Satellite activities at JAXA

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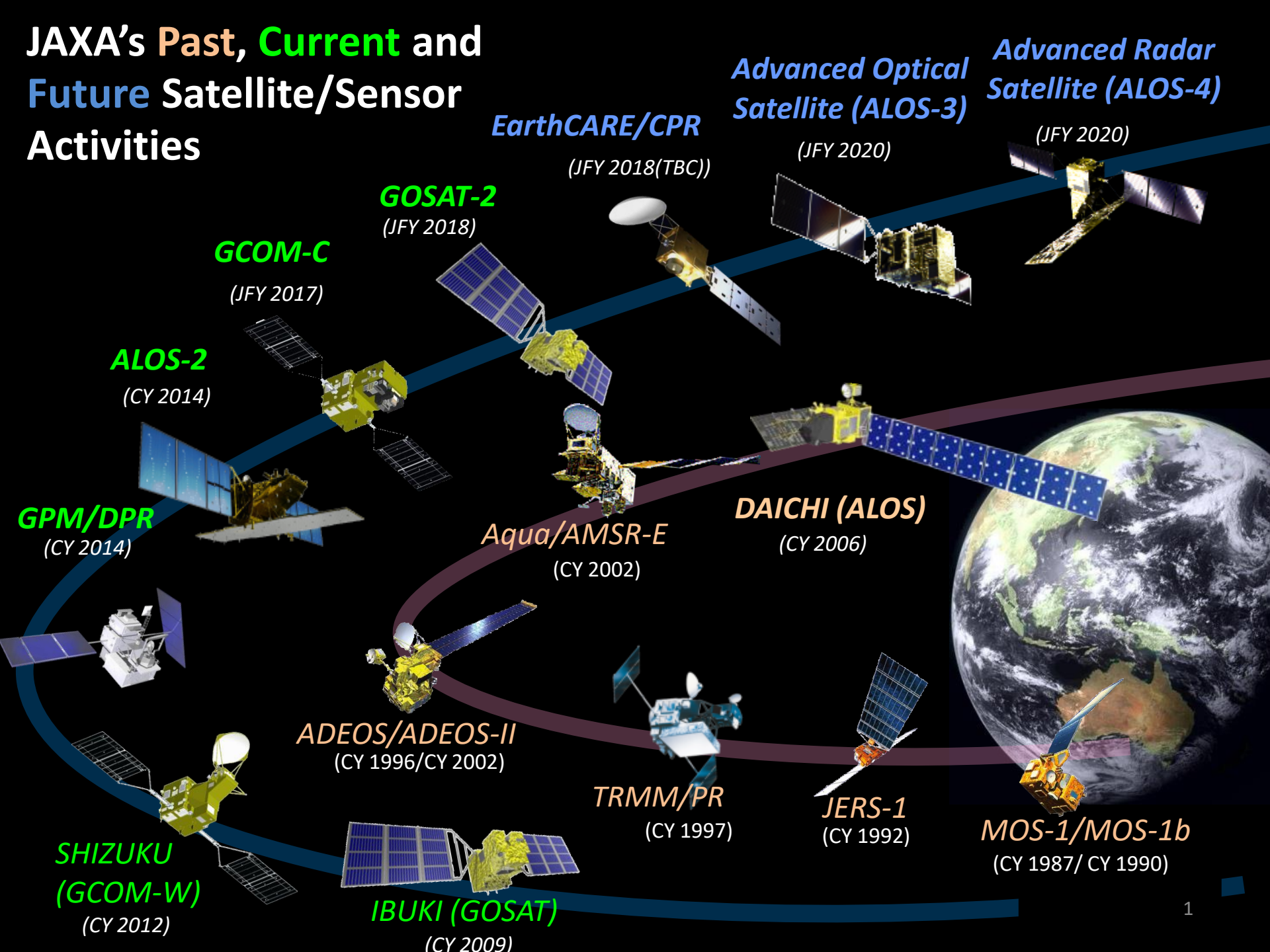
Nov. 27, 2018
2nd GODEX Meeting@New-Delhi, India

JAXA's Past, Current and Future Satellite/Sensor Activities



Satellites in Orbit

Greenhouse Gases Observation Satellite (GOSAT) Series

GOSAT Characteristics	
Design Life	5 years
Orbit	Sun-Synchronous (666km, 13:00 (Dsc.))
Launch	Jan. 23, 2009
Observation	CO_2, CH_4

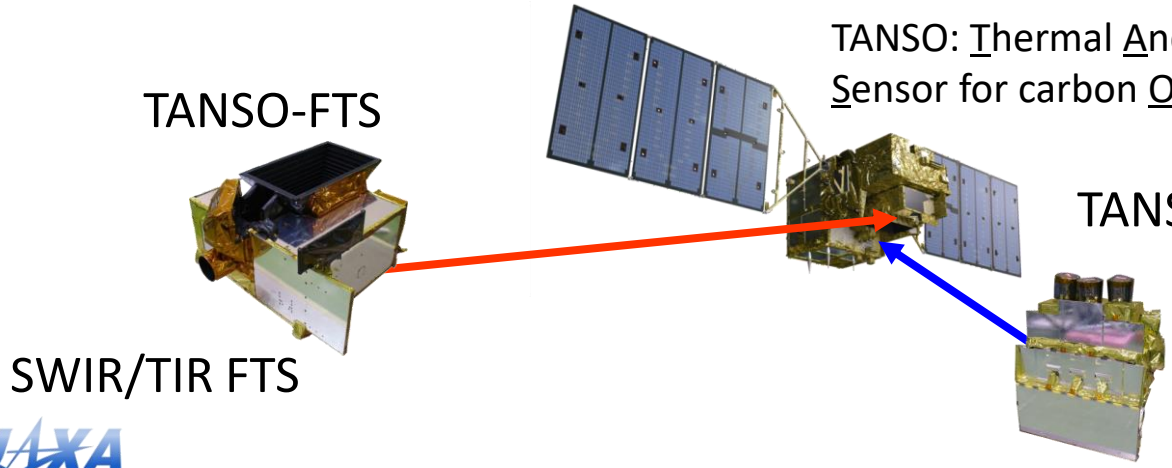
GOSAT-2 Characteristics	
Design Life	5 years
Orbit	Sun-Synchronous (628km, 13:00 (Dsc.))
Launch	Oct. 29, 2018
Observation	CO_2, CH_4 and CO

Before 2009 GOSAT Launch

1997 The Kyoto Protocol at COP 3, GHG observation by a laboratory FTS

2003 GOSAT project started

2009 The Greenhouse Gases Observation Satellite "IBUKI" (GOSAT) is the world's first spacecraft to measure the concentrations of carbon dioxide and methane, the two major greenhouse gases, from space.

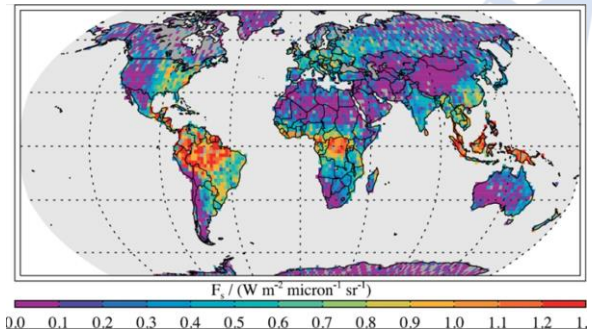


The first 5 years in space (2009 – 2014)

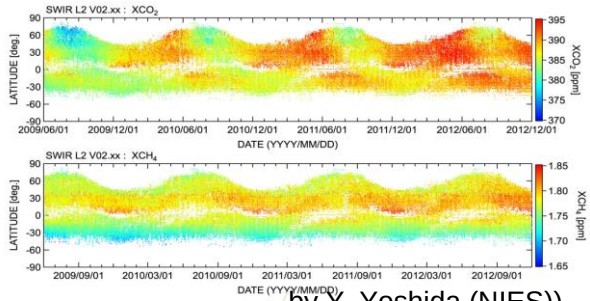
2011 The accuracy of 2 ppm or 0.5% for CO_2 and 13 ppb or 0.7% for CH_4

Chlorophyll Fluorescence measurement from Space

2014 GOSAT 5-year design life
Fully redundant system

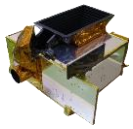


2009, June Frankenberg et al., GRL 2011



by Y. Yoshida (NIES))

One of the two solar paddles stopped its rotation. (June 2014)
The primary Command and Data Management System (CDMS) failed and switched to the secondary (May 2018)



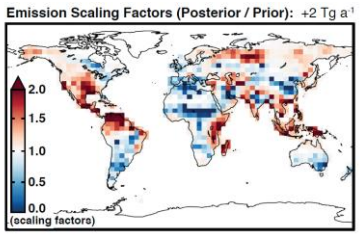
(1) Metrology alignment changed
> ZPD (Zero Path Difference) -position Biased interferogram (2014)

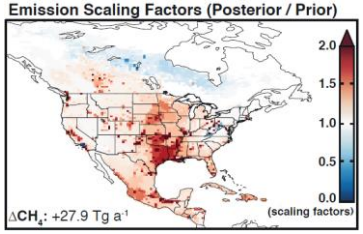
(2) Pointing mechanism switched (2015)

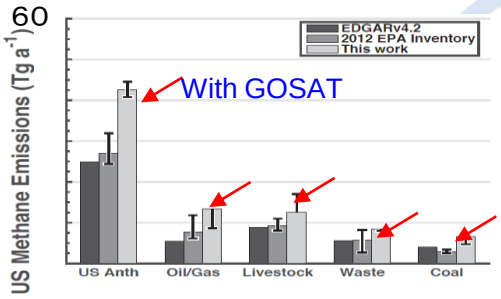
Healthy

The next 5 years in space (2014 - until now)

2015

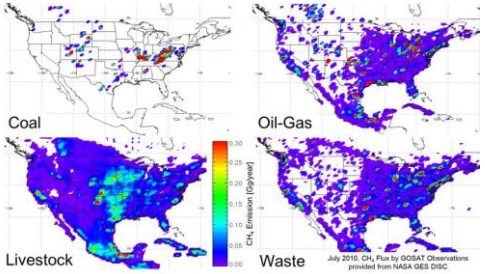






US CH_4 Emission (inventory vs. GOSAT) EDGARv4.2 (Model), the 2012 EPA inventory (EPA, 2014) and GOSAT (Turner et al., 2015, ACP)

2016

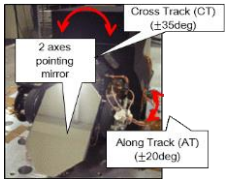


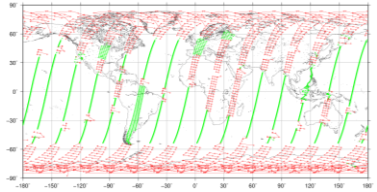
https://mirador.gsfc.nasa.gov/

The Carbon Monitoring System (CMS) CH_4 Flux for North America data set contains estimates in North America based on an inversion of the GEOS-Chem chemical transport model constrained by GOSAT.

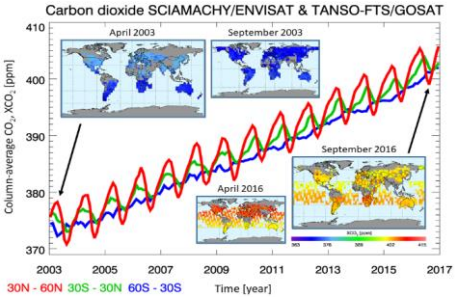
July 2010

2017





Targeting CH_4 large emission source and mega cities with an agile pointing system by uploading the pointing-angle table every day.

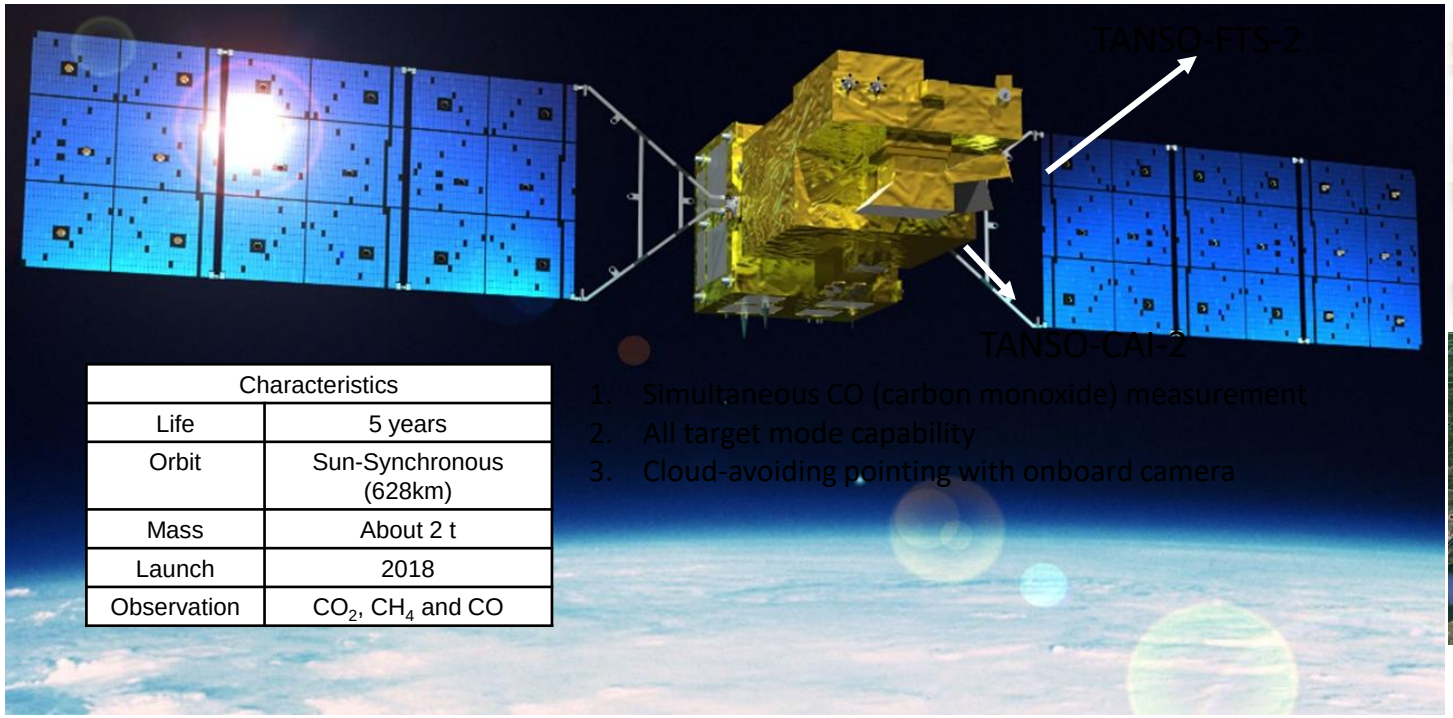


An ensemble of SCIAMACHY/ENVISAT (until April 2012) and TANSO-FTS/GOSAT (since mid 2009)(Buchwitz et al.)

