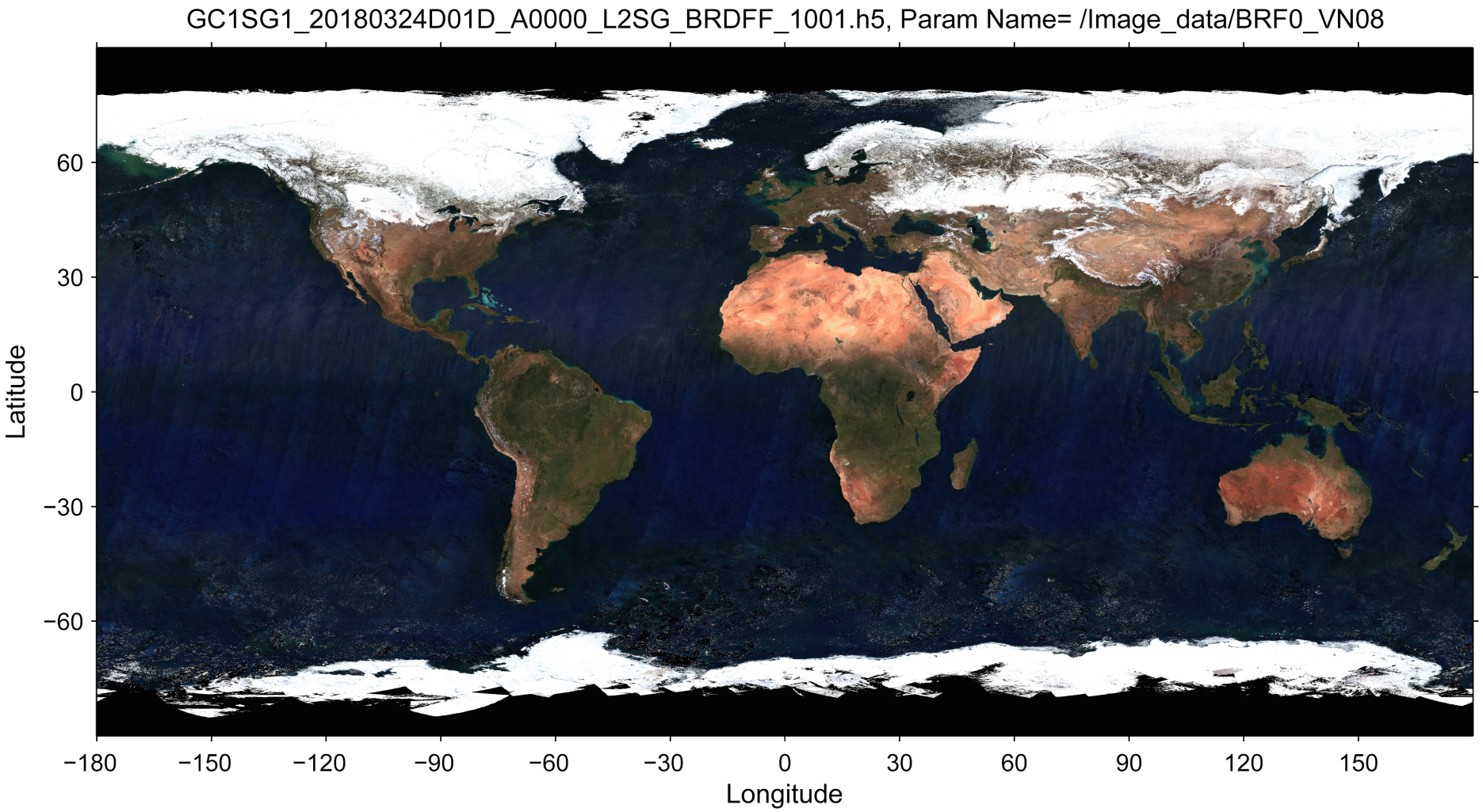
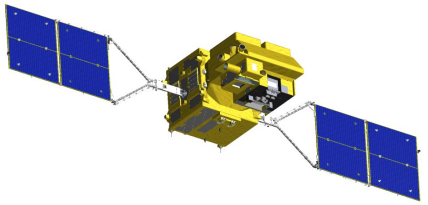
Material 1

Overview of the Global Change Observation Mission - Climate "SHIKISAI" (GCOM-C)



April 11, 2025

Global Change Observation Mission - Climate “SHIKISAI” (GCOM-C)



December 23, 2017: The satellite “SHIKISAI” was launched.

March 28, 2018: The initial checkout was completed.

December 14, 2018: Completed the initial calibration and verification.

December 20, 2018: Released Ver.1 products (29 kinds).

[As of April 11, 2025]
Satellite and sensors: Normal
Ground systems: Normal

H-IIA F37 with GCOM-C onboard launched at 10:26:22 (JST), December 23, 2017

29 Observation Products from SHIKISAI

Area	Group	Product
Common	Input for physical quantity product creation	Digital number/Top of atmosphere (TOA) radiance
Land	**Surface reflectance:** input for land product creation	Precise geometric correction
		Atmospheric corrected reflectance
	Vegetation and carbon cycle: related to amount of vegetation and photosynthesis ①	Vegetation index
		Aboveground biomass
		Vegetation roughness index
		Shadow index
		Fraction of absorbed PAR
		Leaf area index
	Thermal environment: related to photosynthesis and thermal environment ②	Land surface temperature
Atmosphere	**Cloud properties:** related to distribution, amount and classification of clouds ③	Cloud flag
		Classified cloud fraction
		Cloud top temperature/height
		Water cloud optical thickness/effective radius
		Ice cloud optical thickness
	Aerosol properties: distribution, amount and classification of aerosol ④	Aerosol properties using numerical prediction

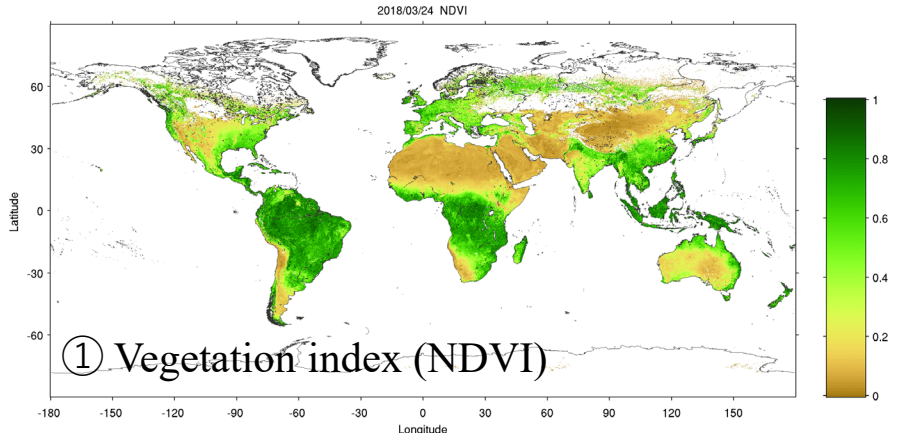
Area	Group	Product
Ocean	**Basis of ocean color:** input for ocean color product creation	Normalized water leaving radiance
		Atmospheric correction parameter
		Photosynthetically available radiation
	Underwater substance (water color): related to photosynthesis and in-water environment ⑤	Chlorophyll-a concentration
		Suspended solid concentration
		Colored dissolved organic matter absorption coefficient
	Thermal environment: related to photosynthesis and thermal environment ⑥	Sea surface temperature
Cryosphere	**Area distribution:** Snow and Ice covered area	Snow and Ice covered area(incl. cloud detection)
		Okhotsk sea-ice distribution
	Surface physics: related to physical properties of snow/ice-covered area	Snow and ice surface temperature
		Snow grain size of shallow layer
		Snow and ice blue-sky albedo

① to ⑥: see next page

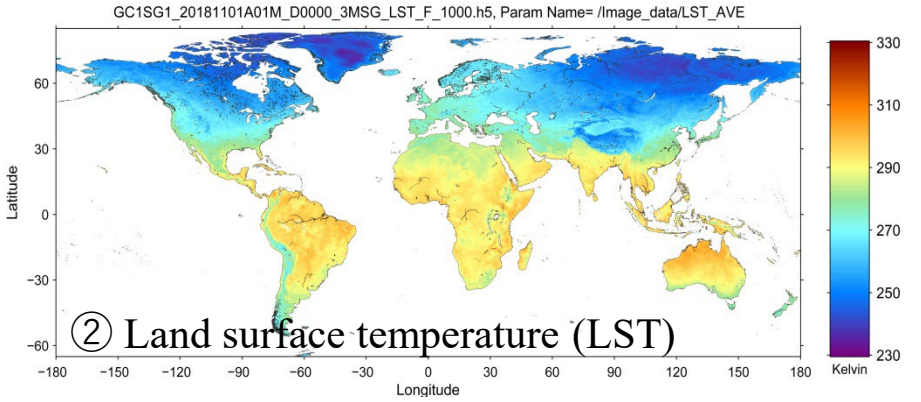
Note: On the G-Portal ftp server, 156 folders (incl. those of various statistical data) have been released (143 standard products and 13 Near realtime).

