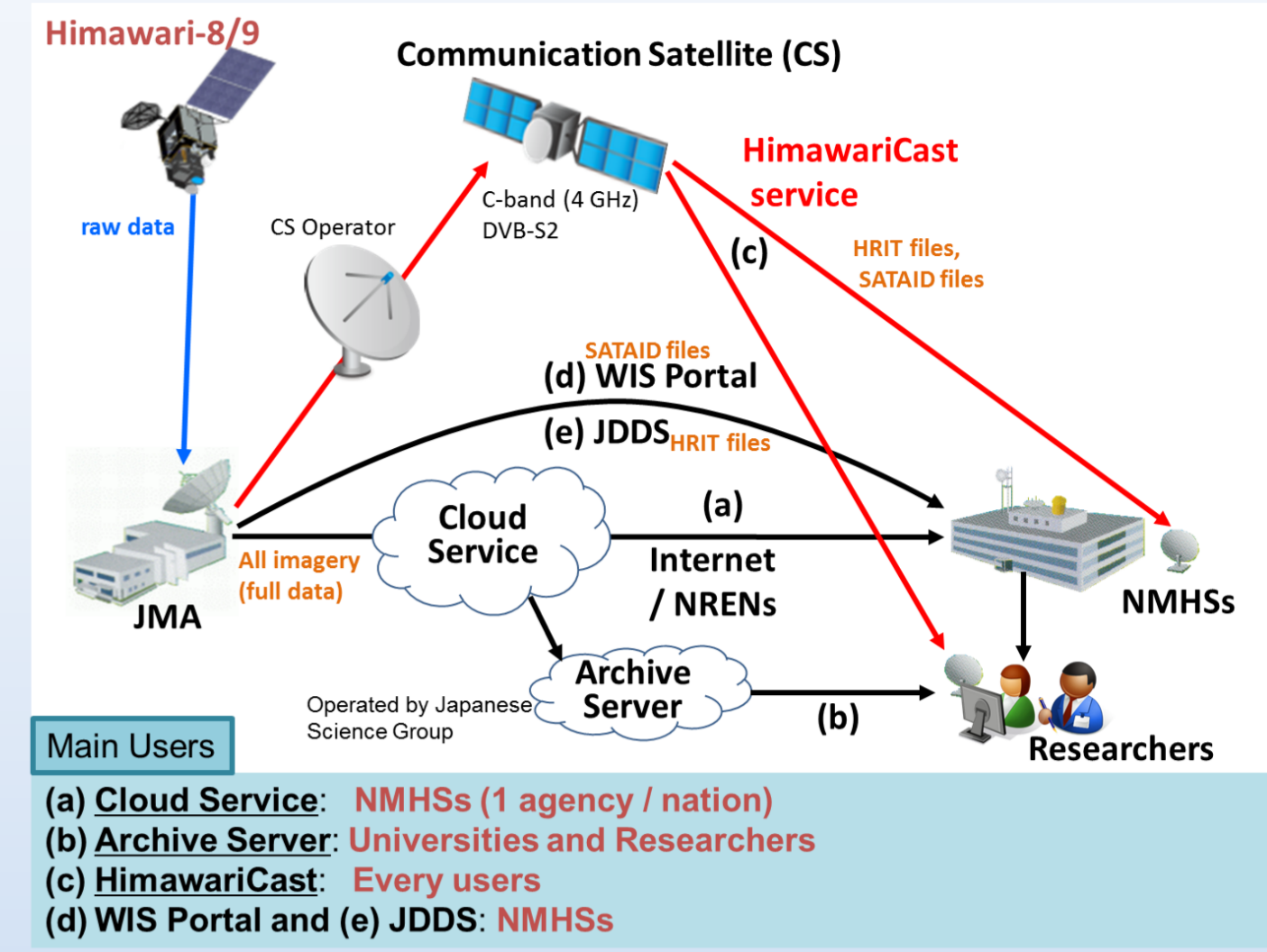
Himawari -8 and -9
Launched on 7 Oct. 2014, started operation on 7 Jul. 2015