2018

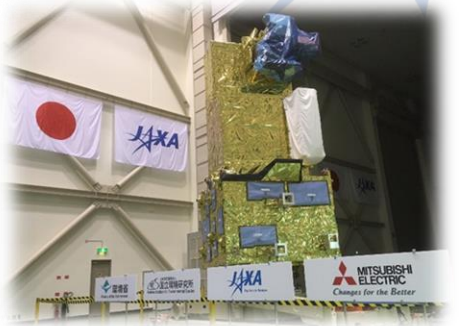
GOSAT-2 was launched on Oct. 29, 2018

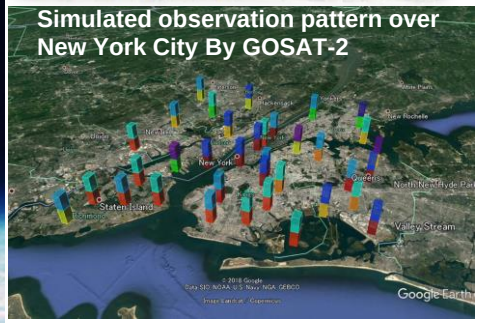
With TANSO-FTS-2 and CAI-2



Characteristics	
Life	5 years
Orbit	Sun-Synchronous (628km)
Mass	About 2 t
Launch	2018
Observation	CO_2, CH_4 and CO

1. Simultaneous CO (carbon monoxide) measurement
2. All target mode capability
3. Cloud-avoiding pointing with onboard camera





Optimizing observation pattern with full target mode capability and wider pointing angles

TANSO-FTS-2

	Band 1	Band 2	Band 3	Band 4	Band 5
Target Gases	O_2	CO_2, H_20	CO_2, CH_4, CO, H_20		
Spectral Coverage (μm)	0.75-0.77	1.56-1.69	1.92-2.33	5.5-8.4	8.4-14.3
Spectral Coverage (cm-1)	12,950 - 13,250	5,900 - 6,400	4,200 - 5,200	1,188 - 1,800	700 - 1,188
Spectral Resolution	0.2 cm^{-1}				
Exposure	4 sec				
IFOV	9.7 km				
Pointing	±40 deg. (Along track), ±35 deg. (Cross track)				
Polarimetry	Yes (P and S channels)			No	

TANSO-CAI-2 (radiometer)

	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10
Spectral Band (nm)	333 - 353	433 - 453	664 - 684	859 - 879	1585 - 1675	370 - 390	540 - 560	664 - 684	859 - 879	1585 - 1675
Tilt	+20 deg. (Forward viewing)					-20 deg. (Backward viewing)				
Spatial Resolution	460 m				920m	460 m				920m
Swath	920 km									

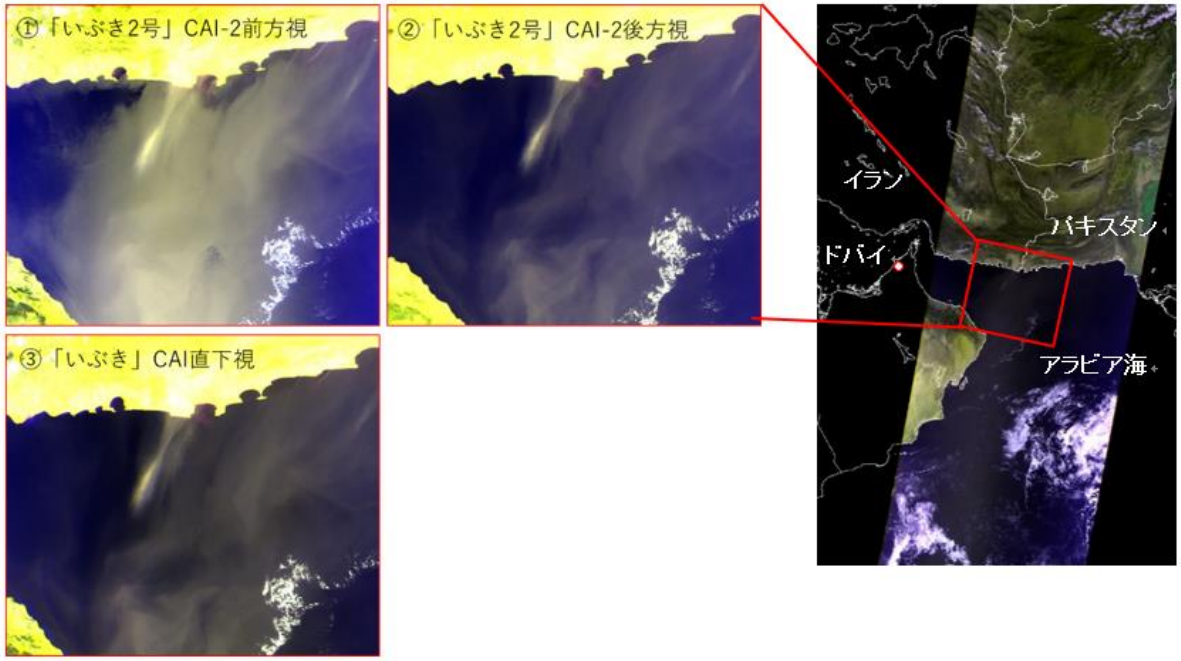
GOSAT-2 Launch & First Light by CAI-2

October 29, GOSAT-2 Launch

- Full targezt observation capability with wider pointing angles
- Identify CO_2 enhancement by combustion with simultaneous measured CO.

CAI-2 first light
(Nov. 5)
Off shore
Pakistan and Iran

(1)CAI-2-forward
(2)CAI-2-backward
(3)CAI Nadir



Global Change Observation Mission – Climate (GCOM-C)

Newly Launched

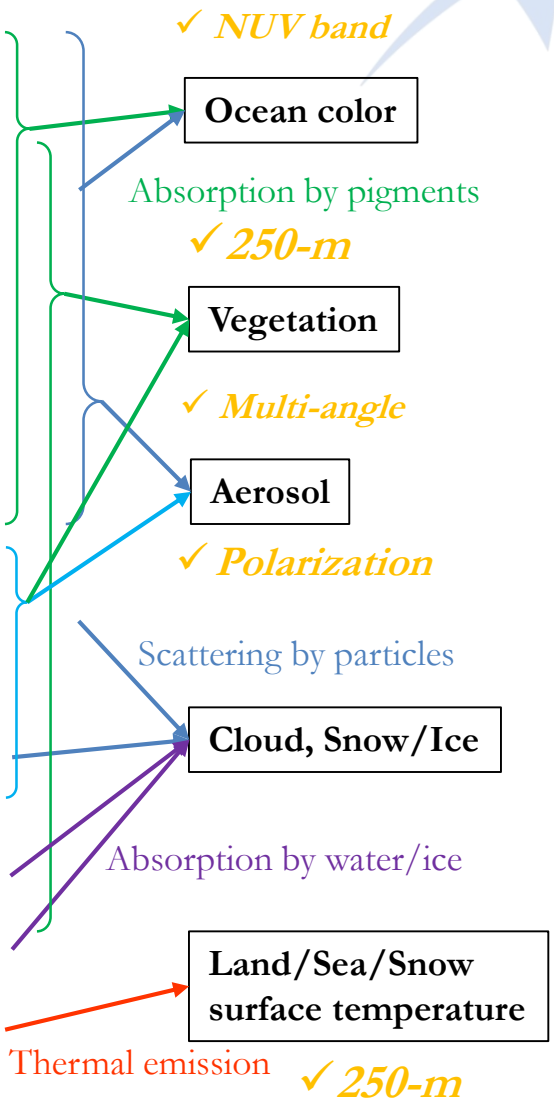
GCOM-C SGLI characteristics	
Orbit	Sun-synchronous (descending local time: 10:30), Altitude: 798km, Inclination: 98.6deg
Launch Date	**Dec. 23, 2017**
Mission Life	5 years
Scan	Push-broom electric scan (VNR: VN & P) Wisk-broom mechanical scan (IRS: SW & T)
Scan width	**1150km** cross track (VNR: VN & P) **1400km** cross track (IRS: SW & T)
Spatial resolution	**250m, 500m, 1km**
Polarization	**3 polarization angles for POL**
Along track tilt	Nadir for VN, SW and TIR, & +/-45 deg for P

- Multi-band Imaging Radiometer (Near UV ~ TIR)
- Polarimeter
- Tilt Observation
- 250m Global at minimum

- Data release is scheduled in mid-December 2018
- Sample products are available from the G-Portal https://gportal.jaxa.jp/gpr/

GCOM-C/SGLI: observation channels

Sub-system	channel	Center wavelength	width	Standard radiance	Saturation radiance	SNR	Pixel size
		nm		W/m²/sr/μm or Kelvin		TI: NEΔT	m
VNR	VN01	379.9	10.6	60	240-241	624-675	**250**/1000
	VN02	412.3	10.3	75	305-318	786-826	**250**/1000
	VN03	443.3	10.1	64	457-467	487-531	**250**/1000
	VN04	490.0	10.3	53	147-150	858-870	**250**/1000
	VN05	529.7	19.1	41	361-364	457-522	**250**/1000
	VN06	566.1	19.8	33	95-96	1027-1064	**250**/1000
	VN07	672.3	22.0	23	69-70	988-1088	**250**/1000
	VN08	672.4	21.9	25	213-217	537-564	**250**/1000
	VN09	763.1	11.4	40	351-359	1592-1746	250/**1000**
	VN10	867.1	20.9	8	37-38	470-510	**250**/1000
	VN11	867.4	20.8	30	305-306	471-511	**250**/1000
	PL01 +60	672 .2	20.6	25	295	609	**1000**
	PL01 +0				315	707	
	PL01 −60				293	614	
	PL02 +60	866.3	20.3	30	396	646	**1000**
	PL02 +0				424	763	
	PL02 −60				400	752	
IRS	SW01	1050	21.1	57	289.2	951.8	**1000**
	SW02	1390	20.1	8	118.9	347.3	**1000**
	SW03	1630	195.0	3	50.6	100.5	**250**/1000
	SW04	2210	50.4	1.9	21.7	378.7	**1000**
	TI01	10785	756	300K	340K	0.08K	**250**/500/1000
	TI02	11975	759	300K	340K	0.13K	**250**/500/1000



Cited from Okamura et al., 2018. SNR is defined at the standard radiance and IFOV shown by bold characters