For products and algorithms, see the web page:
https://suzaku.eorc.jaxa.jp/GCOM_C/data/product_std_j.html

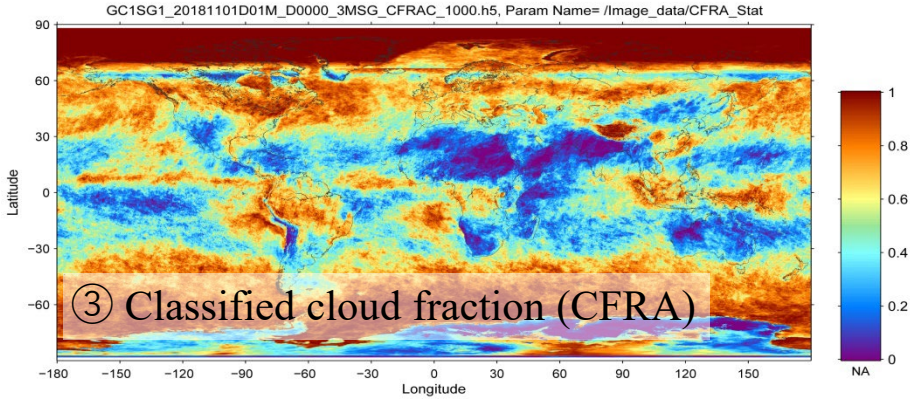
SHIKISAI Highly Frequent Global Observation



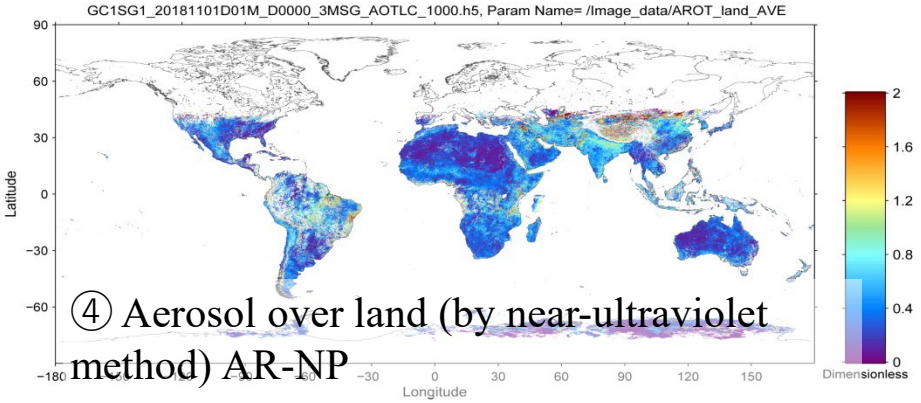
① Vegetation index (NDVI)



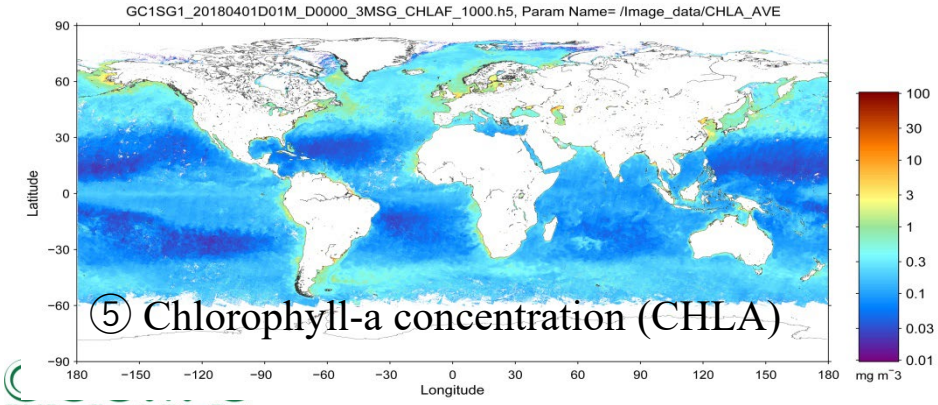
② Land surface temperature (LST)



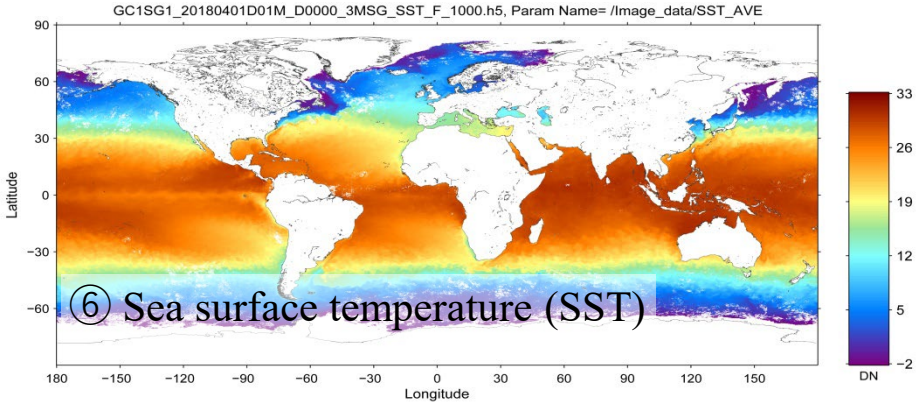
③ Classified cloud fraction (CFRA)



④ Aerosol over land (by near-ultraviolet method) AR-NP



⑤ Chlorophyll-a concentration (CHLA)



⑥ Sea surface temperature (SST)

Five Representative Products

① Vegetation index (NDVI), ② Land surface temperature (LST), ⑤ Chlorophyll-a concentration (CHLA), ⑥ Sea surface temperature (SST) and ⑦ Colors (RGB)

ftp directory name (For the differences between standard data and Near real time, see p.9.)

Standard data: Products are stored by **product type**, **version**, and **date of creation:**
/standard/GCOM-C/GCOM-C.SGLI/**L1B**/**1**/**2019**/**08**/**06**

Near real time: Products from the last 7 days are stored by **product type**.
/nrt/GCOM-C/GCOM-C.SGLI/**L1B**

Examples of file names (Granule-ID)	Projection	Phy. properties	
① GC1SG1_20190601A01D_T0111_**L2SG**_**VGI**_Q_1000.h5	Tile	NDVI	(Note 1)(Note 2)
② GC1SG1_20190726A01D_T0017_**L2SN**_**LST**_Q_1000_000.h5	Tile	LST	
⑤ GC1SG1_201907270113D04509_**L2SL**_**IWPR**Q_1000.h5	Scene	CHLA	(Note 1)
⑥ GC1SG1_201907292206S46907_**L2SN**_**SST**DQ_1002.h5	Scene	SST	
⑦ GC1SG1_201907292202S46906_**1BSN**_VNRDQ_1006.h5	Scene	RGB(L1B)	(Note 3)
⑦ GC1SG1_20190729A01D_T0016_**L2SN**_**LTOA**Q_1006_006.h5	Tile	RGB(LTOA)	(Note 3)
⑦ GC1SG1_20190726A01D_T0017_**L2SN**_**RSRF**Q_1001_001.h5	Tile	RGB(RSRF)	(Note 3)

Note 1: CHLA and NDVI are not file names, but SD array names in the HDF file.
Note 2: VGI products (that include NDVI as a data set) are not available as Near real time, but only as standard products.
Note 3: RGB products can be created as any of L1B, LTOA and RSRF. We recommend the use of atmospheric corrected reflectance (RSRF).