- AHI (Advanced Himawari Imager)**
 - Enhance channel number, spatial resolution and imaging update frequency
- L2 product**
 - Da1 : AMV, CSR, cloud (mask, type, phase and top-height), dust, rapidly developed cumulus area
 - Under development : volcanic ash, SST, optimal cloud analysis, atmospheric stability
- Data dissemination**
 - Full data in HSD format for NMHS through HimawariCloud service
 - HSD : Himawari Standard Data, 329GB/day in full disk every 10 min
 - HimawariCast broadcasts limited data (14 bands, 1 & 4km res.) through a communication satellite
- Plans**
 - Discontinue a concurrent dissemination of MTSAT-2 L2 products late March 2016
 - Himawari-9 will be launched in the 2nd half of 2016
 - operation : 2022 ~ 2029

Himawari-8,9/AHI Channel Set		MTSAT2	
Band	Central Wavelength [μm]	Spatial Resolution	
1	0.43 - 0.48	1Km	
2	0.50 - 0.52	1Km	
3	0.63 - 0.66	0.5Km	1km
4	0.85 - 0.87	1Km	
5	1.60 - 1.62	2Km	
6	2.25 - 2.27	2Km	
7	3.74 - 3.96	2Km	4km
8	6.06 - 6.43	2Km	4km
9	6.89 - 7.01	2Km	
10	7.26 - 7.43	2Km	
11	8.44 - 8.76	2Km	
12	9.54 - 9.72	2Km	
13	10.3 - 10.6	2Km	4km
14	11.1 - 11.3	2Km	
15	12.2 - 12.5	2Km	4km
16	13.2 - 13.4	2Km	



- Full disk**
Interval : 10 minutes (6 times per hour), 23 swath
- Region 1 JAPAN (North-East)**
Interval : 2.5 minutes (4 times in 10minutes)
EW x NS: 2000 x 1000 km, 2 swath
- Region 2 JAPAN (South-West)**
Interval : 2.5 minutes (4 times in 10minutes)
EW x NS: 2000 x 1000 km, 2 swath
- Region 3 Typhoon**
Interval : 2.5 minutes (4 times in 10minutes)
EW x NS: 1000 x 1000 km, 2 swath
- Region 4 Land mark**
Interval : 0.5 minutes (20 times in 10minutes)
EW x NS: 1000 x 500 km, 1 swath
- Region 5 Land mark**
Interval : 0.5 minutes (20 times in 10minutes)
EW x NS: 1000 x 500 km, 1 swath