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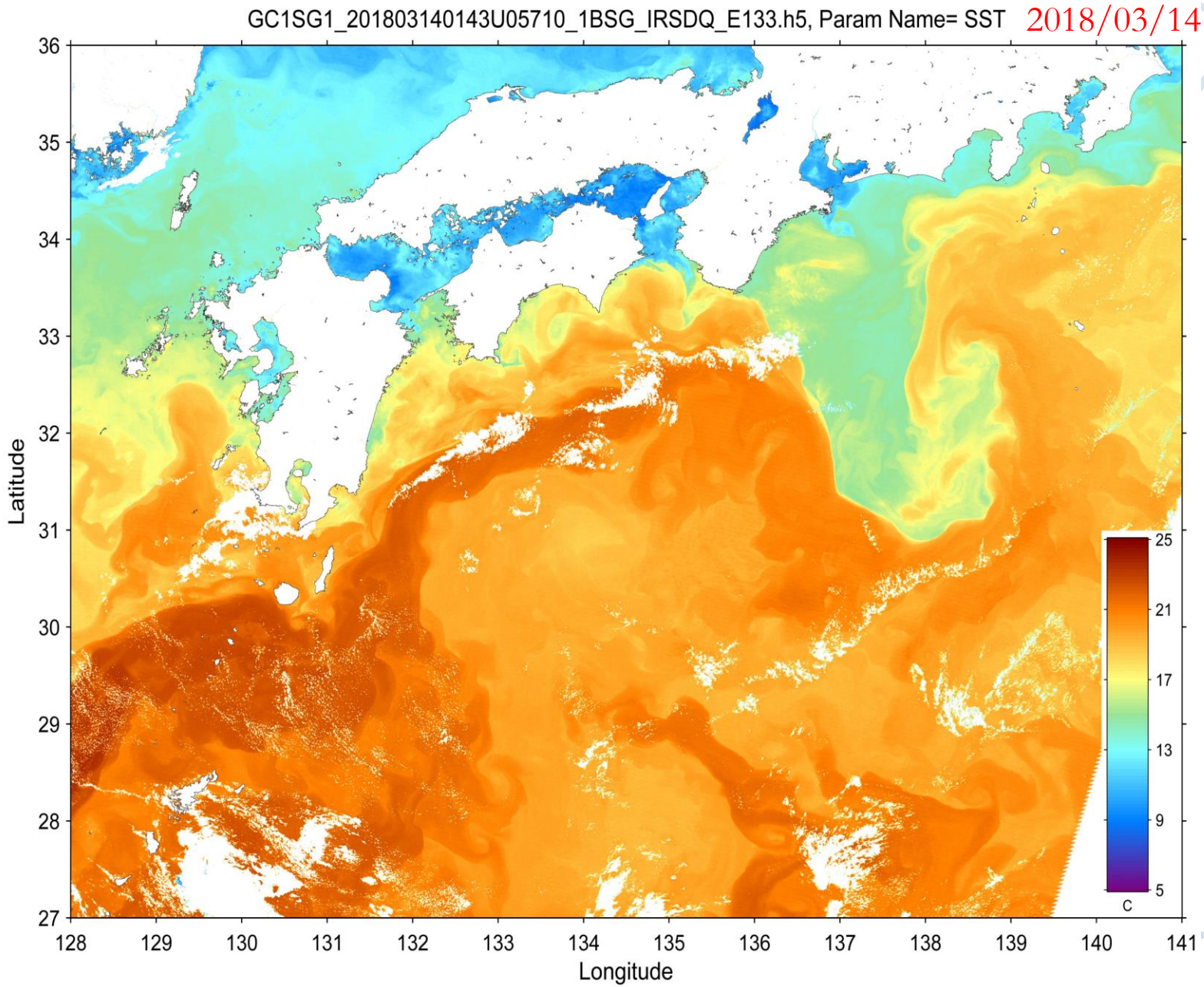
GCOM-C 250-m Sea Surface Temperature



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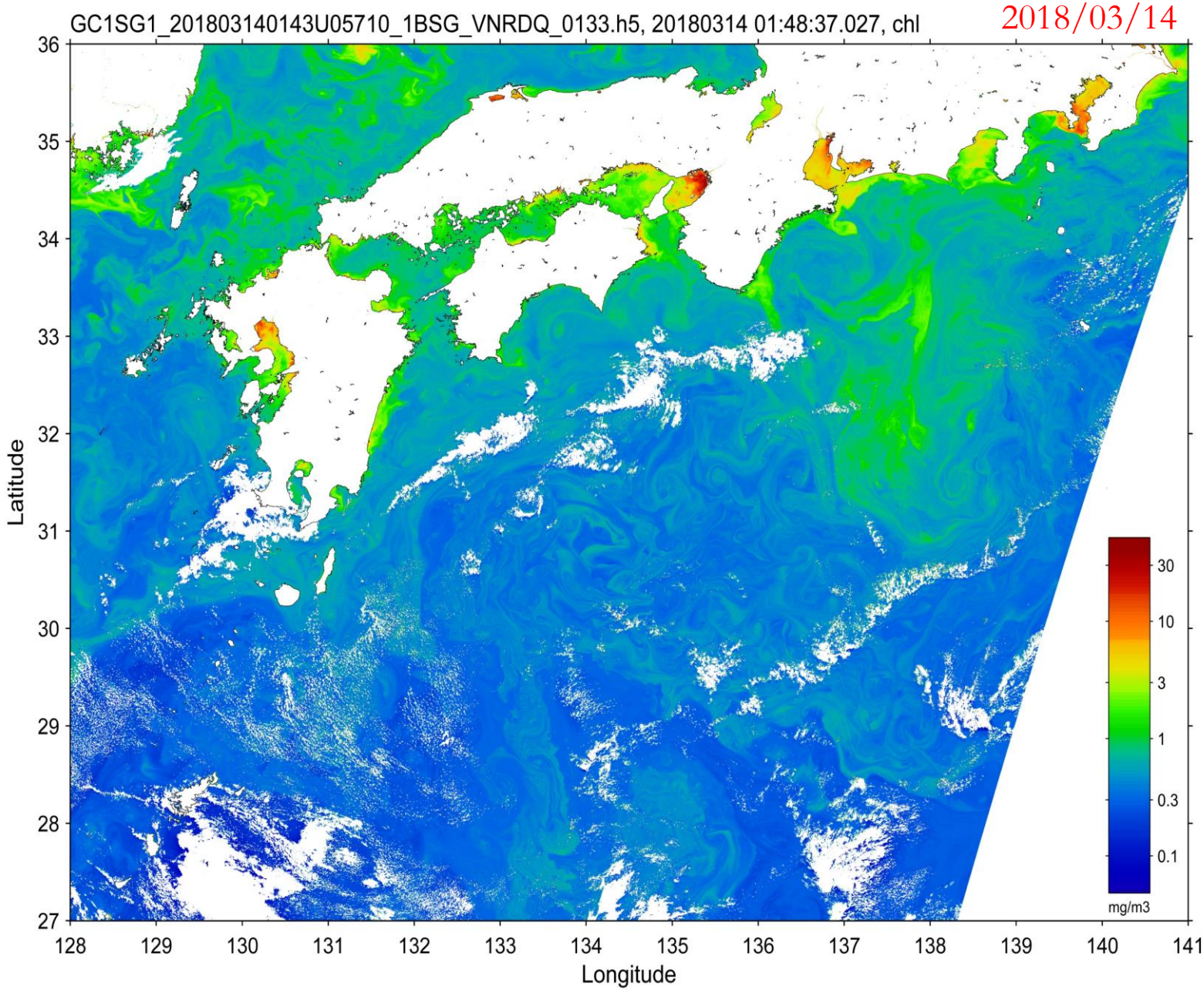
GCOM-C 250-m Chlorophyll-a Concentration



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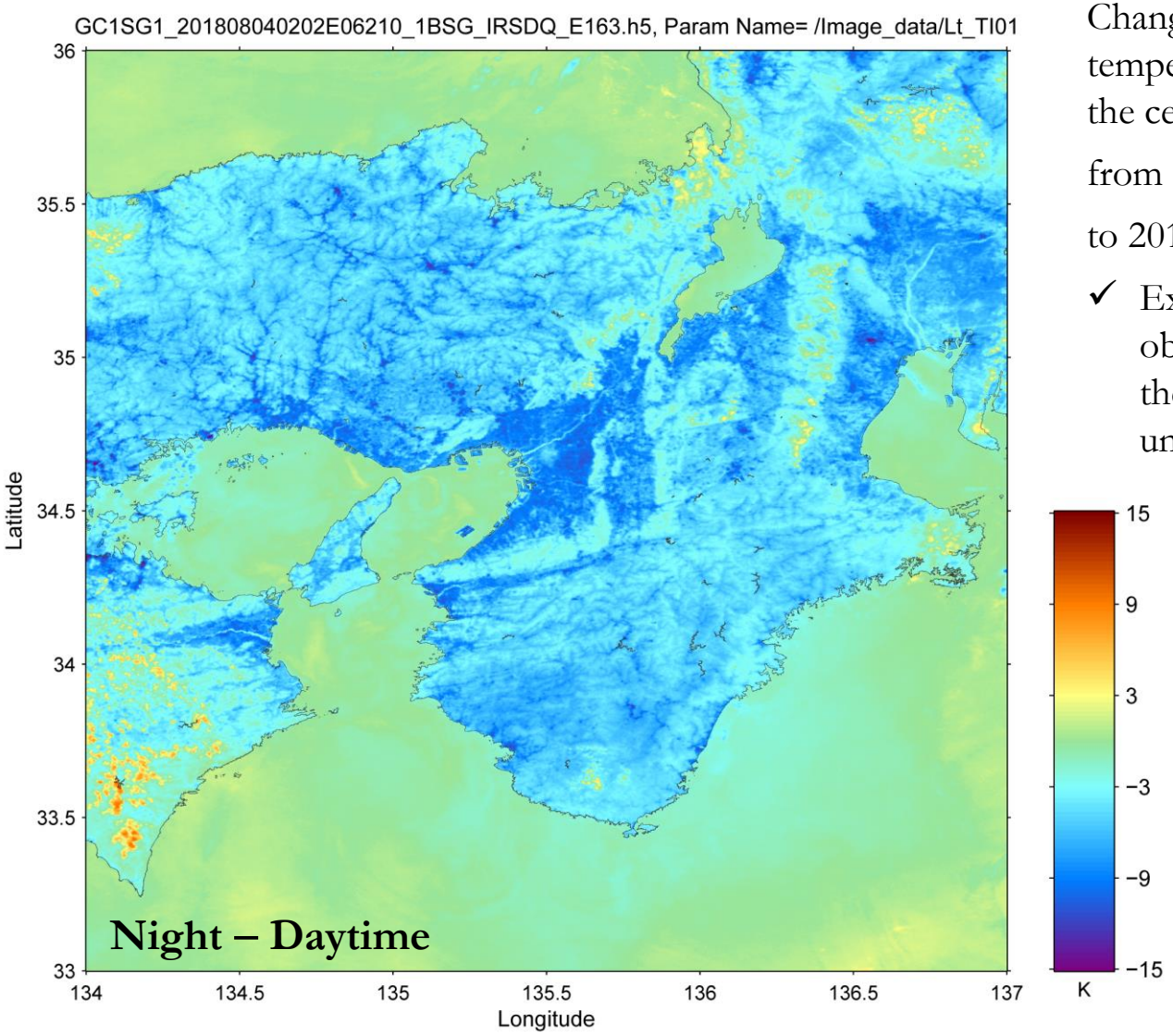
GCOM-C Land Surface Temperature



Change of 11-μm brightness temperature around the Kinki area (in the center of Japan)

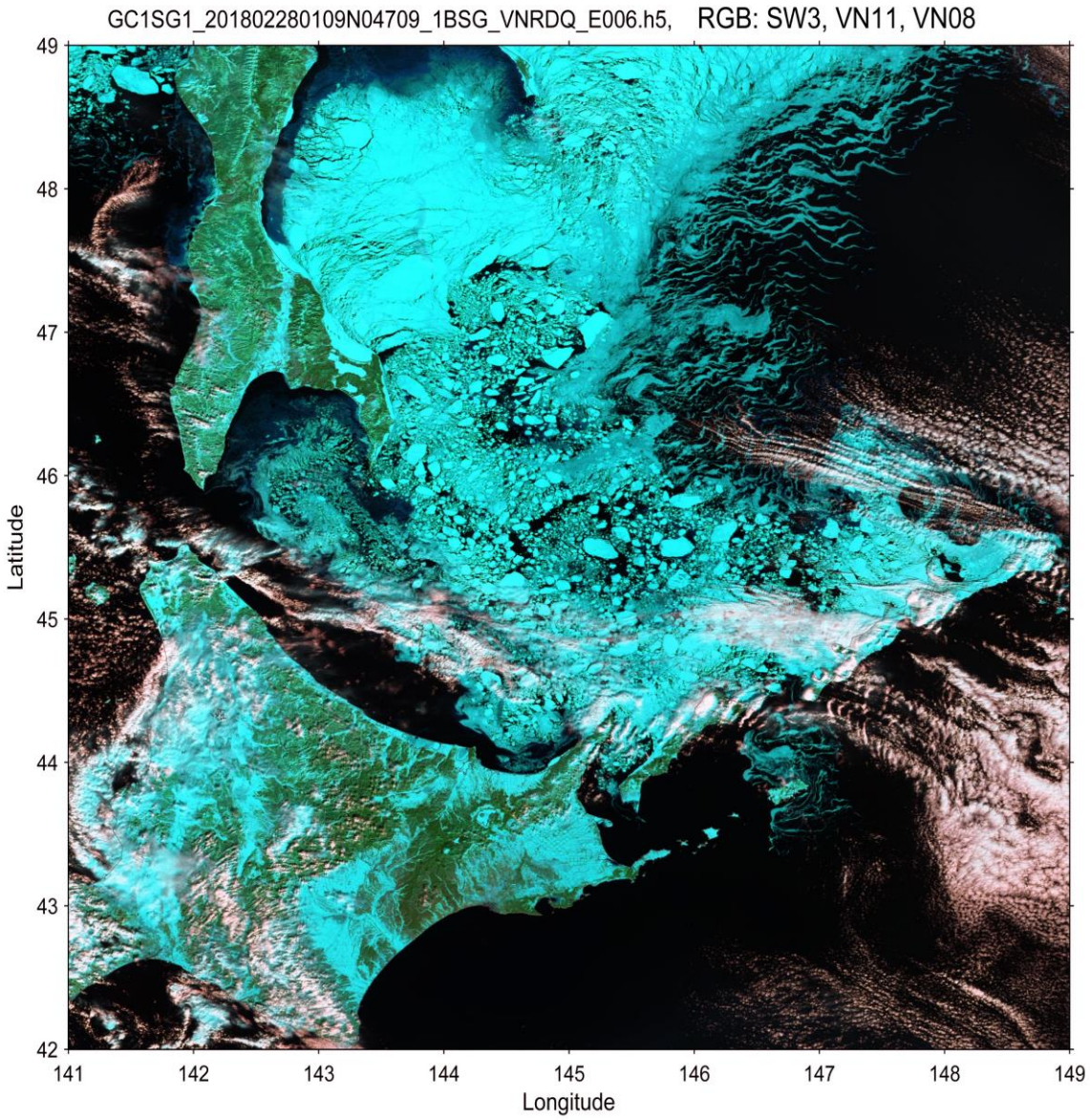
from 2018/8/4 02:02 UT (daytime)

to 2018/8/4 13:19 UT (nighttime)

- ✓ Extreme daytime heating is observed around city areas such as the Osaka Plain and Kyoto basin under a hot summer in 2018.