SHIKISAI's Range of Daily Observation

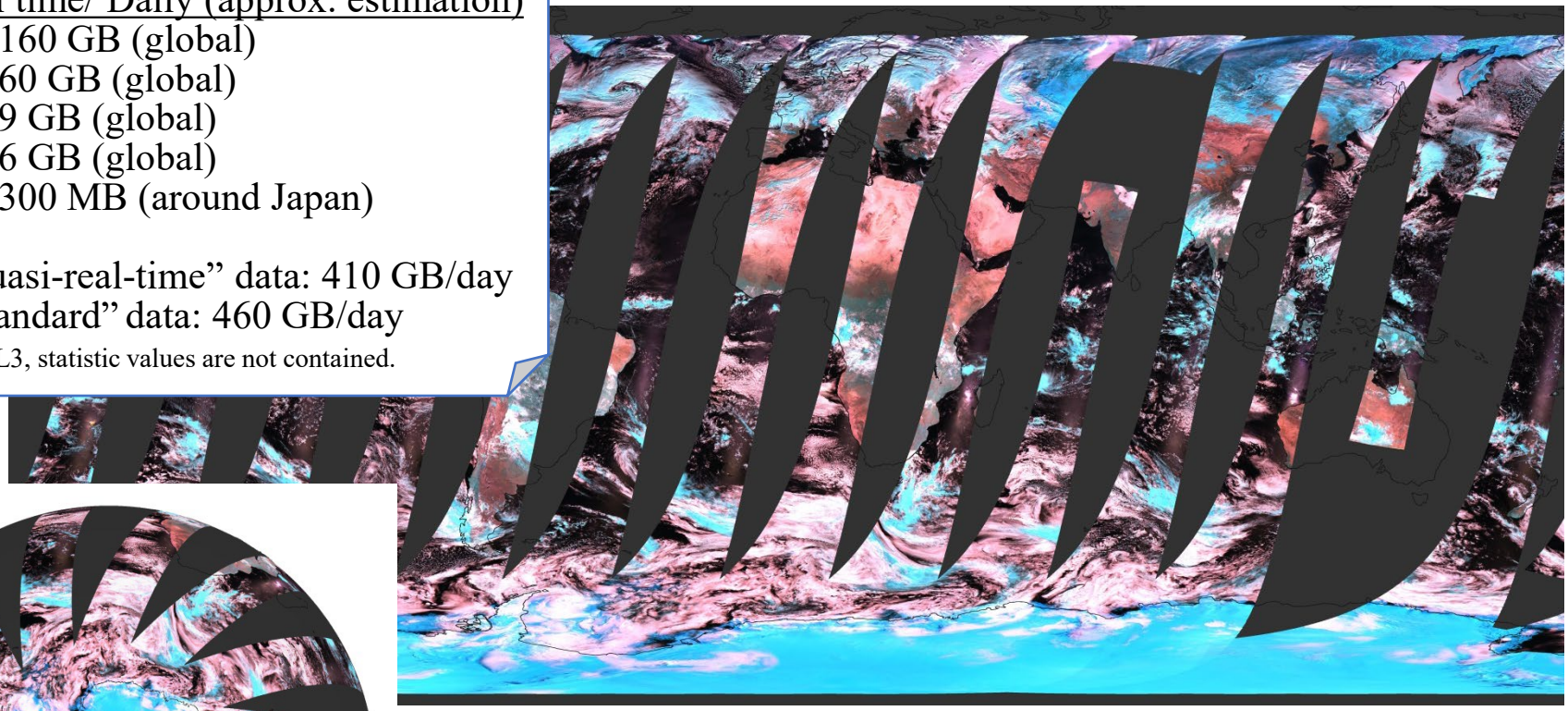
Facts on January 1, 2018

Near real time/ Daily (approx. estimation)

L1B	160 GB (global)
RSRF	60 GB (global)
LST	9 GB (global)
SST	6 GB (global)
IWPR	300 MB (around Japan)

Total "quasi-real-time" data: 410 GB/day
Total "standard" data: 460 GB/day

Note: L3, statistic values are not contained.



SHIKISAI is a polar orbiting satellite that optically observes the entire Earth every two or three days with a range of observation that exceeds 1,000 km in width.
This satellite has constantly observed Earth 24 hours a day, every day since observation commenced on January 1, 2018 (except during function checks and calibration).
For the differences between standard data and Near real time, see p.8-9.

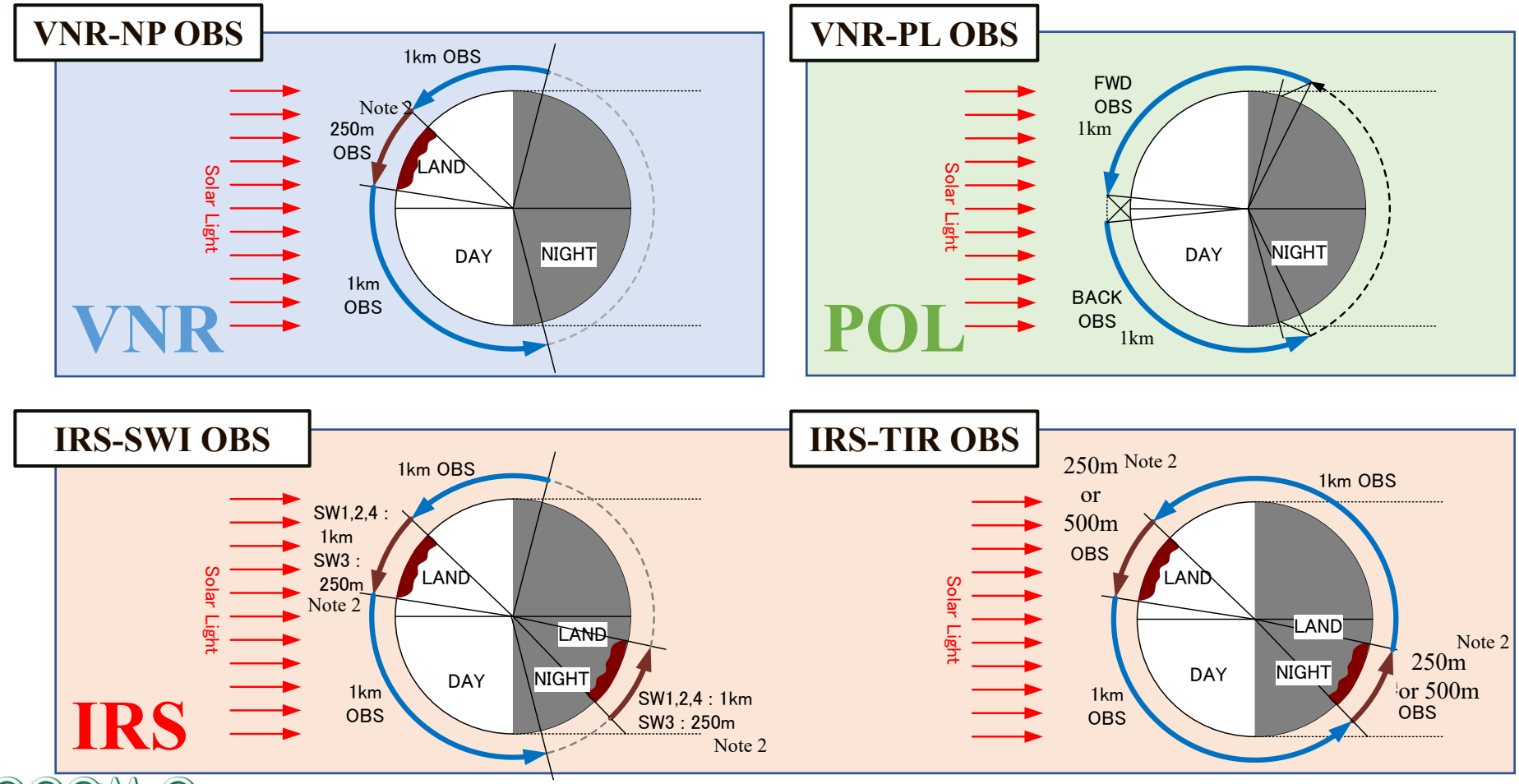
Observation Areas and Resolutions

[Three L1B files]

- Switching is performed independently for observing NP*1, PL*1, SWI*2 and TIR*2.

*1: NP is stored with the name "VNR" in an L1B file separately from PL, which is stored with the name "POL" in another L1B file.

*2: SWI and TIR are stored in a single L1B file in the IRS.

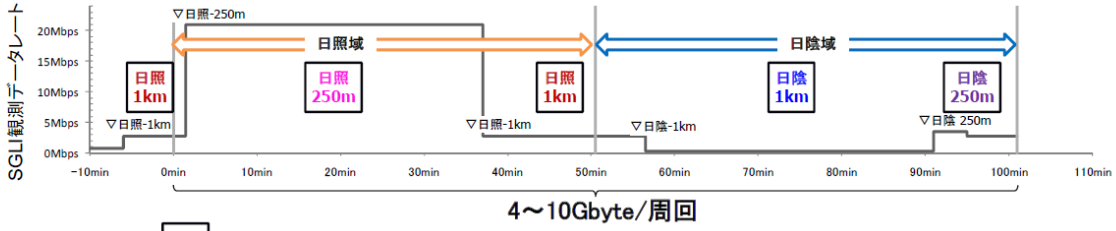


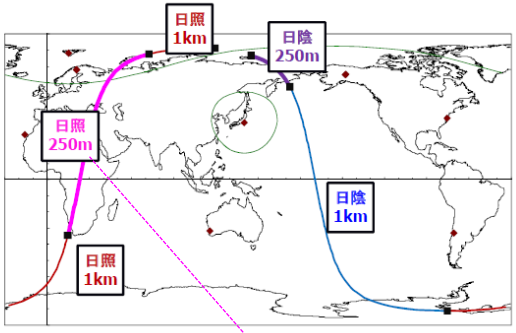
Note 1: These charts show basic patterns and may differ from actual operations. For details, see the Observation Plan.

Note 2: Aside from the 250-m observation data, 1-km observation data created by the addition of 250-m data are also available.