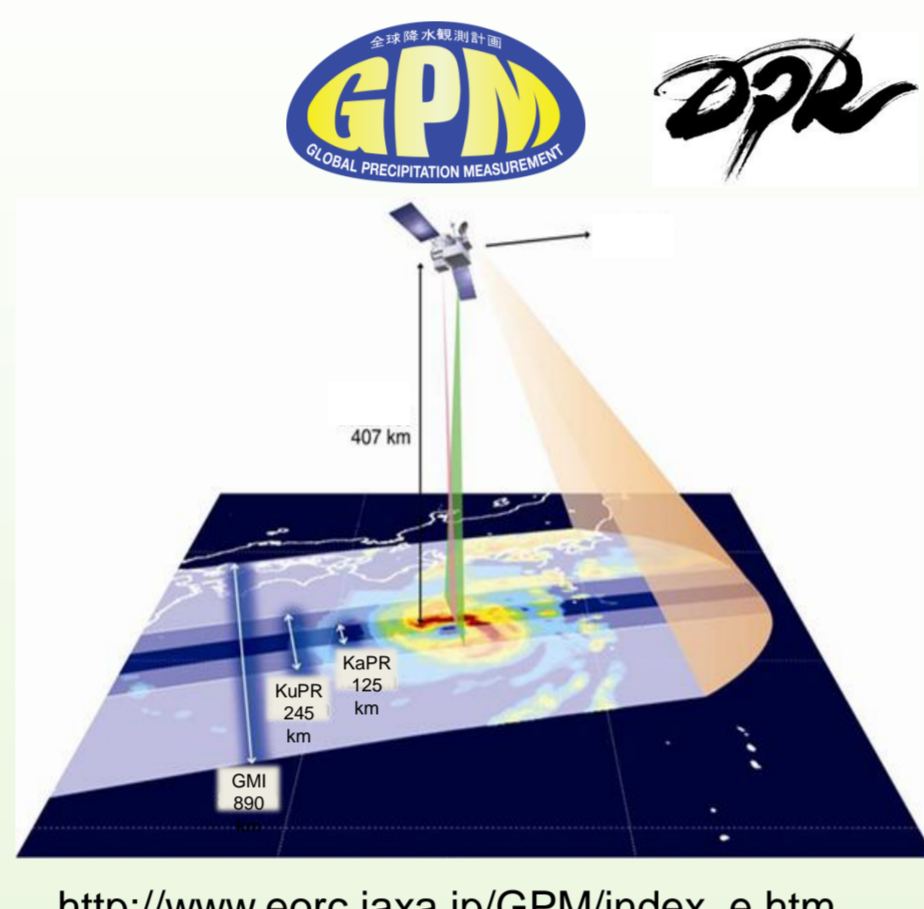
More information is available on <http://www.jma-net.go.jp/msc/en>

- MTSAT-2 (Himawari-7)** : stand-by satellite
- Operated since 1 July 2011

JAXA

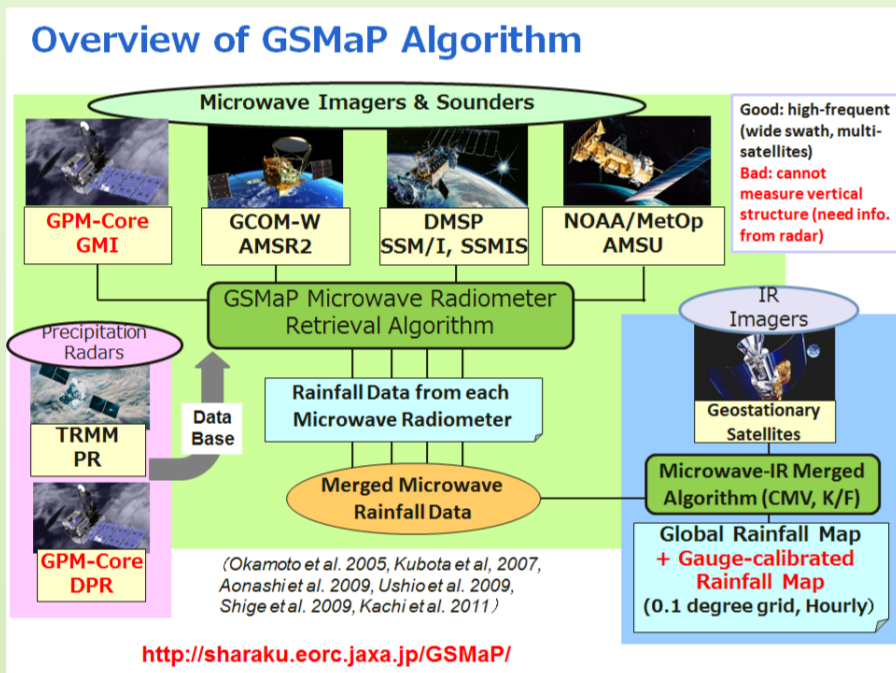
DPR on GPM (Global Precipitation Mission) Feb 2014~