- ✓ SGLI 250-m thermal-infrared observation can be used for investigation of the daily temperature change

GCOM-C Sea-ice Distribution

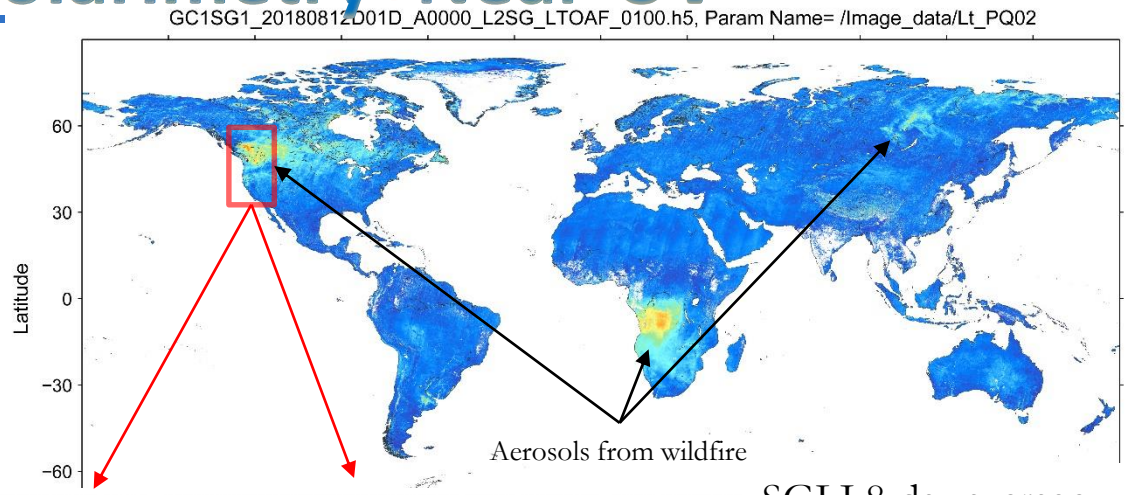


RGB image by 1.6 μm, 866 nm, and 672 nm channels around Hokkaido and the south of the Okhotsk Sea captured by GCOM-C on Feb. 28, 2018. Light blue areas show snow or sea ice.

- ✓ Detail structures of snow and sea-ice areas can be monitored by the 250 m resolution of a shortwave infrared channel SW03 (1.6 μm), in addition to the VNR channels

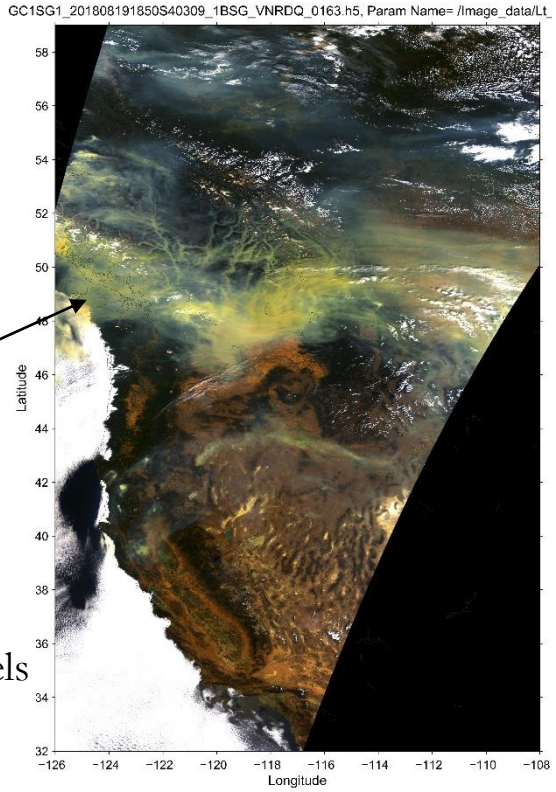
GCOM-C Polarimetry+Near-UV

- ✓ SGLI polarimetry + near-UV will be able to improve the aerosol monitoring

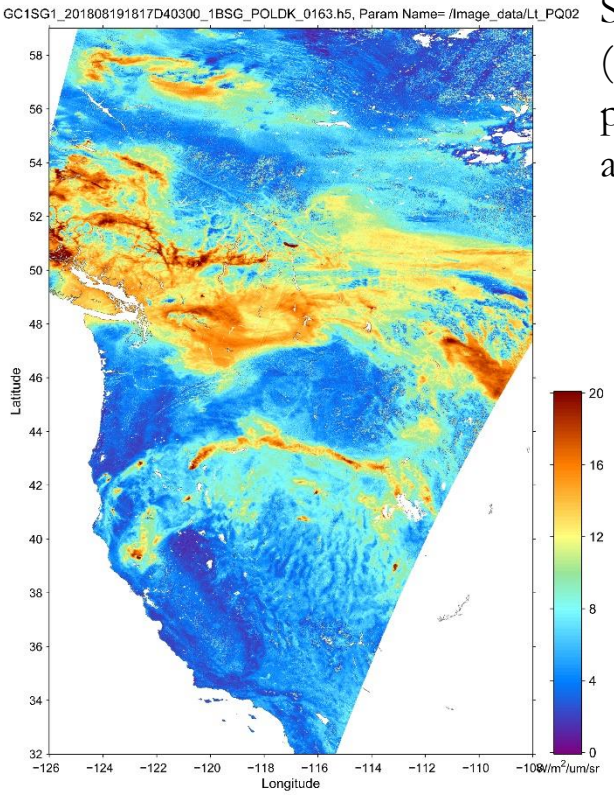


SGLI 8-day average (12-19 Aug 2018) polarization radiance at 865nm

Strong absorption of aerosol in the near-UV wavelength



SGLI RGB image of 670nm, 530nm, and 380nm channels (2018/08/19)



SGLI polarization radiance at 865nm (2018/08/19)

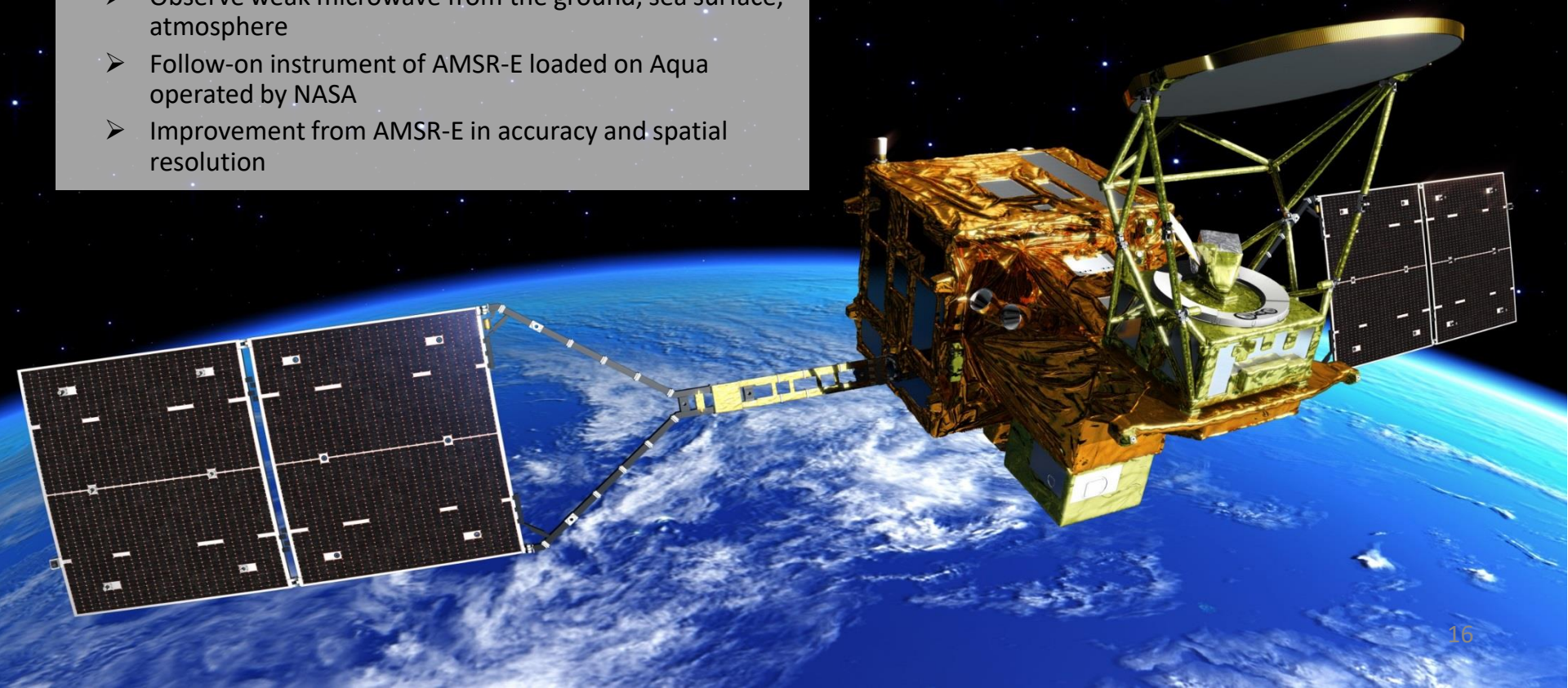
Global Change Observation Mission – Water (GCOM-W “SHIZUKU”)

■GCOM-W “*SHIZUKU*”: Medium size satellite

- Weight: Approx. 2 tons
- Size: 5.1m（L）×17.5m（W）×3.4m（H)
- Power generation: Approx. 4000W

■Mission instrument: AMSR2

- Advanced Microwave Scanning Radiometer 2 (AMSR2)
- Observe weak microwave from the ground, sea surface, atmosphere
- Follow-on instrument of AMSR-E loaded on Aqua operated by NASA
- Improvement from AMSR-E in accuracy and spatial resolution



AMSR2 Standard/Research Products

Standard Products

https://gportal.jaxa.jp/gpr/

	Product	Resolution	Accuracy
	Brightness Temperature	5-50 km	< 1.4 K
GEO	Total Precipitable Water	15 km	GPS:1.5 kg/m^2
GEO	Cloud Liquid Water	15 km	0.04 kg/m^2
GEO	Precipitation	15 km	Ocean 48% Land 86%
GEO	Sea Surface Temperature	50 km	0.5 ºC Zonal RMSE 0.2 ºC
GEO	Sea Surface Wind Speed	15 km	1.0 m/s
GEO	Sea Ice Concentration	15 km	9 %
GEO	Snow Depth	30 km	18 cm
GEO	Soil Moisture Content	50 km	4 %

Research Products

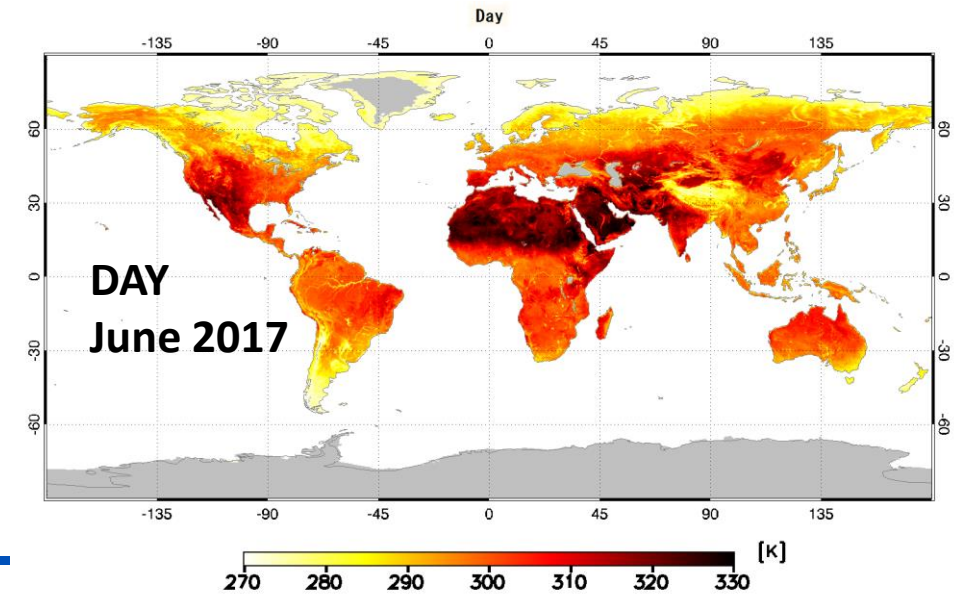
http://suzaku.eorc.jaxa.jp/GCOM_W/research/resdist.html