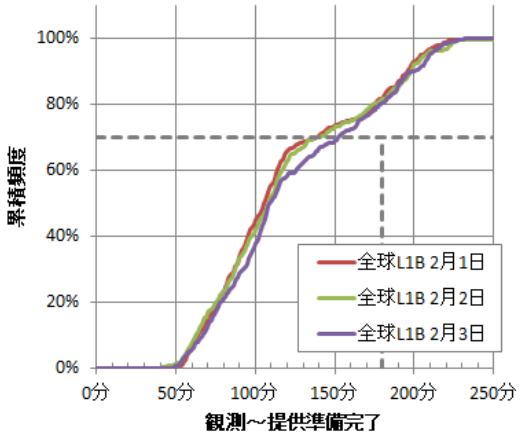
From Observation to Readiness for Data Provision
(Near real time service)

- Observation data are downlinked about every 100 minutes within the visibility range of the Svalbard station in the Arctic region.
  - ✓ Note that the Near real time service is available about 3-6 hours after observation.
  - ✓ Observation may be interrupted or delayed due to particular affairs of the ground stations and during sensor calibration.

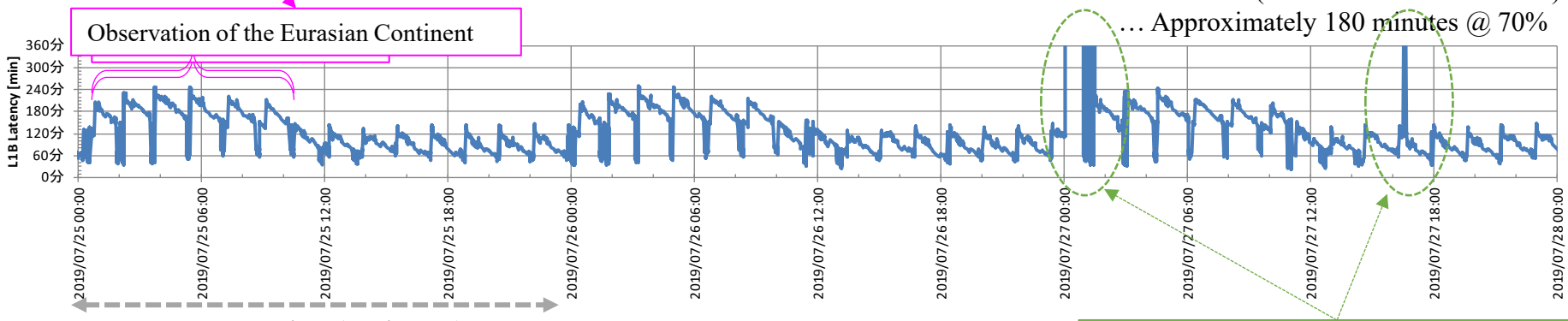




	GCOM-C	GCOM-W1(参考)
観測データレート	**21.1 Mbps (日照・250m分解能)**	0.0874 Mbps
観測データ量	**4～10 GByte/周回 60～90GByte/日**	0.066 GByte/周回 0.95 GByte / 日
ミッションデータレコーダ (MDR)容量	**72 GByte (BOL)**	4 GByte (BOL)
X-Band ダウンリンクレート	**120 Mbps**	10 Mbps



Latency = From observation to readiness for data provision (actual values)
(Global near real time L1B)
… Approximately 180 minutes @ 70%



SHIKISAI's Data Provision Service

Differences of GCOM-C product provision service

April 11, 2025

	G-Portal *1		**JASMES** *2	
	Standard products	Near-realtime products	Standard products	Near-realtime products
Products	・Verified accuracy ・Radiance products (L1) ・Physical quantity products (L2) *5 ・Statistic products (L3 and others)	・Prioritize Real-time rather than accuracy ・Radiance product（L1B) ・A part of physical quantity products（L2) ・Provide only for 7 days after observation	・Radiance products (L1) ・Physical quantity products (L2) ・Statistic products (L3 and others)	・Radiance product（L1B) ・A part of physical quantity products（L2)
Data format	HDF5 format	HDF5 format （processing each downlink *4)	NetCDF, PNG (Conversion to equi-latitude longitude projection)	
Download	G-Portal WEB site SFTP-get	SFTP-get	JASMES WEB site (only PNG) FTP-get	
Preparation period for data provision (*3)	About 1~2 days after observation date.（Confirming)	About 6 hours after observation time (Confirming)	About 1~2 days after observation date. (Confirming)	About 6 hours and a little more after observation time. (Confirming)
User registration	Web site		Web site	

* 1 [URL] https://gportal.jaxa.jp/gpr/?lang=en

* 2 [URL] https://www.eorc.jaxa.jp/JASMES/index.html

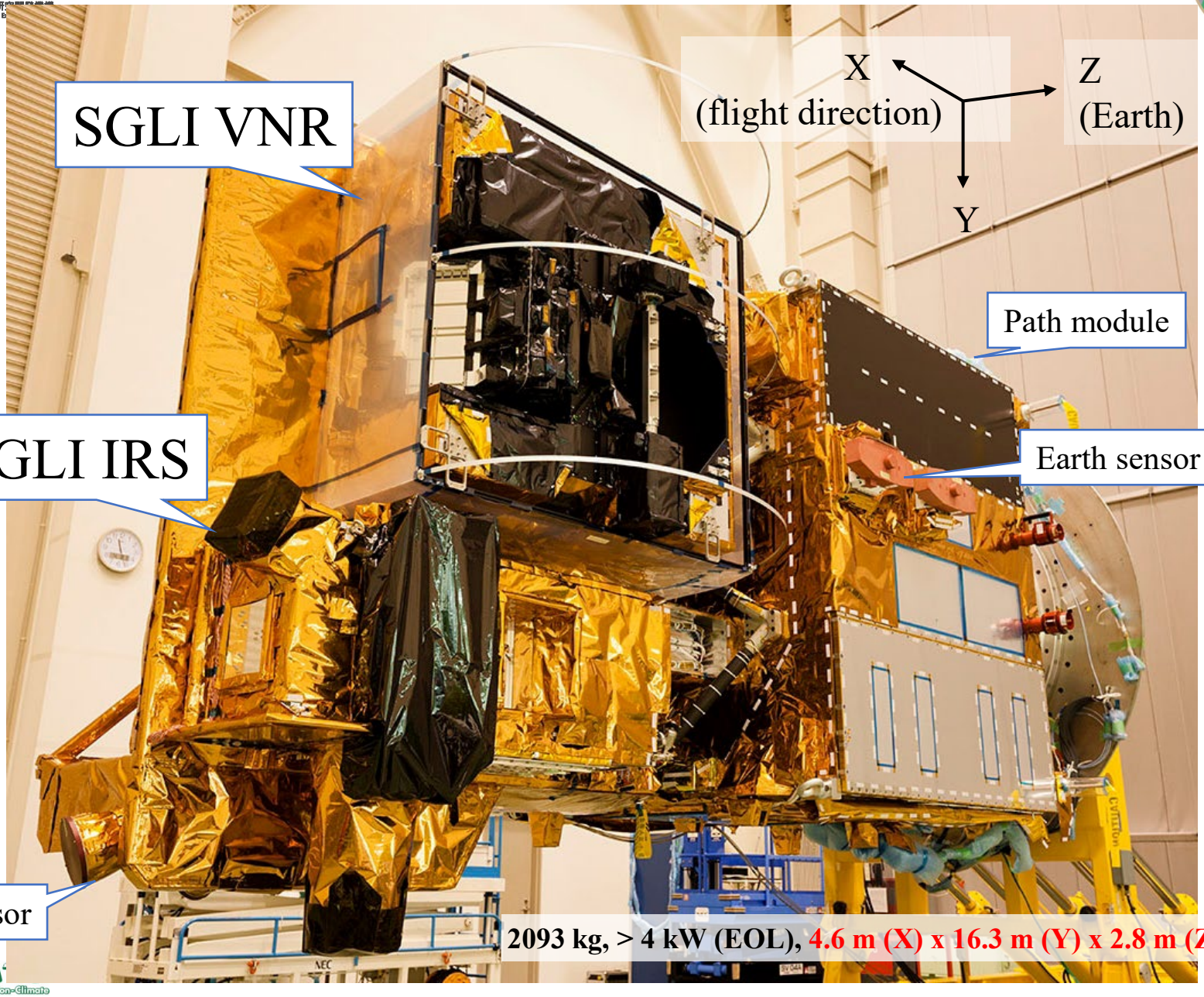
* 3 Providing service is sometimes late due to the operation schedule. And downloading time largely varies depending on your network environment and also the type or the number of your target product. Providing of JASMES products is sometimes later than G-portal NRT products due to processing for map projection and purpose of research.

* 4 For real time improvement, a file may be devided.

* 5 Standard L2 OKID products are continuously available by ftp during only 31-days after released. After that, please get them by web order or use L2 standard SICE products.