- GPM**: Achieve high accurate/frequent global precipitation observation
 - Core observatory
 - Developed under NASA and JAXA equal partnership
 - 2 instruments : DPR and GMI (GPM Microwave Imager)
 - Constellation satellites: GPM Core, Megha-Tropiques, DMS-P, GCOM-W, MetOp, NOAA, Suomi-NPP, JPSS
- DPR (Dual-frequency Precipitation Radar)**
 - KuPR (13.6 GHz) and KaPR (35.5 GHz)
 - Highly sensitive precipitation measurement
- All standard products released in Sep 2014
- Available on JAXA G-Portal : <https://www.gportal.jaxa.jp/gp/top.html>



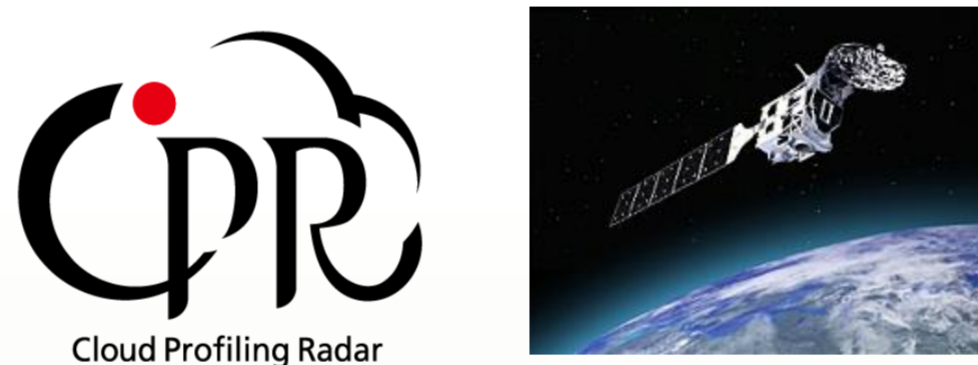
http://www.eorc.jaxa.jp/GPM/index_e.htm

Satellite	GPM core		TRMM
Radar	KuPR	KaPR	PR
Observation frequency	13.597 & 13.603 GHz	35.547 & 35.553 GHz	13.796 & 13.802 GHz
Swath width	245 km	125 km	215 km
Horizontal resolution	5 km	5 km	4.3 km
Range resolution	250 m	250/500 m	250 m
Minimum Ze and rain rate	18 dBZ 0.3 mm/h	12 dBZ 0.5 mm/h	18 dBZ 0.7 mm/h
Launch date (JST)	28 Feb. 2014		28 Nov. 1997
Orbit (inclination)	Non-sun-synchronous (65 deg)		Non-sun synchronous (35 deg)
Altitude	407 km		350 km