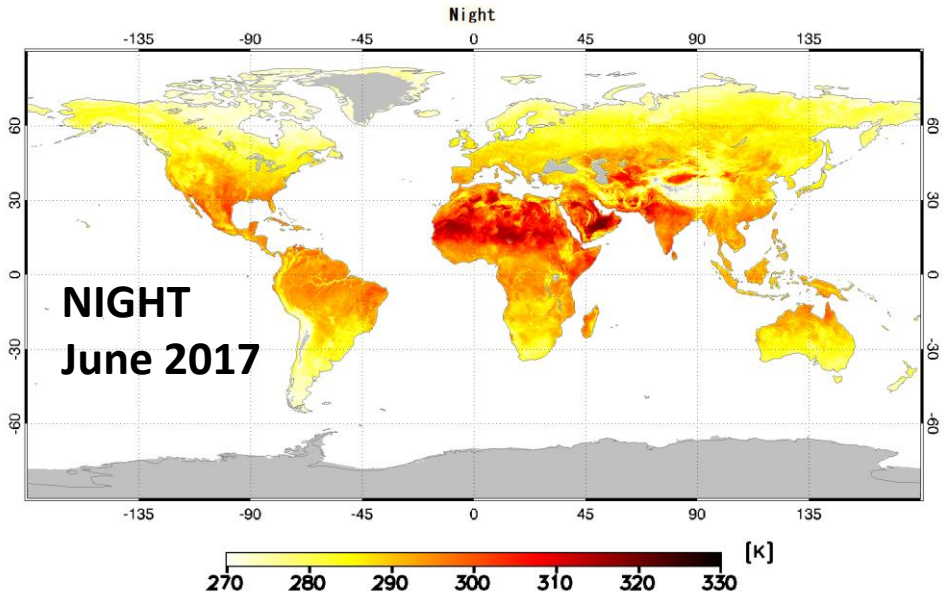
Products	Resolution	Accuracy
All-weather sea surface wind speed	60 km	4 m/s
High-resolution (10-GHz) SST	30 km	0.6 ºC
Soil moisture and vegetation water content based on the land data assimilation	25 km	Under development
Land surface temperature	15 km	3 ºC (forest) 4 ºC (nondense vegetation)
Vegetation water content	10 km	± 1 kg/m^2 (obs. site at Australia)
High resolution sea ice concentration	5 km	± 17 %
Thin ice detection	15 km	92.4 % (for Okhotsk sea)
Sea ice moving vector	50 km	Under evaluation
Total Precipitable Water over Land	15 km	2.59 kg/m^2 (vs. GPS)

Released to public | **To be released**

AMSR2 Land Surface Temperature

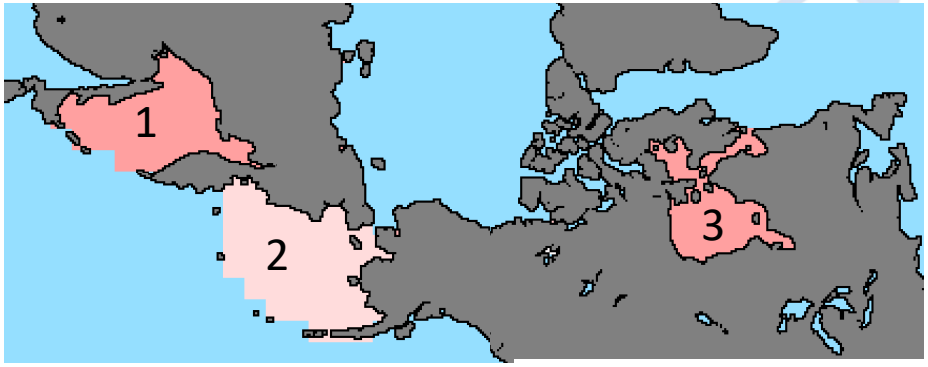
- Algorithm provided by Tom Jackson (USDA) based on Holmes et al. (2009)
- Retrieval of LST by single equation using 36 GHz V TB
  - Equation is obtained by using linear regression between AMSR2 LST and LST at ground observation sites in Europe and US
- Observing top of forest over forest area
- Capable to obtain frequent LST for both day & night
- Released in February 2018 through http://suzaku.eorc.jaxa.jp/GCOM_W/research/resdist.html
  - Detailed validation results are also available at the web site



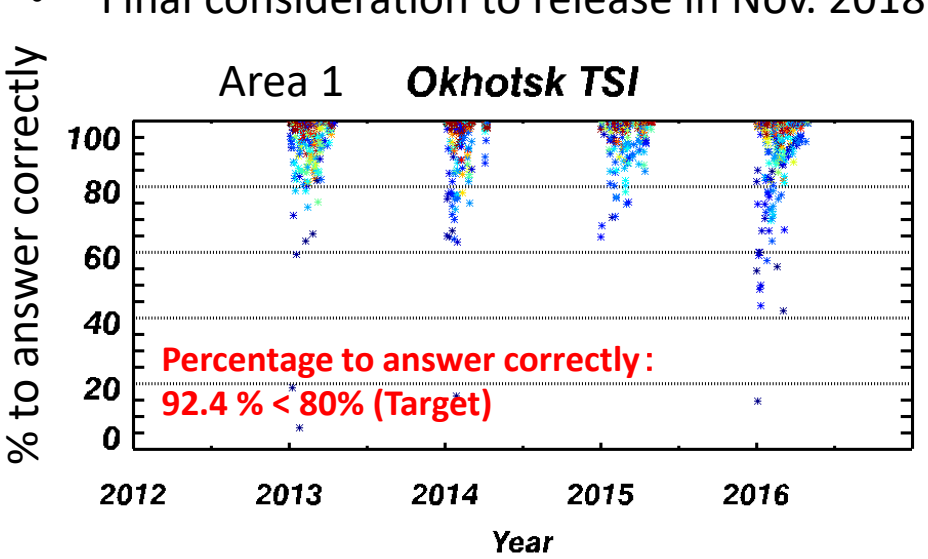


AMSR2 Thin Ice Detection

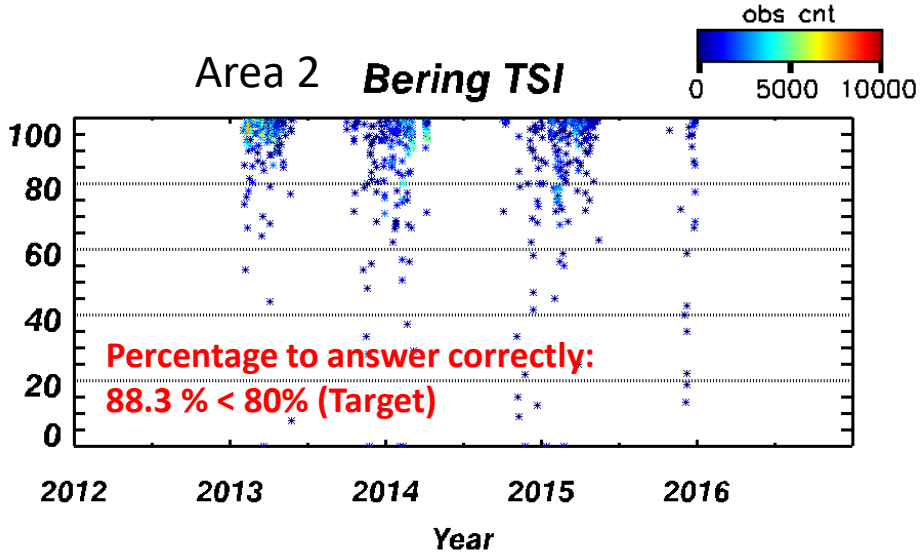
- Algorithm provided by **K. Cho (Tokai Univ.)**
- To detect thin ice area thinner than 30 cm using characteristic space by 18.7 and 36.5 GHz TBs.
- Validation with thin ice area detected by MODIS band 1 & 2 under clear sky condition.
- Accuracy of area 1-3 is 92.4, 88.3 & 97.8 % respectively.
- Final consideration to release in Nov. 2018.



Area 1: Okhotsk Sea, 2: Bering Sea, 3: Hudson Bay



747 scenes during 2013-2016 winter over Okhotsk Sea.

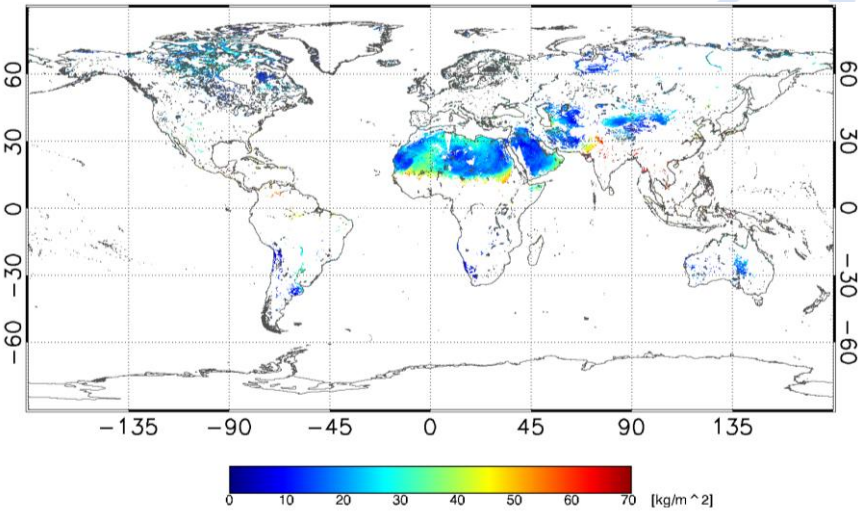


569 scenes during 2013-2016 winter over Bering Sea.

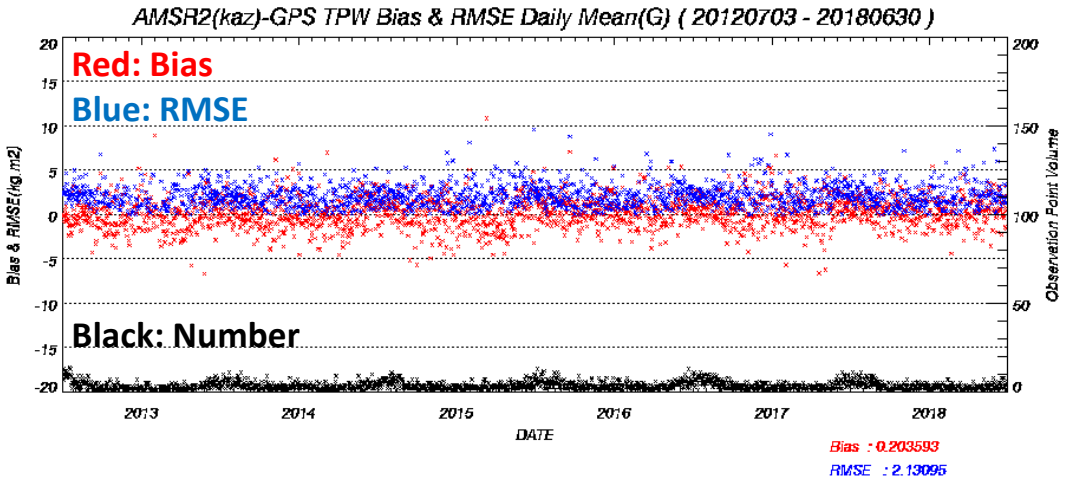
AMSR2 Total Precipitable Water over Land

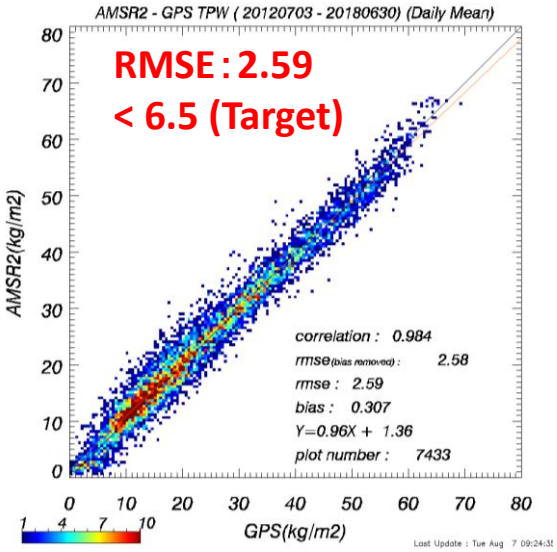
- Algorithm provided by **M. Kazumori (JMA)** based on Kazumori and Kachi (2017)
- To retrieve TPW over land (except ice and vegetation area) using polarization differences of 18 and 23 GHz respectively
- Validation versus GPS and radio sonde.
- Newly proposed as research product to complement standard TPW over ocean.

