



Emerging applications and science from GCOM-C

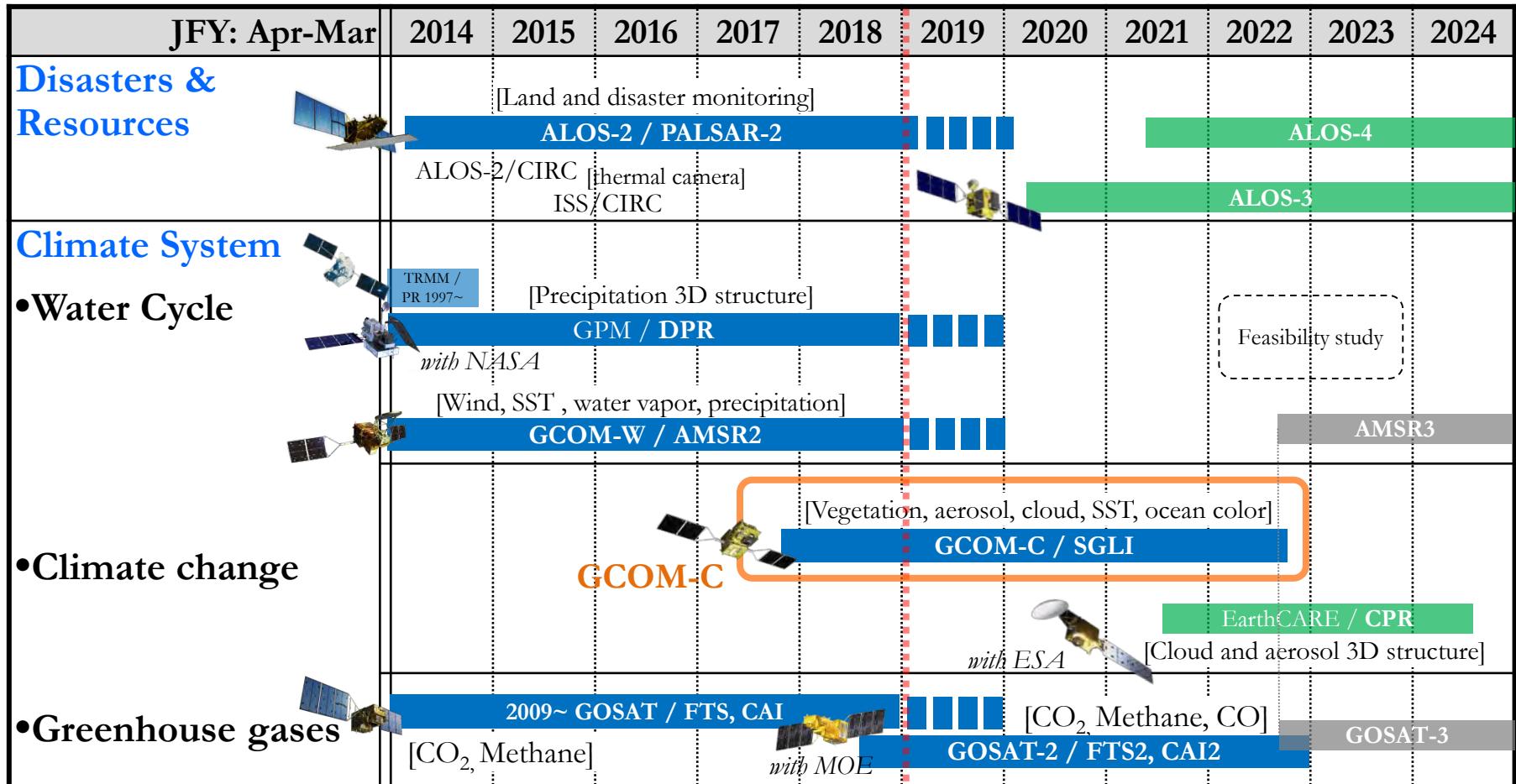
Hiroshi Murakami

JAXA/EORC

2019 International Ocean Colour Science Meeting

Busan, South Korea, 9-12 April 2019

1. JAXA Earth observation satellite missions



Mission status

On orbit

Development

Study

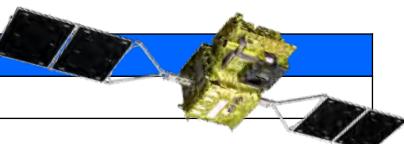
Pre-phase-A

2. GCOM-C/SGLI

Global Change Observation Mission – Climate, named "SHIKISAI"

GCOM-C SGLI characteristics

Launch Date	23 Dec. 2017
Weight	2,000kg
Orbit	Sun-synchronous (descending local time: 10:30), Altitude: 798km, Inclination: 98.6deg
Mission Life	5 years (3 satellites; total 13 years)
Scan	Push-broom electric scan (VNR: VN & P) Wisk-broom mechanical scan (IRS: SW & T)
Scan width	1150km cross track (VNR: NP & POL) 1400km cross track (IRS: SWIR & TIR)
Spatial resolution	250m, 500m, 1km
Polarization	3 polarization angles for POL
Along track tilt	Nadir for VN, SW and TIR, & +/-45 deg for POL