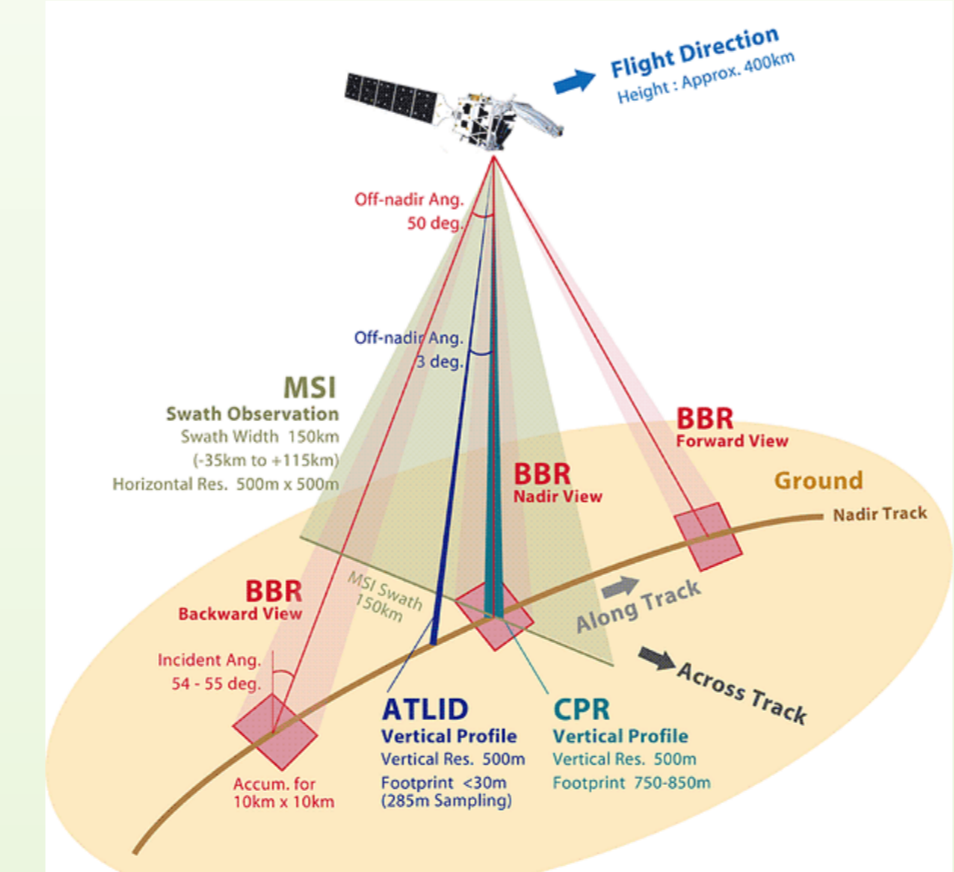
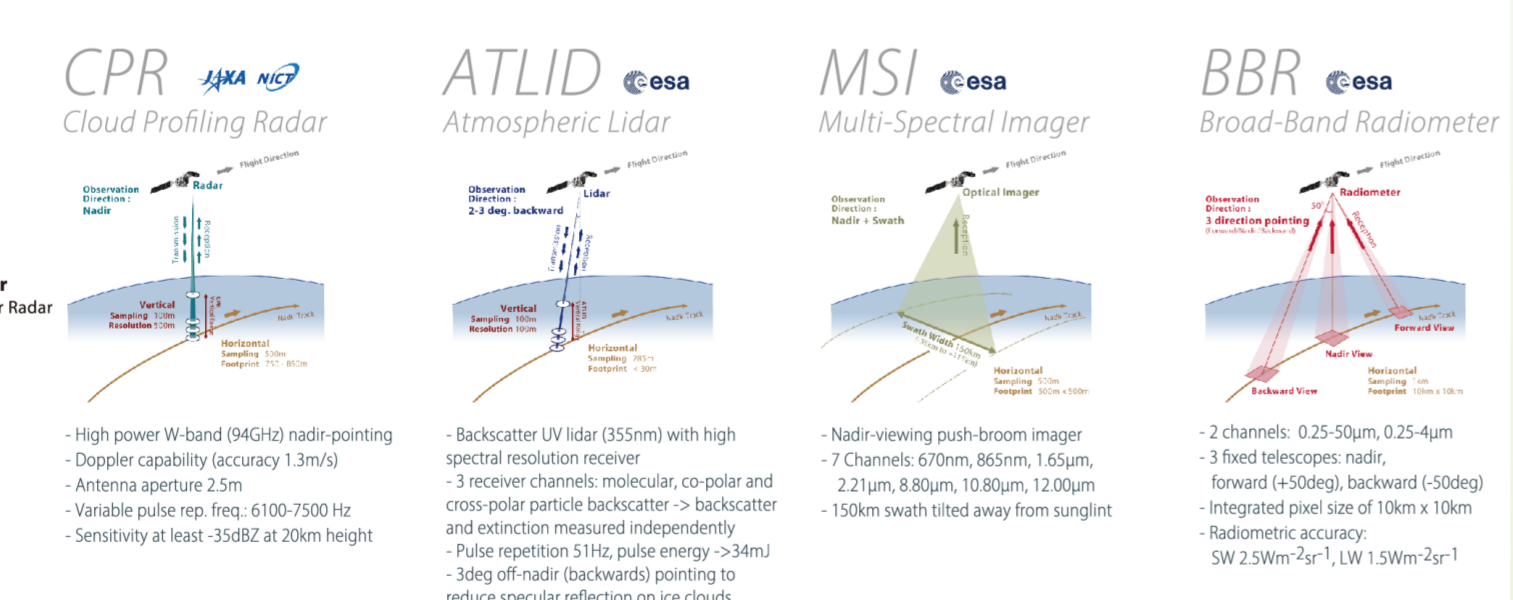