Ascending + Descending Average on Jul. 15, 2014



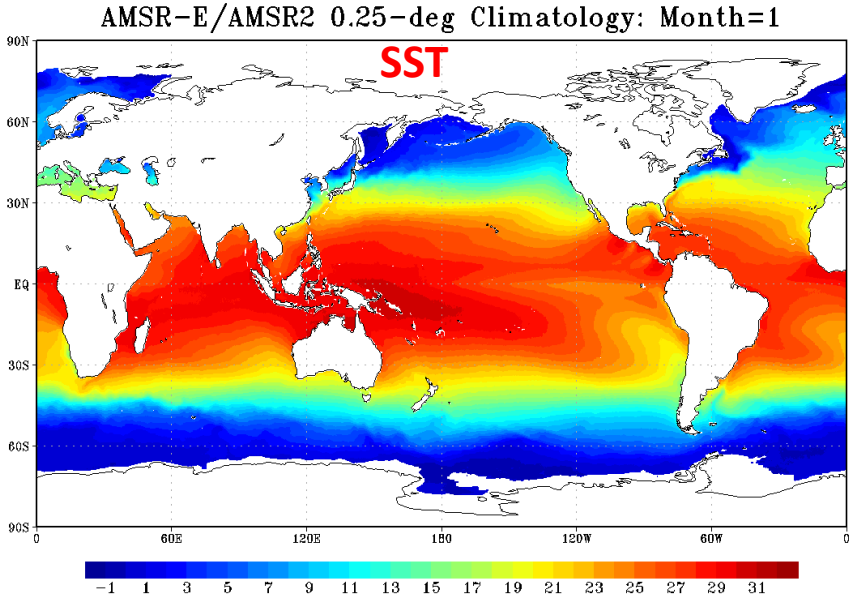
Validation vs. GPS TPW:
Global (Ascending + Descending) during 2012-2018

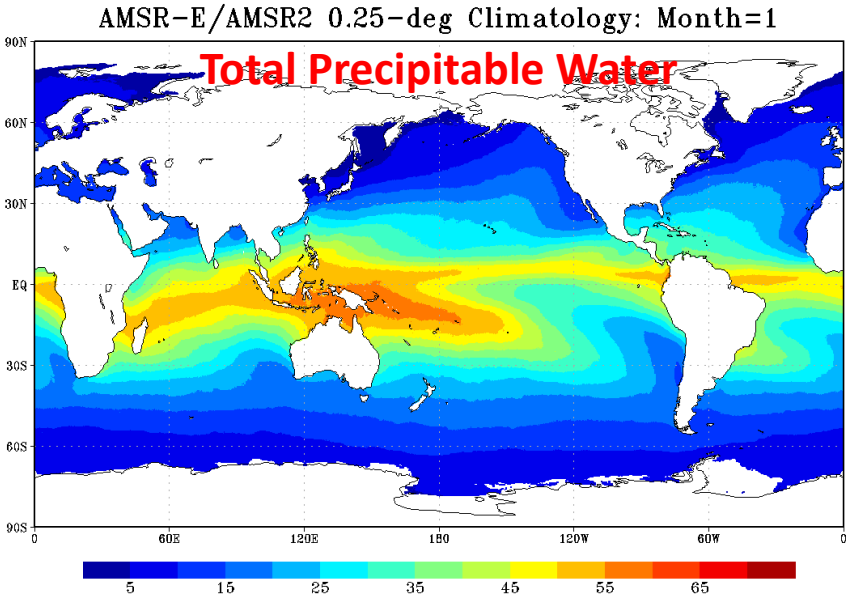




AMSR-E Reprocess Product Status

- To provide consistent dataset between AMSR2 and AMSR-E for long-term analysis, JAXA has reprocessed AMSR-E product applying the latest AMSR2 algorithms.
  - Level 1 & 3 (brightness temperature): Released from G-Portal
    - Level 1B & 1R in AMSR2 format (HDF5)
  - Level 2 & 3 (geophysical parameters): Preparation for public release
    - Applying the current (latest) AMSR2 L2 algorithms and format (HDF5)





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 G-Portal since April 2018.
  - https://www.gportal.jaxa.jp/gp/

AMSR-E L2 Ver.8: Validation Status

Product (ID)	Ver.7 (Current ver)	Ver.8 (Reprocess ver.)	Accuracy definition of AMSR2 (Standard/Target)
Total Precipitable Water (TPW)	1.89 kg/m^2	1.65 kg/m^2	3.5 / 2.0 kg/m^2 * RMSE of instantaneous observation
Integrated Cloud Liquid Water (CLW)	0.0395 kg/m^2 (Jan./Jul. 2003年)	0.0273kg/m^2 (Whole period) 0.0261kg/m^2 (Jan./Jul. 2003)	0.05 / 0.02 kg/m^2 * Data spread (total accuracy including parameter dependency: CLW accuracy = Worst STD. + Worst Bias)
Precipitation (PRC)	Ocean : 94.87% Land : 123.54%	Ocean : 65.92% Land : 91.13%	Ocean 50 / 20 % Land 120 / 80 % * Relative error at 50km average (RMSE ratio against averaged precipitation rate)
Sea Surface Temperature (SST)	RMSE 0.62 deg.C	RMSE 0.54 deg.C	0.5deg.C@RSME / 0.2deg.C@Bias * Standard: Global monthly averaged of RMSE * Target: Monthly bias average at each 10-deg lat.
Sea Surface Wind Speed (SSW)	1.164 m/s	1.079 m/s	1.0 / 1.0 m/s * Global monthly averaged of RMSE
Sea Ice Concentration (SIC)	N.H. 6.66% S.H. 8.10%	N.H. 7.01% S.H. 8.02%	10 / 5 % * RMSE of instantaneous observation
Snow Depth (SND)	GSOD 17.0cm	GSOD 17.7cm	20 / 10 cm * MAE of instantaneous observation
Soil Moisture Content (SMC)	Mongolia 3.07%vol U.S. LR 3.87%vol	Mongolia 2.16%vol U.S. LR 4.88%vol	10 / 5 %vol * MAE of instantaneous observation

AMSR2 follow-on Mission

- AMSR2 is now flying more than six years exceeding designed life, and JAXA have received strong requests from both domestic and international communities about needs of the AMSR2 follow-on mission in recent years.
- In response to those requirements, **AMSR2 follow-on sensor has been in pre-project phase since September 1, 2018.**
  - Mission Definition Reviews (MDR): April to June 2018 - **COMPLETED**
  - Project Preparation Review (management): July 2018 - **COMPLETED**
  - System Requirement Review (SRR): December 2018 - **ONGOING**
  - System Definition Review (SDR): mid-2019
  - Project Transition Review (management): mid-2019
- The new satellite (tentatively called as GOSAT-3) will become a joint mission of GOSAT-2/TANSO-2 successor sensor (advanced spectrometer to monitor greenhouse gases) and GCOM-W/AMSR2 follow-on sensor (advanced microwave radiometer).
  - TANSO-FTS-2 and TANSO-CAI-2 will be replaced with an advanced hyperspectral sensor.
  - **Orbit definition is currently under negotiation** with TANSO-2 successor mission, but will be decided by SRR. We will keep early afternoon orbit around 13:00 or 13:30 in LT
- AMSR2 follow-on sensor specification
  - Almost equivalent sensor specification to the current AMSR2 (antenna size, channels) except **additional higher frequency channels of 166 & 183 GHz** for snowfall retrievals
  - **New products** including snowfall, TPW over land, high-resolution SST, all-weather sea surface wind speed & high-resolution sea ice concentration
  - **Near-real-time data distribution** capability will be the same as AMSR2

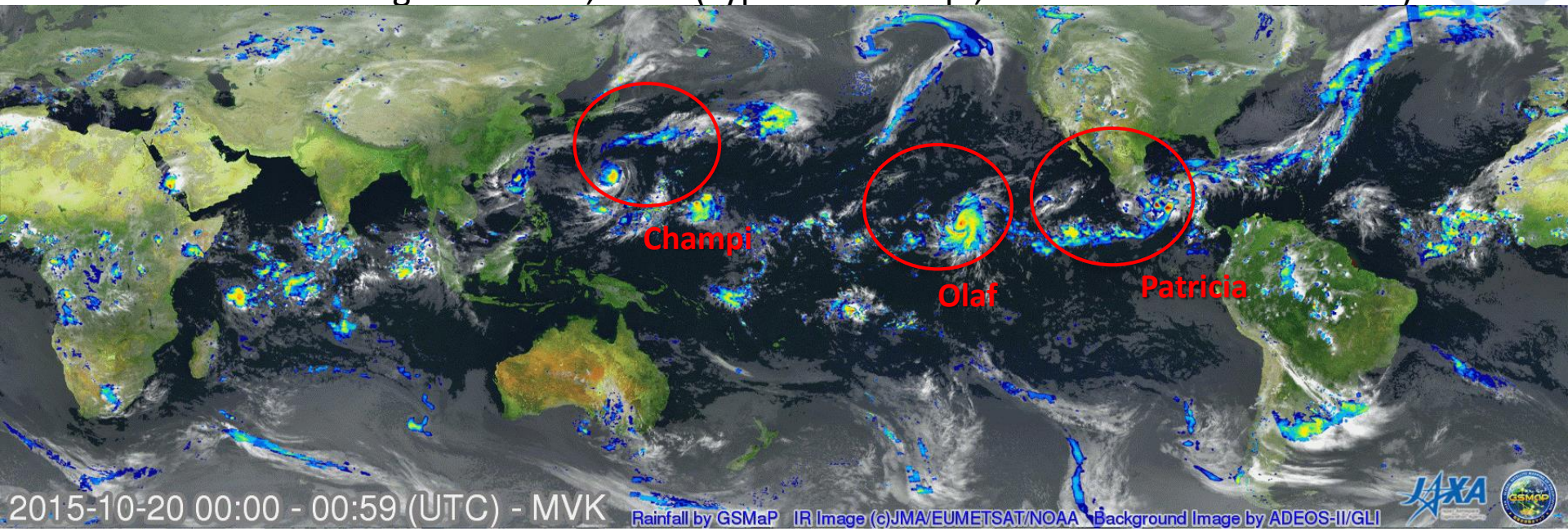
Global Precipitation Measurement Mission (GPM)

GPM is US-Japan space cooperation for monitoring global precipitation.

GPM core satellite was launched on February 28, 2014.

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 GPM mission (Core and Constellations).
  - Processing and distributing global rainfall in near real time basis (4-h latency) by merging multi-satellite data.
  - Hourly product in 0.1x0.1deg. lat/lon grid.
- GSMaP Realtime version (GSMaP_NOW) over Himawari area (0-h latency)
  - Extension to EUMETSAT/Meteosat area is in preparation.

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

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

Extension of GSMaP_NOW

- JAXA has provided the GSMaP realtime product (GSMaP_NOW) in the domain of JMA GEO-Himawari since Nov. 2015.
  - The rainfall estimates are provided just now (0-hr latency)
- The GSMaP_NOW domain was extended to the EUMETSAT GEO region (Meteosat/MSG) in 1st November 2018.

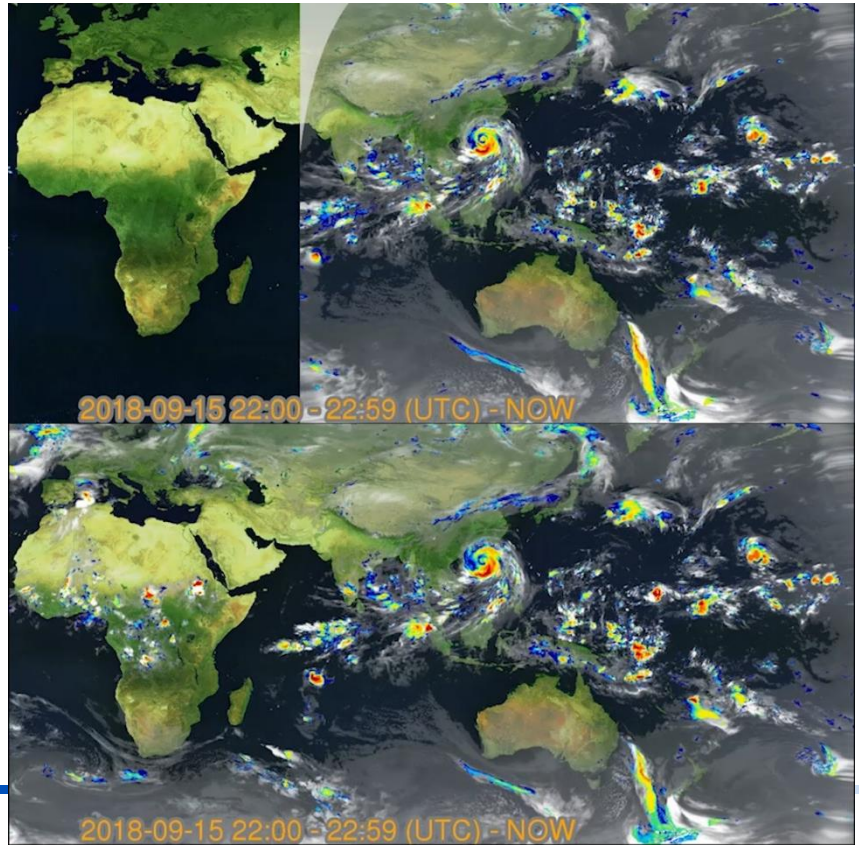
Old GSMaP_NOW

(JMA GEO-Himawari region)