APPENDIX

SHIKISAI Satellite at Tsukuba Space Center 2016



2093 kg, > 4 kW (EOL), 4.6 m (X) x 16.3 m (Y) x 2.8 m (Z)

Examples of GCOM-C Data Usage

Ocean

- Phytoplankton growth in the spring of 2019
- Oceanic weather forecast (coordinated with JAMSTEC)

Land

- New green leaves/autumn leaves in Japan
- Land surface temperature in the exceptionally hot summer of 2018

Cryosphere

- Drift ice observation
- Field verification on Greenland

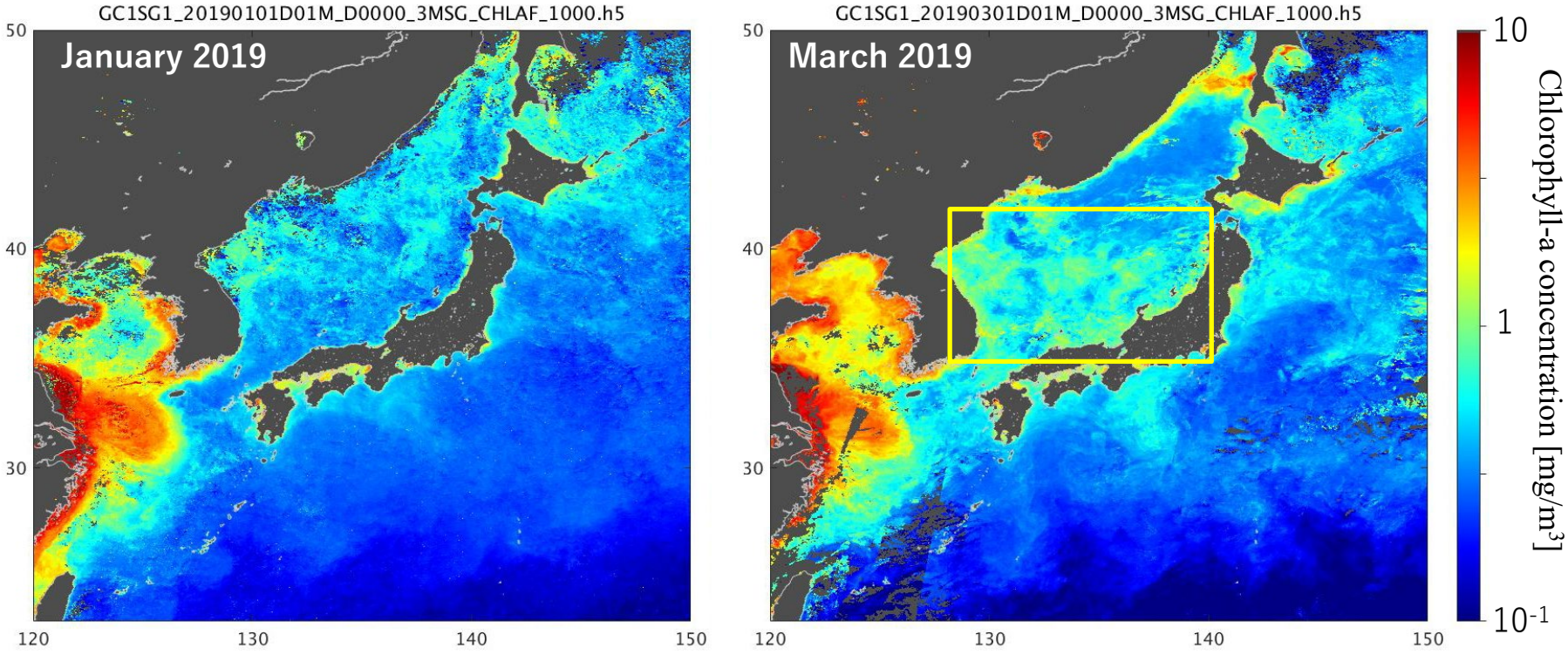
Atmosphere

- Yellow dust observed in the spring of 2018

Volcano

- Volcanic Activities and Forest Fire Prompt Announcement System

Phytoplankton growth in the spring of 2019



Source: an article published on the EORC web page "Views of the Earth" on April 5, 2019

Spring bloom (phytoplankton growth) was detected in the Sea of Japan, south of latitude 40 degrees.

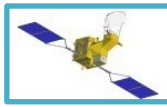
Note: Normally, phytoplankton grows in April/May off Hokkaido and starting in June in the Sea of Okhotsk.

Oceanic weather forecast (coordinated with JAMSTEC)

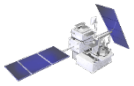
The "Oceanic Weather Forecast" system was developed for analyzing and forecasting physical properties of the sea surfaces and waters around Japan with JAXA's satellite-based sea surface temperature products which have been data-assimilated with JAMSTEC's oceanic models.

Note: GCOM-C sea surface temperature (SST) data are scheduled to be introduced in fiscal year 2019.

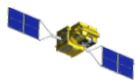
JAXA: Ocean Products


GCOM-W/AMSR2 SST


HIMAWARI-8/AHI SST


GPM/GMI SST

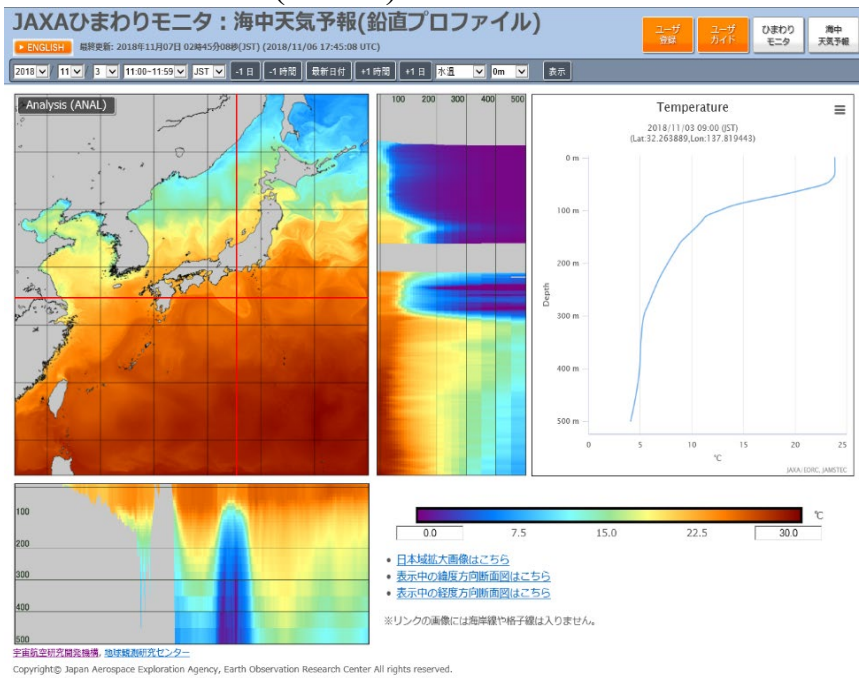

Coriolis/Windsat SST


GCOM-C/SGLI SST

← **To be introduced in FY2019**

JAMSTEC: Japan Agency for Marine-Earth Science and Technology's high-resolution regional oceanic property model
(JCOPE-T: 3-km resolution around Japan)

Model SST and forecast will be released from JAXA Himawari Monitor (P-Tree).

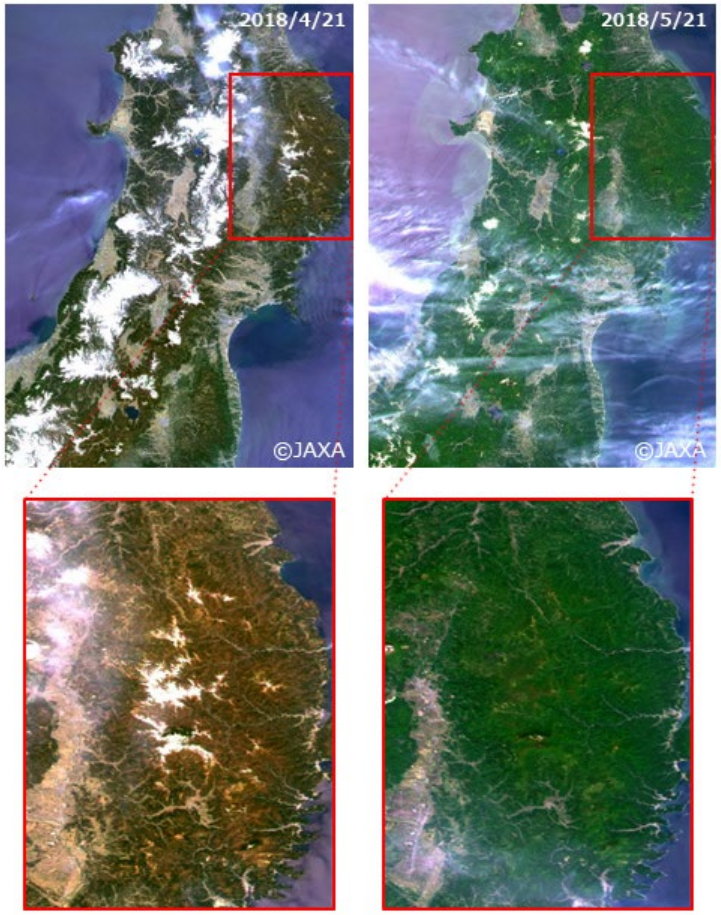


https://www.eorc.jaxa.jp/ptree/ocean_model/index_j.html

Source: an article published on the EORC web page "Views of the Earth" on November 17, 2018