CPR on EarthCARE (Jan 2018)

- EarthCARE** : ESA Earth Explorer Core Mission
 - Evaluate the radiative interaction and radiative forcing of cloud and aerosol, and reduce the uncertainties in global warming prediction by measuring 3 dimensional global structure of clouds and aerosols
 - Joint mission of ESA and JAXA
 - Sun-synchronous orbit at 400 km altitude, 97.05 degrees inclination and 14:00 LT of descending node
 - 4 instruments: CPR, ATLID, MSI, and BBR
- CPR (Cloud Profiling Radar)** : The world's first satellite-borne Doppler cloud radar
 - W-band (94GHz) radar to observe 3-dimensional distribution and physical characteristics of cloud and drizzle.
 - Approximately 6 times higher sensitivity than CloudSat/CPR
 - In-cloud vertical motion by Doppler measurement function has the potential to contribute to the understanding of cloud and precipitation process
- All JAXA standard products and ESA products will be available on **JAXA G-Portal** : <https://www.gportal.jaxa.jp/gp/top.html>
- L1B (single sensor, engineering values) will be released 6 month after launch
- L2A (single sensor, high-level microphysics) 9 month after launch
- L2B (multi sensor, high-level microphysics) 18 month after launch



Payloads

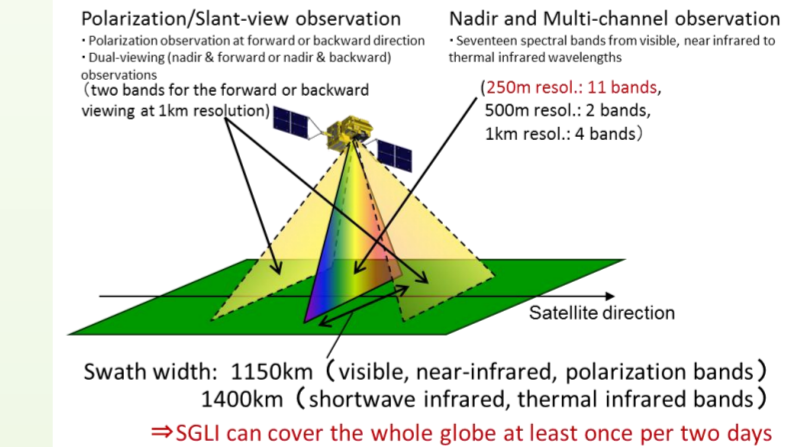
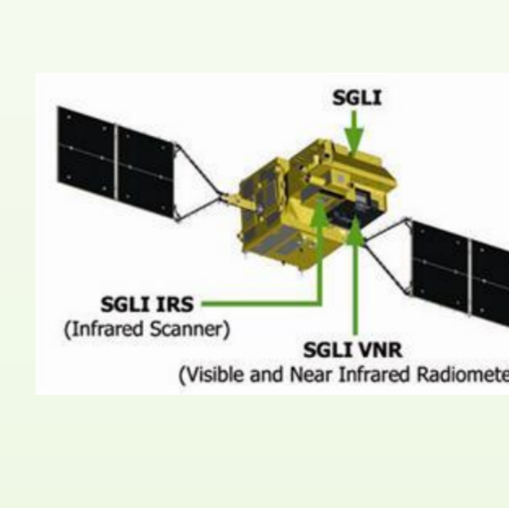