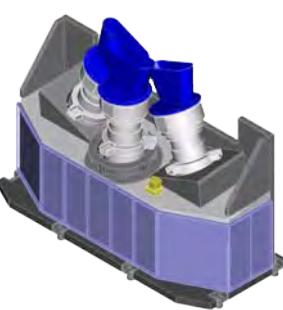


Specification of SGLI spectral bands

CH	λ	$\Delta\lambda$	L_{std}	L_{max}	SNR@ L_{std}	IFOV
	nm		W/m ² /sr/ μ m K: Kelvin			
VN1	380	10	60	210	250	250 /1000
VN2	412	10	75	250	400	250 /1000
VN3	443	10	64	400	300	250 /1000
VN4	490	10	53	120	400	250 /1000
VN5	530	20	41	350	250	250 /1000
VN6	565	20	33	90	400	250 /1000
VN7	673.5	20	23	62	400	250 /1000
VN8	673.5	20	25	210	250	250 /1000
VN9	763	12	40	350	1200*	250 /1000*
VN10	868.5	20	8	30	400	250 /1000
VN11	868.5	20	30	300	200	250 /1000
POL1	673.5	20	25	250	250	1000
POL2	868.5	20	30	300	250	1000
SW1	1050	20	57	248	500	1000
SW2	1380	20	8	103	150	1000
SW3	1630	200	3	50	57	250 /1000
SW4	2210	50	1.9	20	211	1000
TIR1	10800	700	300K	340K	0.2K	250/500/1000
TIR2	12000	700	300K	340K	0.2K	250/500/1000

VNR-POL

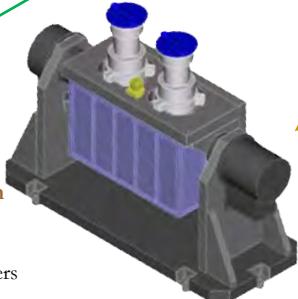
Polarization two telescopes (670nm and 865nm)
Each has three polarization-angle filters



VNR-NP

Non-polarization three telescopes

Each has the same 11 channels



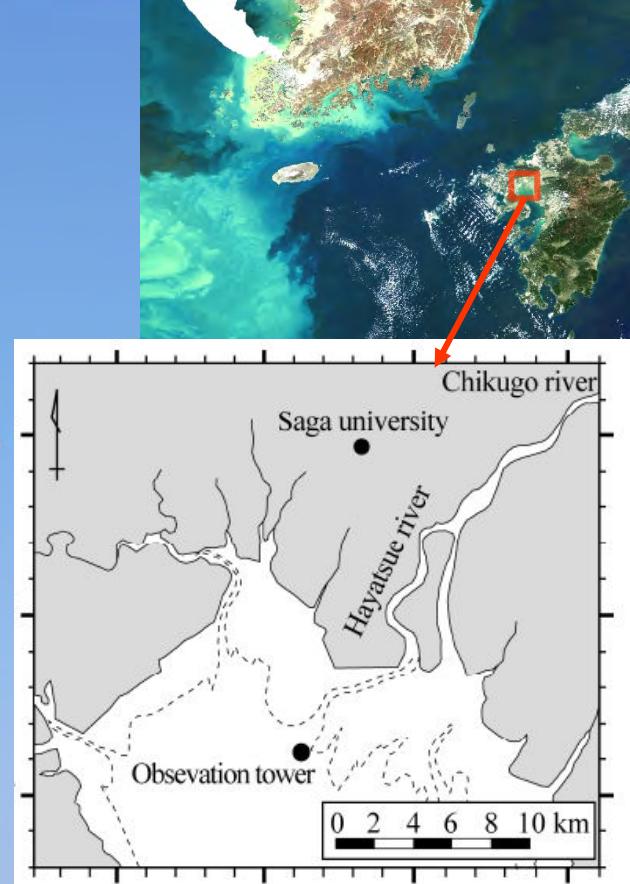
**InfraRed Scanner
(SGLI-IRS)**

https://suzaku.eorc.jaxa.jp/GCOM_C/data/prelaunch/index.html

AERONET-OCv3 Ariake-Tower in Ariake-Bay, Japan, has been operated since April 2018



M. Hori JAXA/EORC



✓ JAXA has added an AERONET-OC site, ARIAKE-TOWER, with PI Ishizaka and Univ. Saga