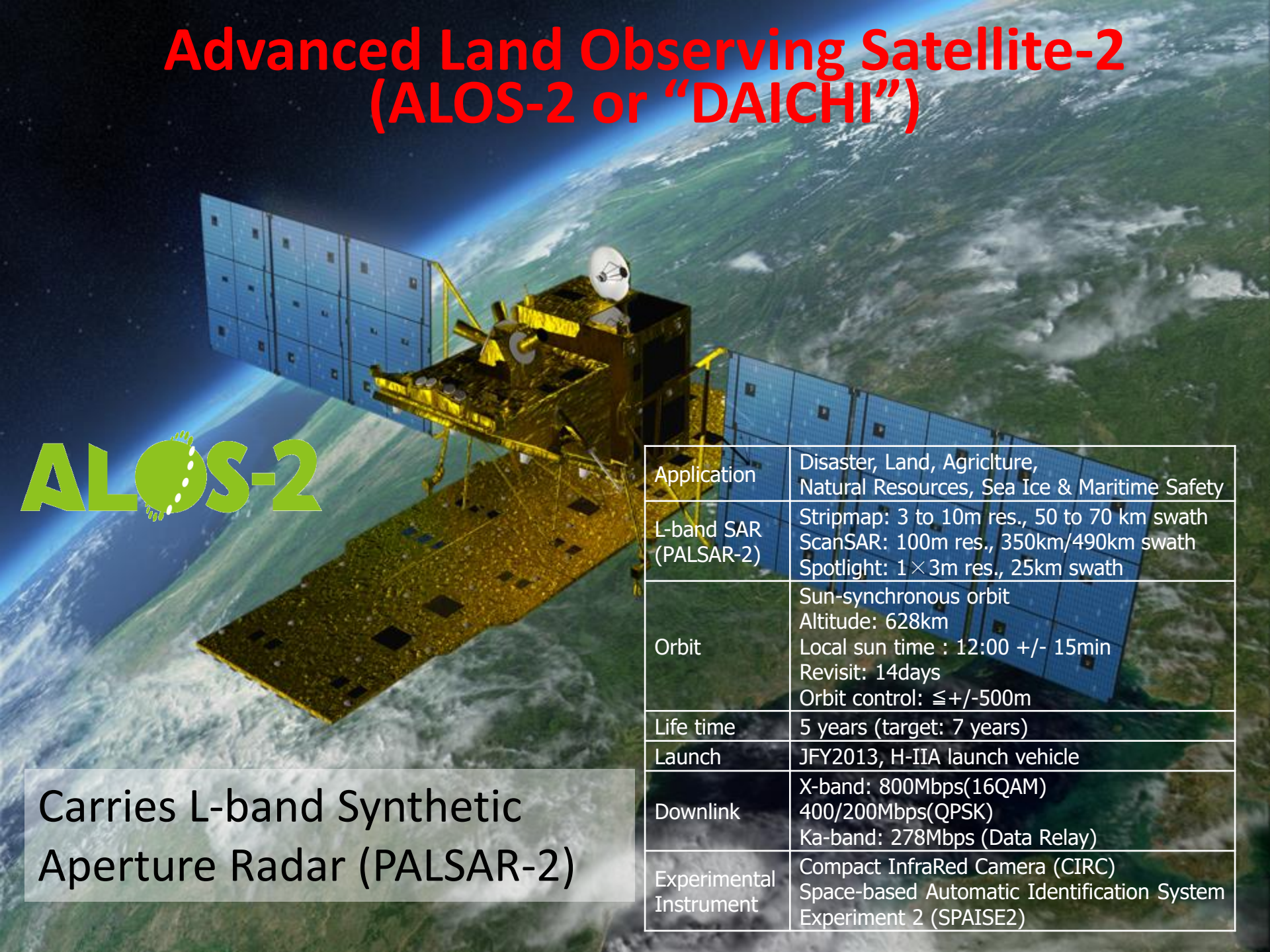
New GSMaP_NOW

(JMA GEO-Hiimawari region + EUMETSAT Meteosat/MSG)

Extension of the NOAA GOES regions is on-going.



Advanced Land Observing Satellite-2 (ALOS-2 or "DAICHI")

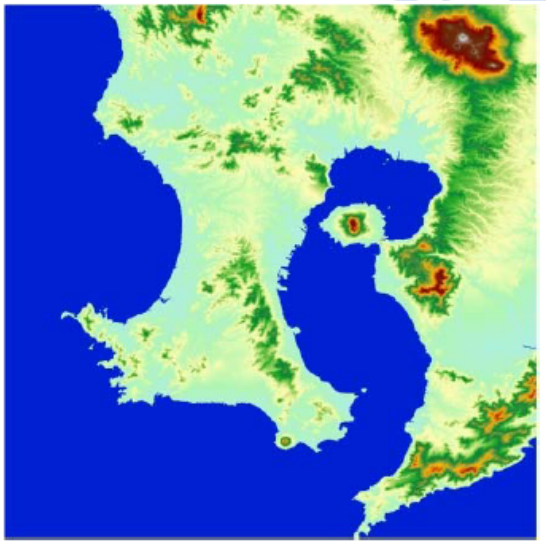


Application	Disaster, Land, Agriclture, Natural Resources, Sea Ice & Maritime Safety
L-band SAR (PALSAR-2)	Stripmap: 3 to 10m res., 50 to 70 km swath ScanSAR: 100m res., 350km/490km swath Spotlight: 1×3m res., 25km swath
Orbit	Sun-synchronous orbit Altitude: 628km Local sun time : 12:00 +/- 15min Revisit: 14days Orbit control: ≦+/-500m
Life time	5 years (target: 7 years)
Launch	JFY2013, H-IIA launch vehicle
Downlink	X-band: 800Mbps(16QAM) 400/200Mbps(QPSK) Ka-band: 278Mbps (Data Relay)
Experimental Instrument	Compact InfraRed Camera (CIRC) Space-based Automatic Identification System Experiment 2 (SPAISE2)

Carries L-band Synthetic Aperture Radar (PALSAR-2)

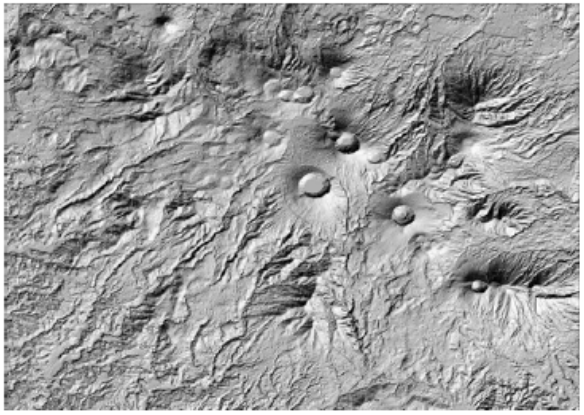
ALOS Global DSM (AW3D)

JAXA is starting to process the precise global digital 3D map using some 3 million data images acquired by the Panchromatic Remote sensing Instrument for Stereo Mapping (PRISM) onboard *"DAICHI"* (ALOS).



The digital 3D map consists of a DEM (or DSM) and ortho-rectified images (ORI) that indicate geolocation. DEM is compiled this time has a five meters in spatial resolution with five meters height accuracy (RMSE) that enables us to express land terrain all over the world. Hence its strong character will prove useful in various areas including mapping, damage prediction of a natural disaster, water resource research etc.

The global 3D map Version 1 have been completed on March 2016. JAXA commissioned the processing work and service provision to NTT DATA Corporation and Remote Sensing Technology Center of Japan (RESTEC).

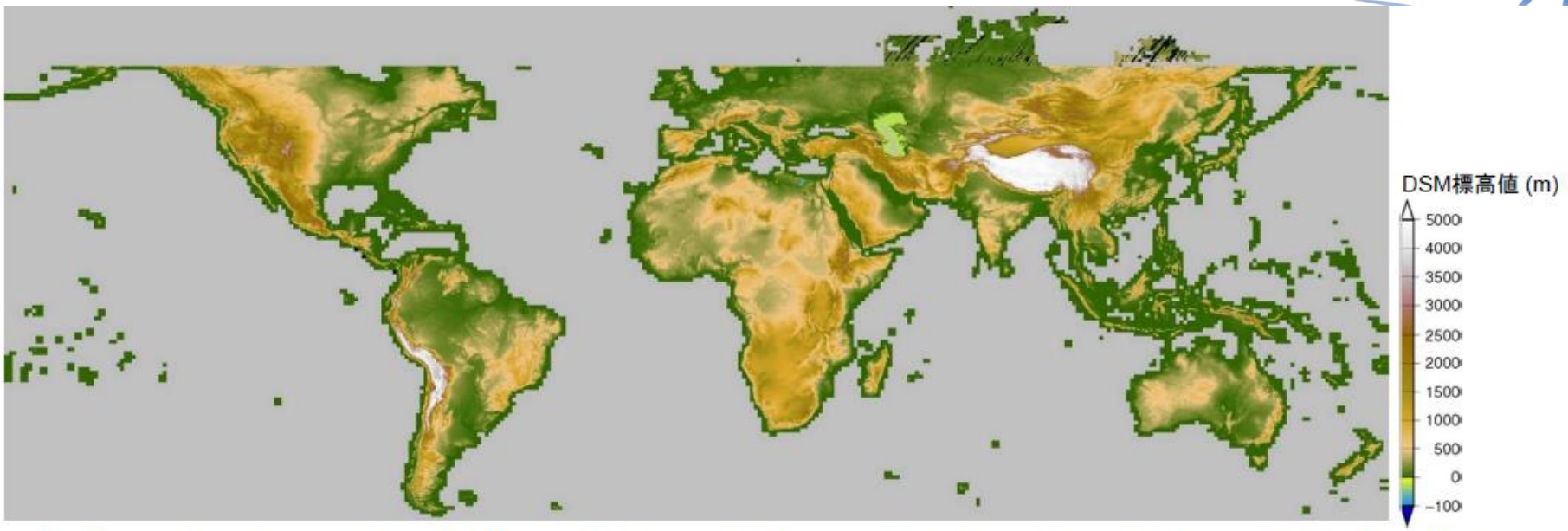


In order to popularize the utilization of the 3D map data, JAXA started to publish the 30 m-mesh global DSM (AW3D30) on April 2016, which is available free of charge for any users including commercial purposes. AW3D30 DSM was translated from original 5 m-mesh AW3D DSM dataset, therefore it still have a five meters height accuracy as expected. We expect that the 3D map will contribute to the expansion of satellite data utilizations and the industrial promotion, science and research activities as well as the Group on Earth Observations (GEO).

Related links

- JAXA AW3D: http://www.eorc.jaxa.jp/ALOS/en/aw3d/index_e.htm
- AW3D NTT DATA and RESTEC: http://aw3d.jp/en/index.html
- Sample movies of the digital 3D map: http://www.youtube.com/watch?v=pZg78PXnlQc

30-m mesh DSM Ver. 2.1 (Apr. 2018)



The browse image of AW3D30 ver. 2.1 except for over 60 deg. lat areas (as of March 2018).

- AW3D ver. 2 was used as source dataset:
  - ✓ Additional CCD alignment calibration (2,600 tiles), global bias error correction (14,900 tiles): Total 15,361 tiles
- Out of them (i.e. over 60 deg. latitude areas) are same with ver. 1.1
- Updates DSM complement policy
- Land-water mask updates using AVNIR-2 ORI
- AW3D30 ver. 2.1 was released on April 2018

Update land-water mask based on AVNIR-2 in AW3D30 ver. 2.1.

Current land-water and low correlation mask in ver. 1.1.

Freely Available

https://www.eorc.jaxa.jp/ALOS/en/aw3d30/index.htm

Upcoming Satellites

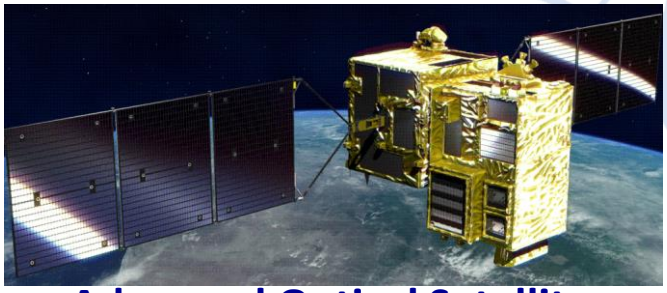
Earth Cloud, Aerosol and Radiation Explorer (EarthCARE)

JAXA provides Cloud Profiling Radar (CPR) , the world's first W-band Doppler radar (94GHz) to observe vertical structure and dynamics of clouds,.

Institutions	European Space Agency (ESA), National Institute of Information and Communications Technology (NICT), Japan Aerospace Exploration Agency (JAXA)
Launch	2018 using Soyuz or Zenit (by ESA)
Mission Duration	3-years
Mass	Approx. 2200kg
Orbit	Sun-synchronous sub-recurrent orbit Altitude: approx. 400km Mean Local Solar Time (Descending): 14:00
Repeat Cycle	25 days
Orbit Period	5552.7 seconds
Semi Major Axis	6771.28 km
Eccentricity	0.001283
Inclination	97.050°

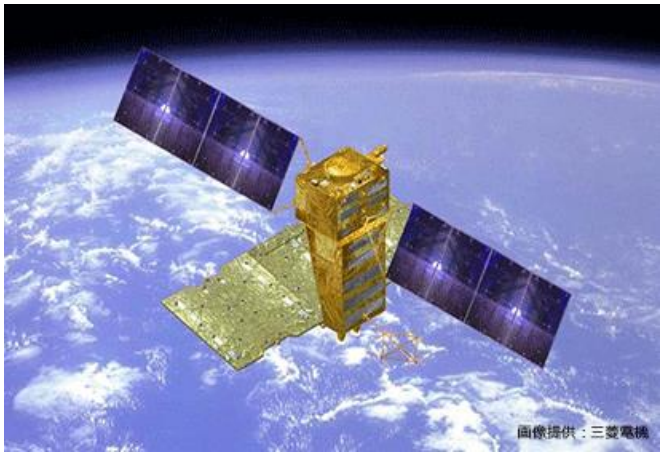
Advanced Optical and Advanced Radar

- Advanced Optical Satellite (ALOS-3)
  - Successor of ALOS/AVNIR-2 (high-resolution optical imager)
  - Horizontal resolution: 0.8m (pan-chromatic band) and 3.2m (color band)
  - Swath width: 70km
  - Scheduled to be launched in JFY 2020



Advanced Optical Satellite (ALOS-3)