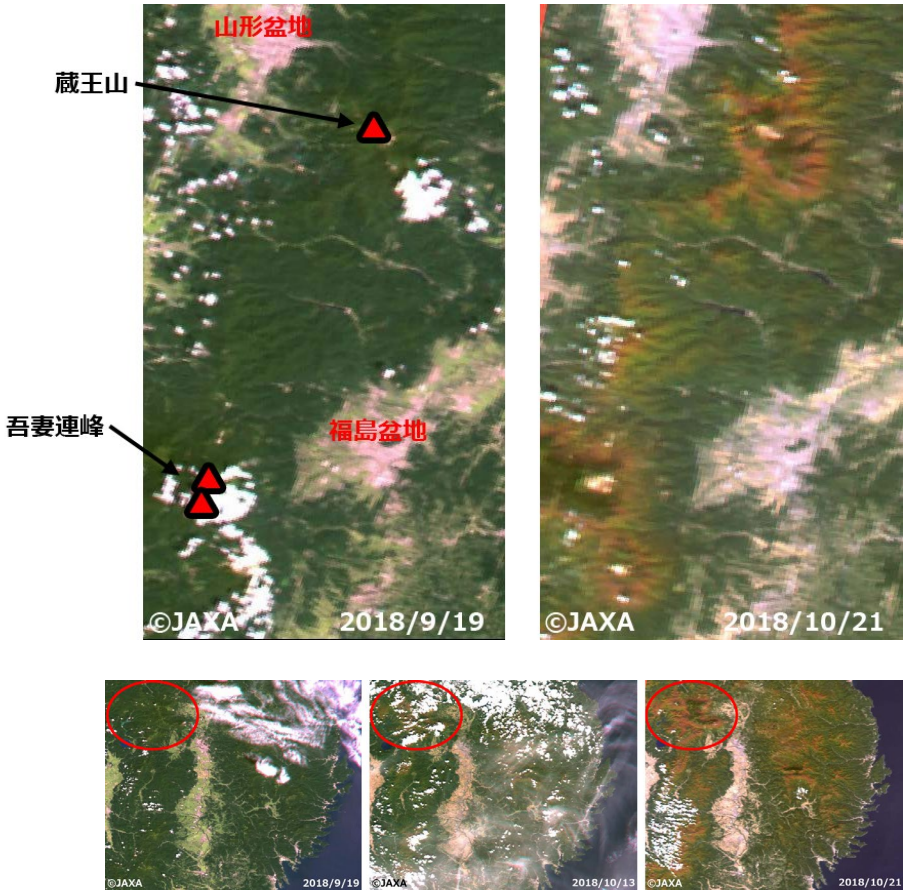
New green leaves/autumn leaves in Japan

New green leaves in the spring of 2018



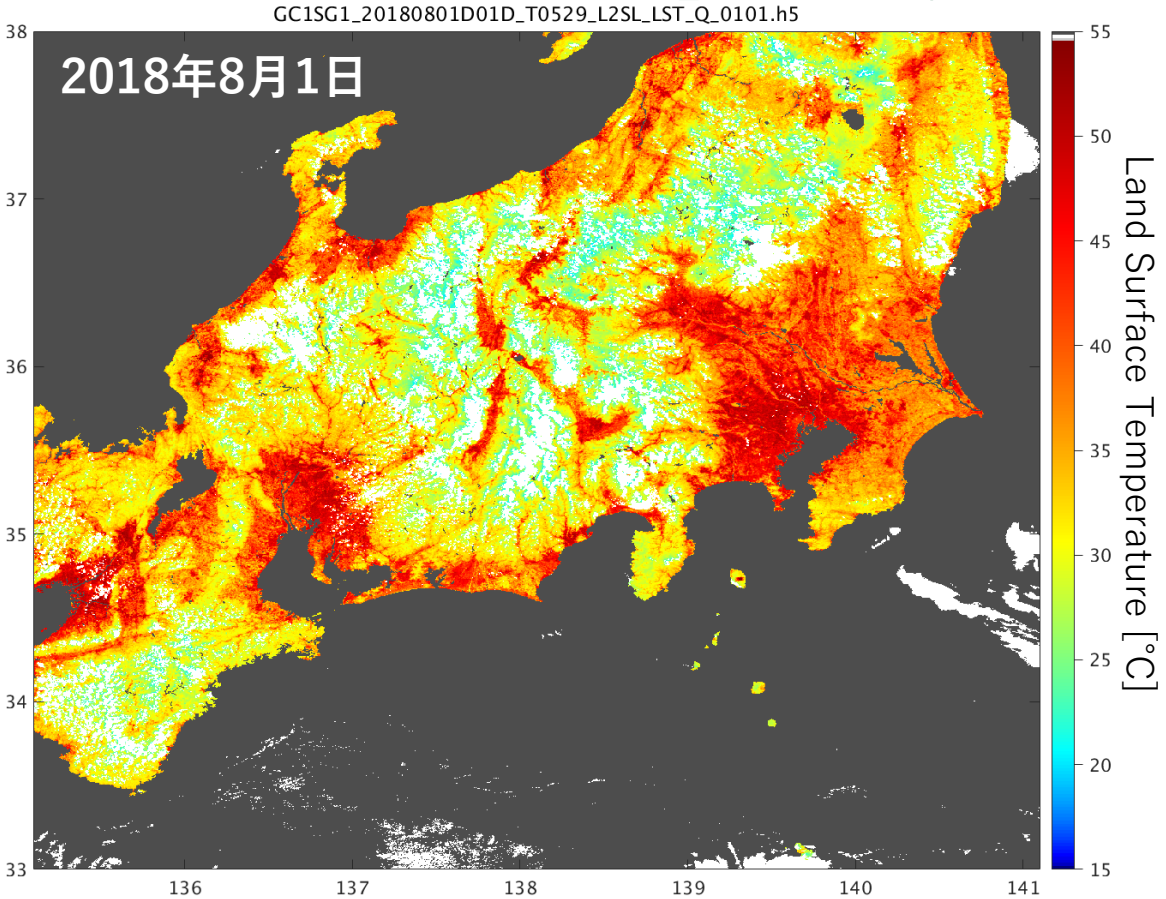
Leaves deployed on the Japanese archipelago, captured by SHIKISAI on May 14, 2019.
Source: an article published on the EORC web page “Views of the Earth” on EORC on May 31, 2018

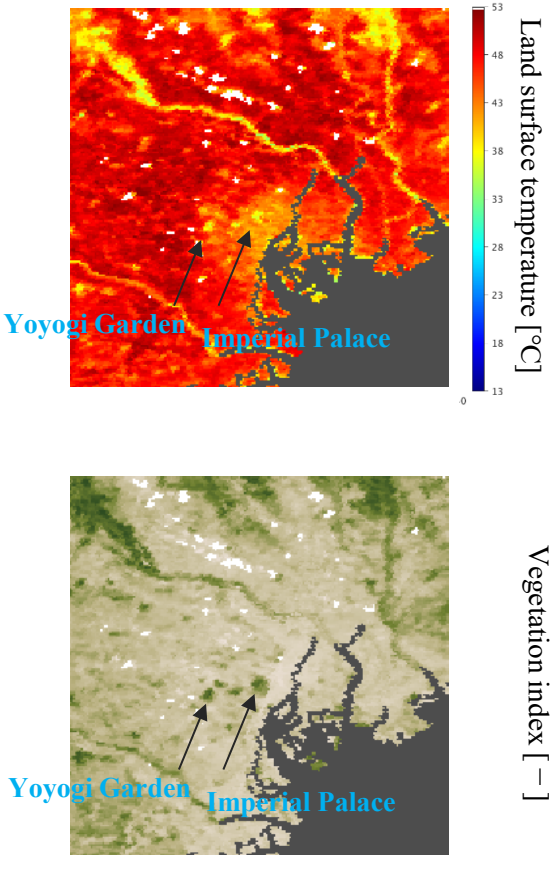
Autumn leaves in the autumn of 2018



Source: an article published on the EORC web page “Views of the Earth” on EORC on October 25, 2018

Land surface temperature in the exceptionally hot summer of 2018





Source: an article published on the EORC web page "Views of the Earth" on EORC on August 1, 2018