SGLI on GCOM-C1 (JFY 2016)

- Long-term observation of the radiation budget and carbon cycle
- GCOM-C** : Sun-synchronous orbit at 798 km altitude, 98.6 degrees inclination and 10:30 LT of descending node
- SGLI (Second Generation Global Imager)**
 - Multi-ch optical sensor, consisting of two components of SGLI-VNR (Vis and NIR Radiometer) and SGLI-IRS (IR Scanner)
 - Characterized by 250 m resolution (targeted at vegetation, phytoplankton, sea ice), along-track slant view (biomass, land cover), and polarization (aerosol)
- More information is available on http://suzaku.eorc.jaxa.jp/GCOM_C/index.html



CH	Characteristics of SGLI spectral bands										
	λ, nm	Δλ, nm	W _{eff} , nm	IRF, %	SNR@L ₀ , K/NEAT	IFOV, m	HPV, deg	Tilt, deg			
VN1	380	10	60	210	250	250	1000	0			
VN2	412	10	75	250	400	250	1000	0			
VN3	443	10	64	400	300	250	1000	0			
VN4	490	10	53	450	400	250	1000	0			
VN5	530	20	41	350	250	250	1000	0			
VN6	565	20	33	300	400	250	1000	0			
VN7	673.5	20	23	62	400	250	1000	0			
VN8	673.5	20	25	210	250	250	1000	0			
VN9	763	12	40	350	1200	250	1000	0			
VN10	868.5	20	8	30	400	250	1000	0			
VN11	868.5	20	30	300	200	250	1000	0			
PC1-L	673.5	20	25	250	250	1000	±45				
PC2-L	868.5	20	30	300	250	1000	±45				
SW1	1050	20	57	248	500	1000	0				
SW2	1380	20	8	105	150	1000	0				
SW3	1630	200	3	50	57	250	1000	0			
SW4	2210	50	1.9	20	211	1000	0				
TIR1	1080	0.7	30K, 340K	0.2K	250	750	1000	0			
TIR2	1200	0.7	30K, 340K	0.2K	250	500	1000	0			



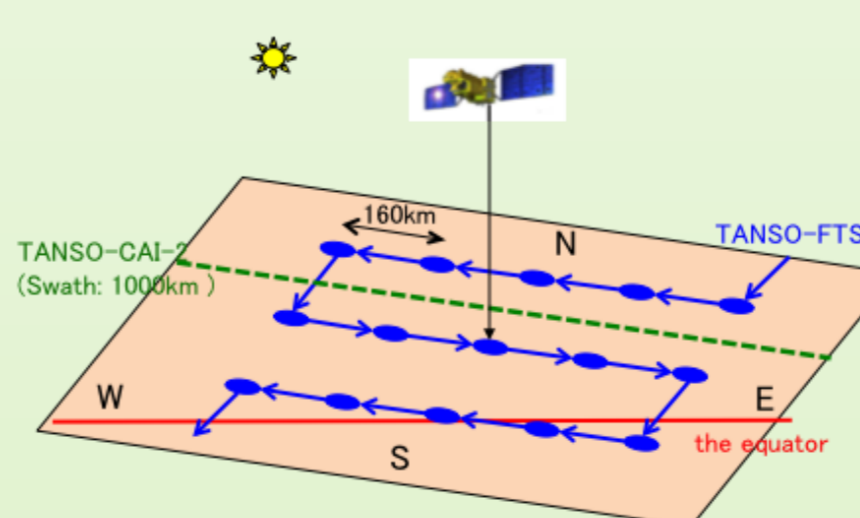
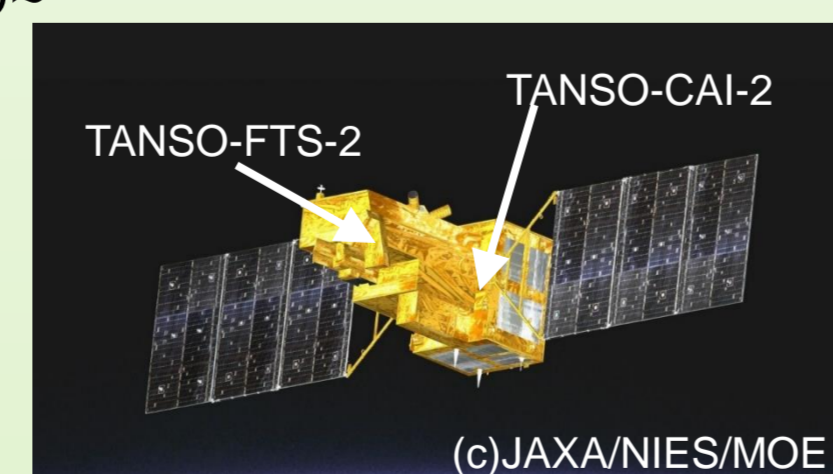
250m over the land or coastal area, and 1km over offshore
 Multi-angle obs. for aerosols
 250m-mode possibility
 SGLI can cover the whole globe at least once per two days