- Advanced Radar Satellite (ALOS-4)
  - Successor of ALOS-2/PALSAR2 (L-band SAR)
  - Horizontal resolution: 1x3m (spot-light mode), 3m (high-resolution mode), and 25m (wide swath mode)
  - Swath width: 35kmx35km (spot-light mode), 200km (high-resolution mode) and 700km (wide swath mode)
  - Scheduled to be launched in JFY 2020



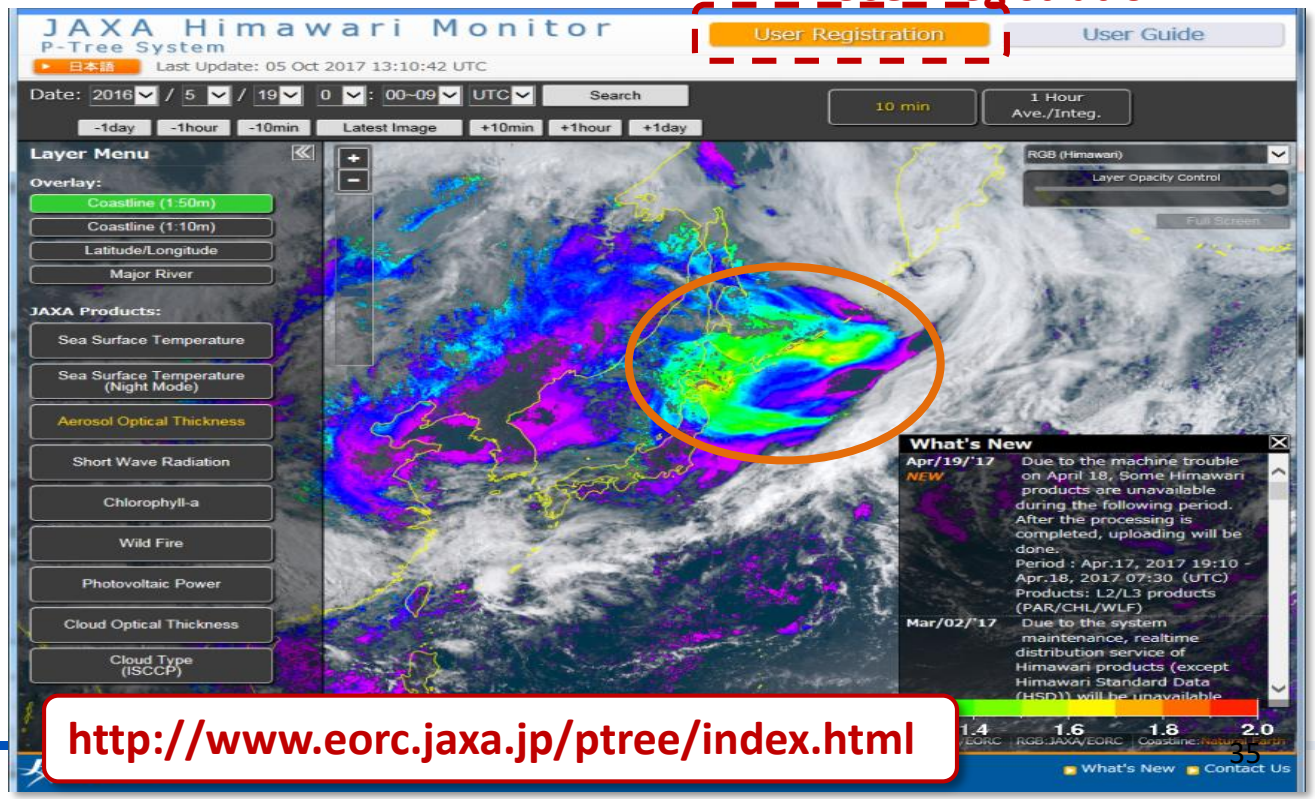
Advanced Radar Satellite (ALOS-4)

Synergies with Himawari

JAXA Himawari Monitor

- JAXA has been developing Himawari-8 products using the retrieval algorithms which will be consistent with the upcoming Japanese earth observation missions (GCOM-C, GOSAT-2 and EarthCARE), in order to seek synergies between the satellites
- JAXA Himawari Monitor website site was opened in August 2015 to distribute Himawari original (Level 1) and geophysical (Level 2) products

- Over 1800 registrations from domestic and international users until today



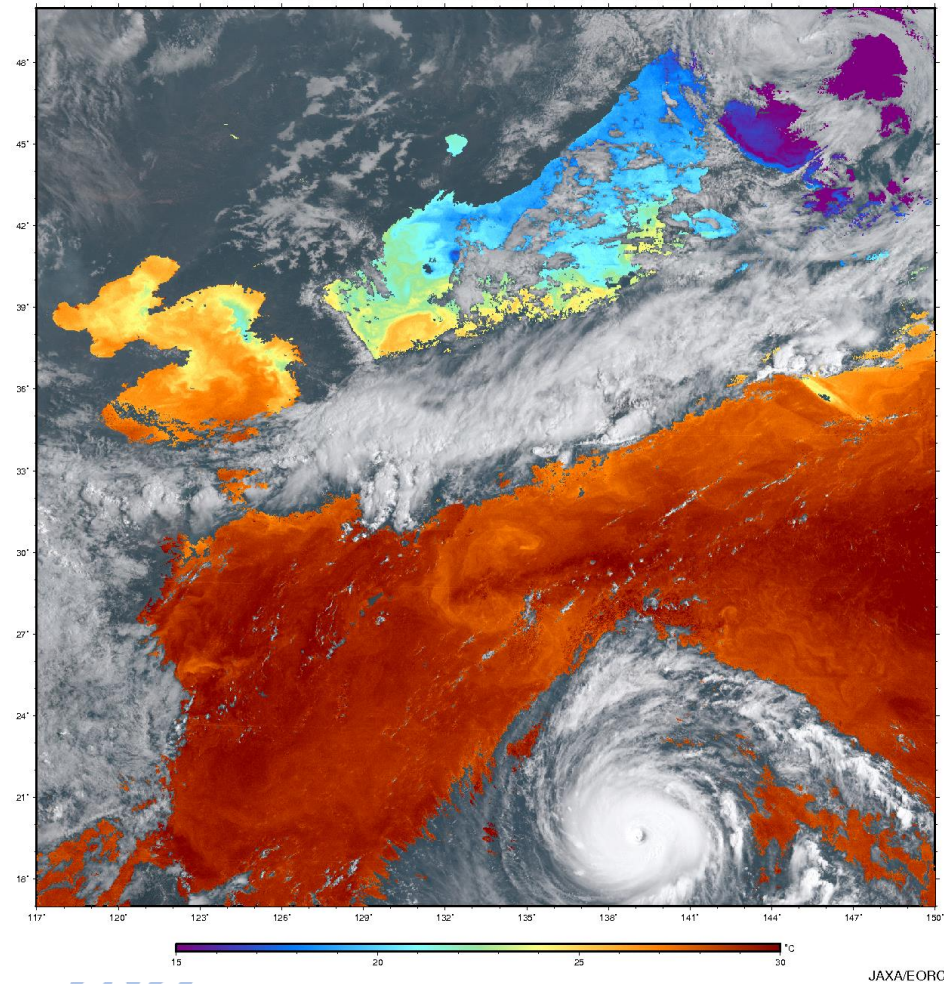
Aerosol Optical Thickness (1530UTC 13 Jan 2017)

JAXA Himawari Products

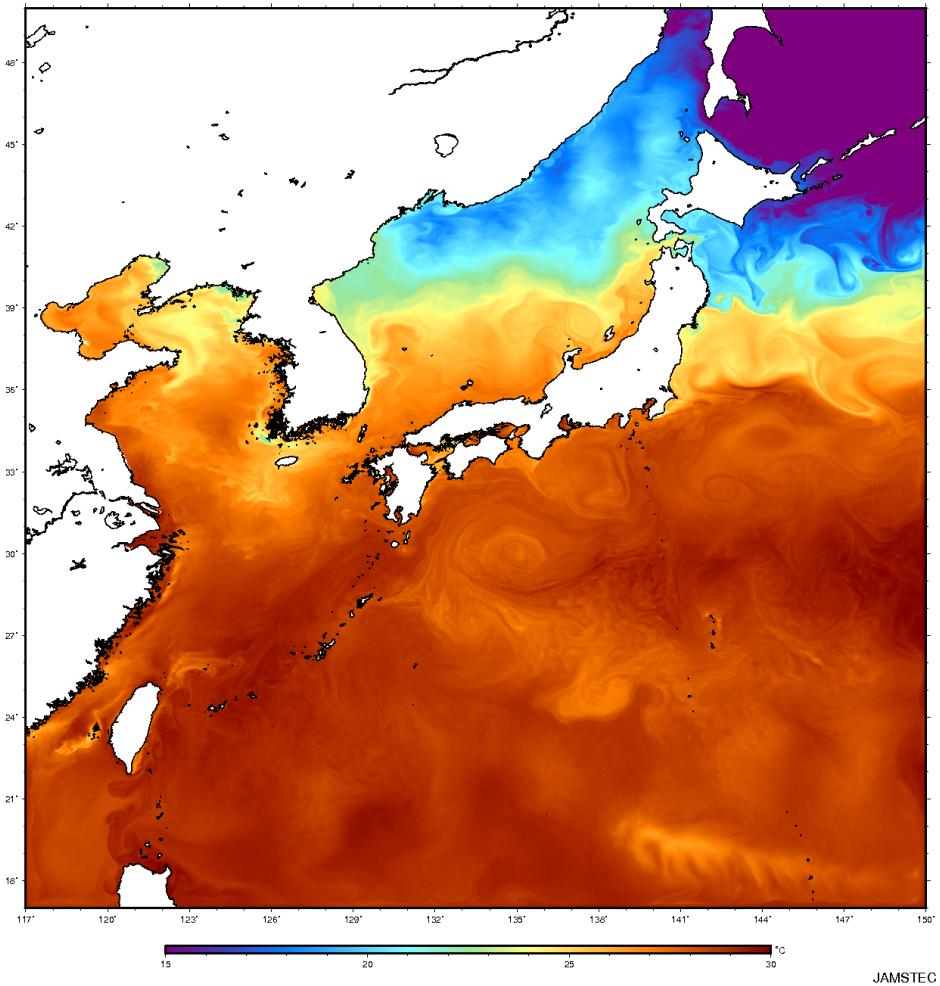
	Product name		Grid size	Interval	Format
L1	Reflectance (6 bands) Brightness temperature (10 bands)		500m/1km/2km	10min(full) 2.5min(Japan)	HSD
					NetCDF
L2/ L3	Atmos-phere	Aerosol properties	5km	10min/1hr/ 1dy/1mon	NetCDF
		Cloud properties	5km	10min	
	Ocean	Sea surface temperature	2km	10min/1hr/ 1dy/1mon	
		Ocean color (Chlorophyll-a)	5km(full) 1km(Japan)	1hr/1dy/1mon	
	Land	Wild fire	2km	10min/1hr/ 1dy/1mon	CSV
	Flux	Photosynthetically active radiation (PAR) & Shortwave radiation (SWR)	5km(full) 1km(Japan)	10min/1hr/ 1dy/1mon	NetCDF
		Photovoltaic Power (image only)	1km/4km	10min	-
L4	Model	Aerosol Property (by MRI/JMA)	Lon. 0.375 deg., Lat. 0.37147 - 0.37461 deg.	1hr	NetCDF
		Sea surface temperature (by JAXA/JAMSTEC)	1/36 deg.	1hr	NetCDF

L4 SST (assimilated Himawari, AMSR2, GMI and Windsat SSTs)

Himawari SST & Visible-RGB



Model SST assimilated satellite SSTs



Typhoon No.21 in 2018. Animation from 00Z Sep.1, 2018 23Z Sep. 4

Summary

- Current satellites
  - 6 satellites (including 2 new ones) in orbit: GOSAT (2009-present) (w/ NIES, MOE), GCOM-W (2012-present), GPM (2014-present) (w/ NASA), ALOS-2 (2014-present), **GCOM-C (2017-present), and GOSAT-2 (2018-present) (w/ NIES, MOE)**
- Upcoming satellites
  - EarthCARE (w/ ESA) in JFY 2019 (TBD)
  - ALOS-3 (optical) and ALOS-4 (SAR) are scheduled in JFY 2020
- Himawari-8
  - Develop and distribute geophysical parameters at JAXA since August 2015
  - Satellit assimilated model output (L4) aerosol and SST are now available.
- Data distribution
  - **http://www.gportal.jaxa.jp/gp/top.html** (ADEOS, ADEOS-2, AMSR-E, TRMM, GPM, GCOM-W, GCOM-C and future environmental satellites)
  - **https://data2.gosat.nies.go.jp/index_en.html** (GOSAT at NIES)
  - **https://satpf.jp/spf_atl/?lang=en** (ALOS, ALOS-2 at PLATFORM) (NOT FREE except PIs)
  - **https://www.eorc.jaxa.jp/ALOS/en/aw3d30/index.htm** (ALOS 30-m mesh DSM) (FREE)
  - **http://suzaku.eorc.jaxa.jp/GCOM_W/research/resdist.html** (GCOM-W research)
  - **https://sharaku.eorc.jaxa.jp/GSMaP** (GSMaP, GSMaP_NOW)
  - **http://www.eorc.jaxa.jp/ptree** (Himawari data at JAXA)
  - **http://kuroshio.eorc.jaxa.jp/JASMES/index.html** (MODIS/GCOM-C, etc.)
  - **http://suzaku.eorc.jaxa.jp/GHRSST/index.html** (JAXA's SST in GDS (NetCDF) format)