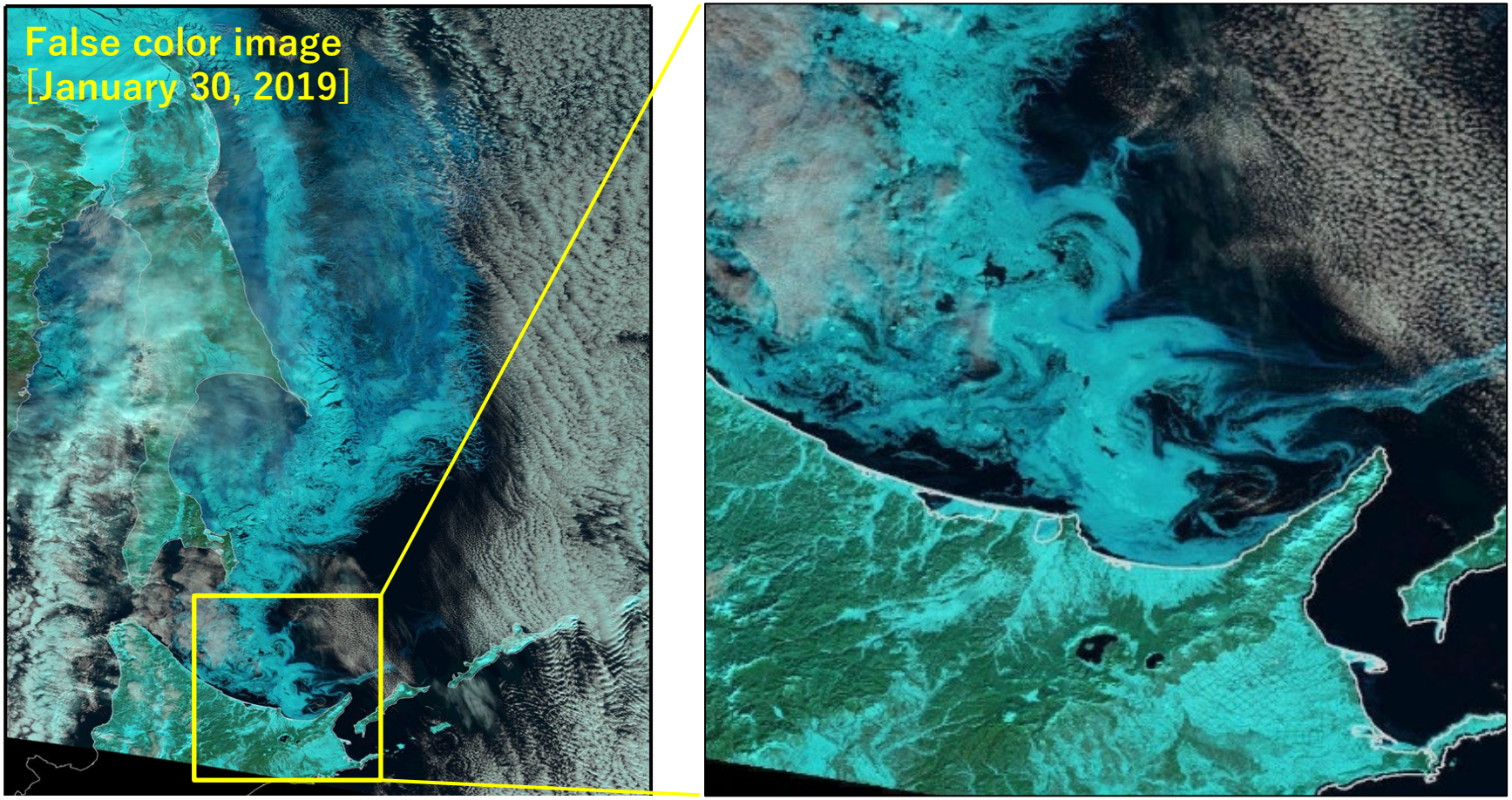
[Related article] "Unprecedented lack of sunlight in 2019" on July 24, 2019

The exceptionally hot summer of 2018 is known by the precisely observed distribution of land surface temperatures.

⇒ In Tokyo, temperatures were lower in greenery areas than in surrounding urban areas (mitigation of the heat island effect).

Drift ice observation

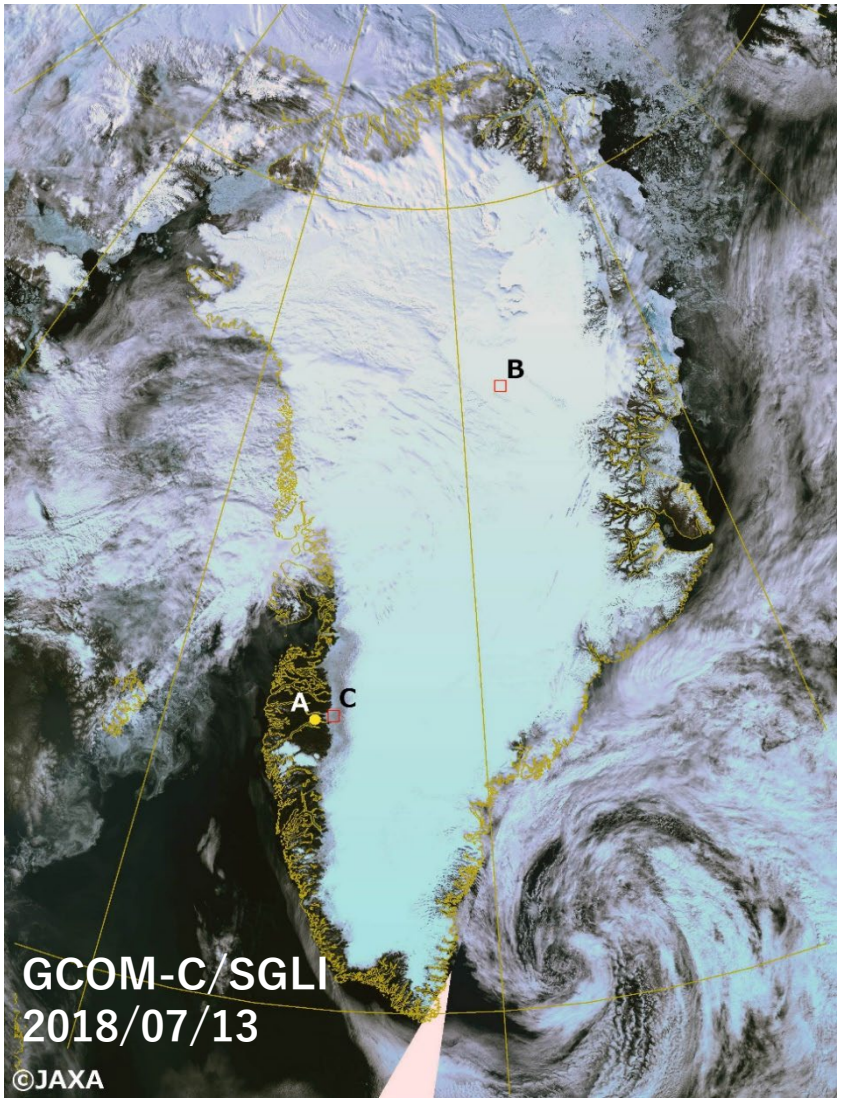
Drift ice reaching the coasts of Hokkaido was observed at the end of January 2019.

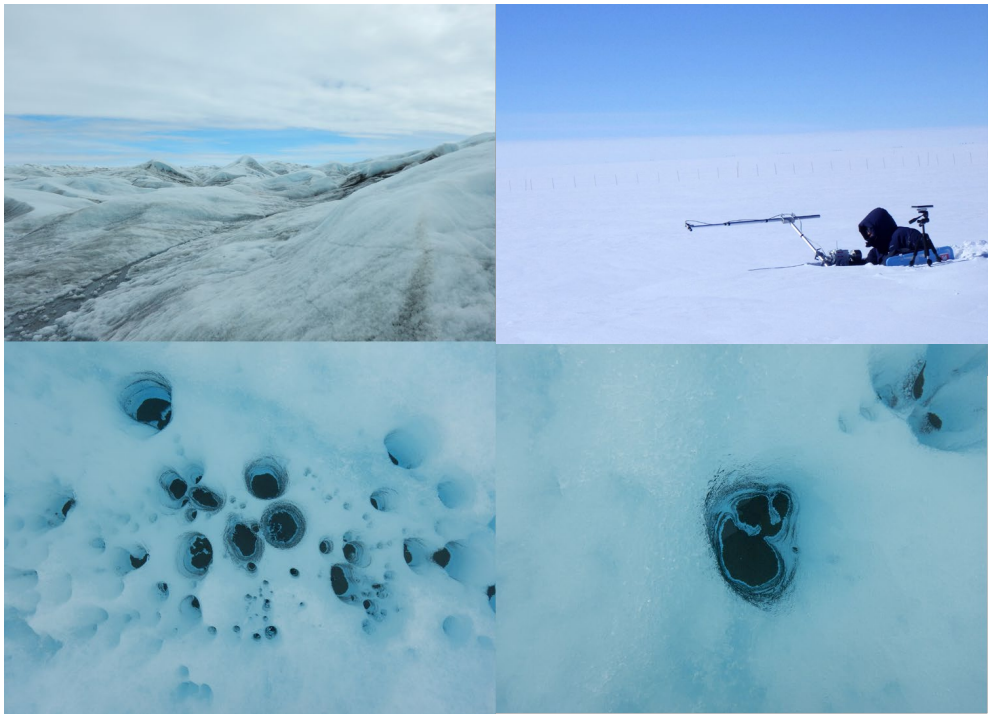


R: SW3 (1630 nm), G: VN11 (868.5 nm), B: VN8 (673.5 nm)