GOSAT (Green house gases Observing SATellite) 23 Jan 2009~

- Objectives of GOSAT and GOSAT2 :
 - Elaborate climate change prediction
 - Clarify the carbon cycle by multi-point and high-precision observation of CO₂, CH₄ and CO
 - Monitor climate change
 - Early detect significant changes in the climate system
 - Contribute to climate policy
 - Monitor efforts to reduce global CO₂

GOSAT2 (early 2018)

- Improve CO₂ and CH₄ observation accuracy, and reduce net flux estimation uncertainty
 - Enhance aerosol observation by FTS-2 band 1 and CAI-2
 - Enhance effective observation with intelligent pointing to avoid cloud contamination and expanding sunglint observation by CAI-2
- Estimate anthropogenic source
 - Add CO band for carbon correlated gas
- Upgrade natural emissions estimation
 - Evaluate vegetation activity with solar-induced chlorophyll fluorescence observation
 - Monitor large emission sources
 - Intensive observation of megacities, plants, wildfires in forests and peatland



Cloud and Aerosol Imager - 2 (TANSO-CAI-2) on GOSAT-2	
Items	Specifications
Band	1 2 3 4 5 6 7 8 9 10
Center wavelength [nm]	343 443 674 869 1630 380 550 674 869 1630
Band width [nm]	20 20 20 20 90 20 20 20 20 90
Line of sight [deg]	+20 -20
IFOV [km]	0.5 1 0.5 1
Swath [km]	1000

Fourier Transform Spectrometer - 2 (TANSO-FTS-2) on GOSAT-2						
Items		Specifications				
Interferometer	Band (polarization)	1 (P/S)	2 (P/S)	3 (P/S)	4	5
	Wavenumber [cm ⁻¹]	12950 - 13250	5900 - 6400	4200 - 5200	1188 - 1800	700 - 1188
	Target	O ₂ A Chlorophyll fluorescence	CO ₂ , CH ₄	CO ₂ , CO	CH ₄	CO ₂ , O ₃
	Sampling	4 sec				
	Resolution	0.2 cm ⁻¹				
Pointing mechanism	SNR	400 (B1), 300 (B2,B3,B4,B5), for Albedo=0.3, SZ=30deg				
	IFOV	10.5 km				
	Swath	750km, cross-track (+/- 35 deg), along-track (+/- 40deg) Expanding of sunglint observation area by wider forward and backward view				
	Pointing	Intelligent pointing by on-board automatic cloud avoidance program On-board memory of global observation points over land for effective soundings GOSAT=3,000points/day->GOSAT-2=19,000points/day				

Red items shows upgrade in GOSAT-2 from GOSAT