Source: an article published at EORC "GCOM-C Image Gallery" on January 30, 2019

Ice melting on Greenland





Greenland Observation Report 7/22 - 30 Russel Glacier @EORC Shimada

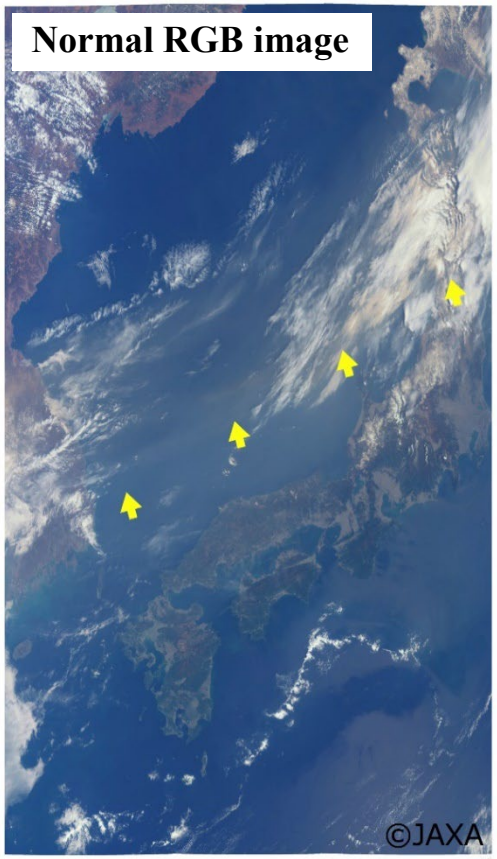
On-site observation was conducted in June 2018 to verify GCOM-C Cryosphere products.

Source: articles published on the EORC web page “Views of the Earth” on EORC on “Views of the Earth” on July 18, 2018 and July 12, 2019

Yellow dust observed in the spring of 2018

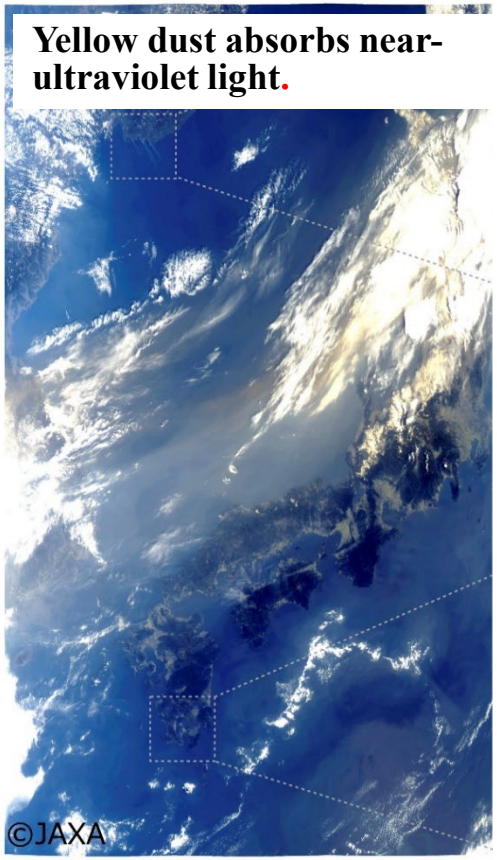
Yellow dust in the spring of 2018 detected by near-ultraviolet and thermal infrared observation with the SGLI's characteristic 250-m resolution

Normal RGB image



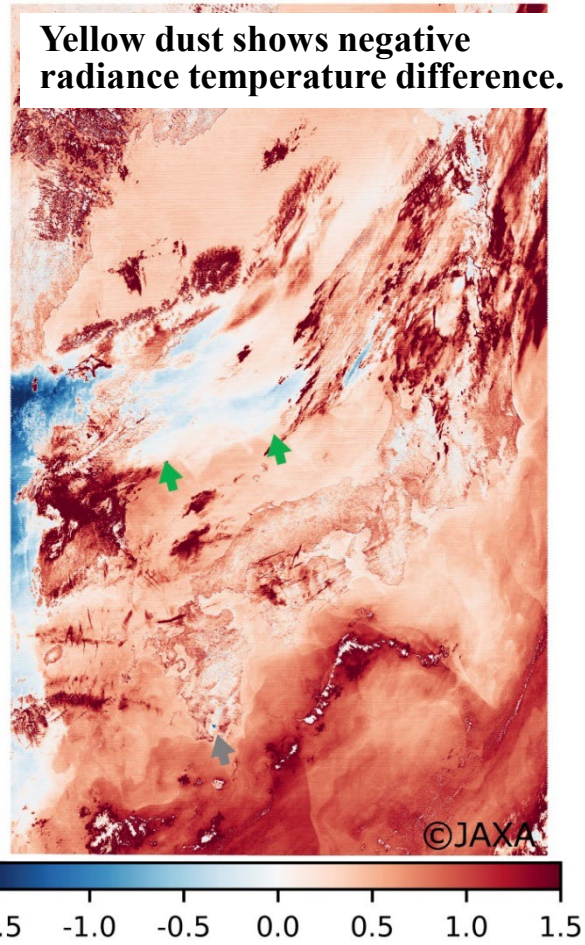
R: VN08, G: VN05, B: VN03

Yellow dust absorbs near-ultraviolet light.



R: VN03, G: VN02, B: VN01

Yellow dust shows negative radiance temperature difference.



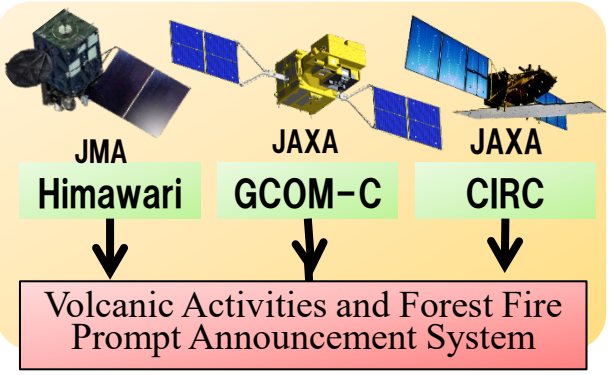
Source: an article published on the EORC web page "Views of the Earth" on EORC on April 9, 2018

Volcanic Activities and Forest Fire Prompt Announcement System

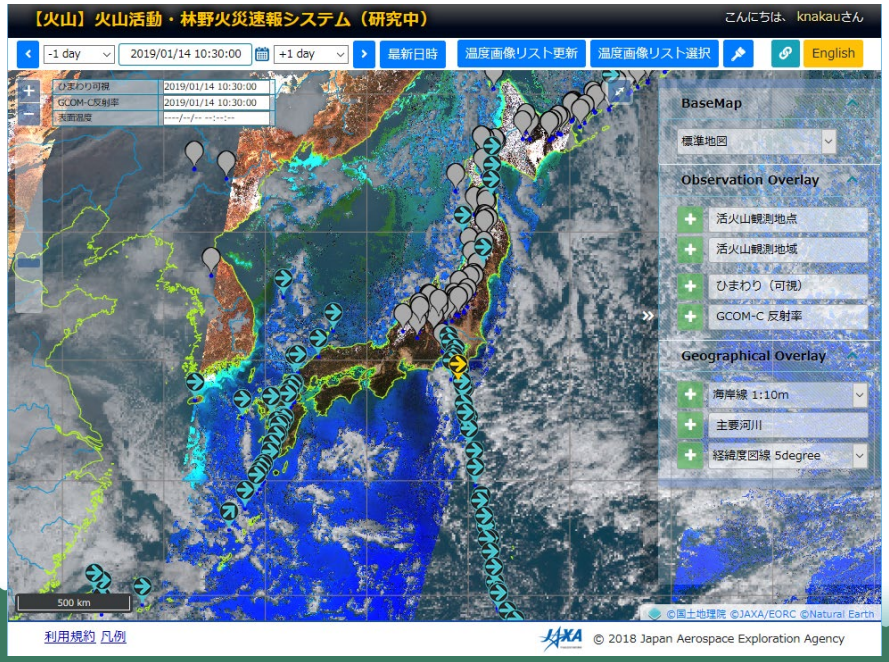
A system for publicizing satellite-based observation information in a format that is accessible to officials from disaster prevention agencies in order to contribute to better monitoring of volcanic activities and forest fire, with the following features:

- **Superimposed representation of thermal infrared and visible observation data**
- **Separate representation of thermal change behavior of each volcano in and around Japan**

Note: Registration of user account is required for using GCOM-C data. GCOM-C data are currently being registered.



Send your questions and inquiry about account registration to: z-sokuho@ml.jaxa.jp



Graph representing chronologic change of radiance temperature

It concerns the model volcanoes selected by the Satellite Analysis Group, Coordinating Committee for Prediction of Volcanic Eruption (JMA).