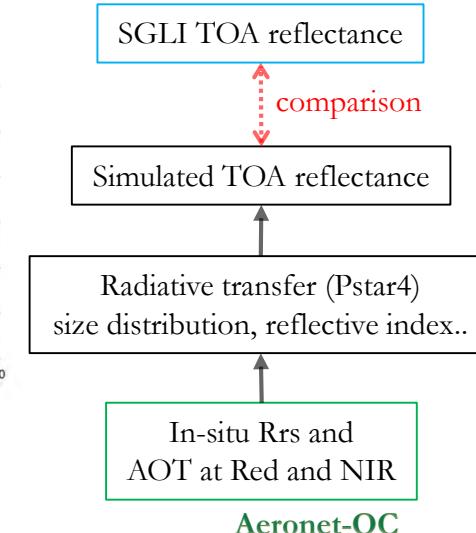
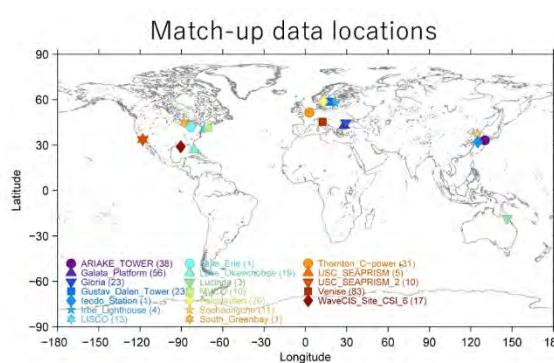
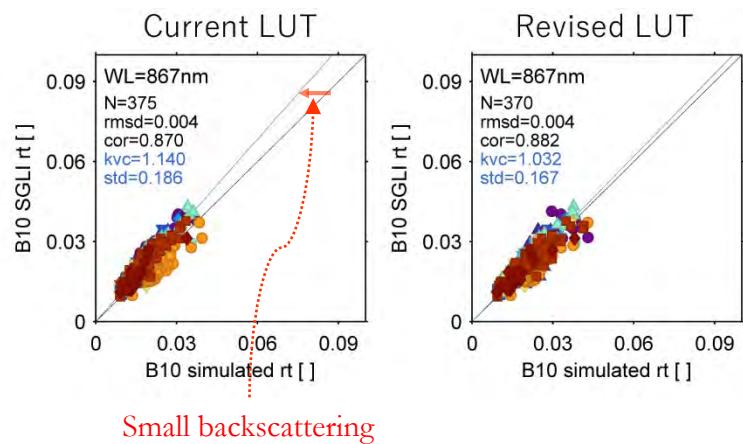
https://aeronet.gsfc.nasa.gov/cgi-bin/data_display_aod_v3?site=ARIAKE_TOWER

Evaluation of the aerosol models by AERONET-OC

GCOS
Global Change Observation Mission - Climate



Simulated Rt by aerosol LUTs of the current SGLI OC algorithm and revised LUTs



- ✓ AERONET (v3) data are provided by NASA/GSFC and PIs of the sites
- ✓ Aerosol reflectance and transmittance is estimated by the aerosol LUTs and AERONET-OC Rrs and AOT
- ✓ Simulated TOA reflectance is smaller than one from the current aerosol LUT and AERONET-OC Rrs and AOT
- ✓ The difference could be reduced by using revised LUTs (based on the aerosol size distribution from the AERONET climatology)
- ✓ **AERONET-OC can be used to evaluate the aerosol model setting**

(corresponding to the recommendation from the IOCS2017 Vi-cal: Aerosol characterization)

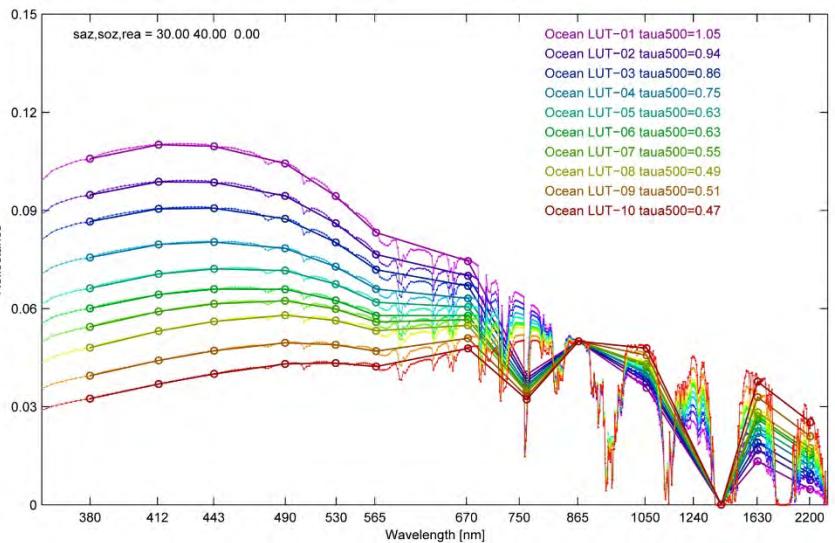
Evaluation of the aerosol models by AERONET-OC

GCOM-C
Global Change Observation Mission - Climate



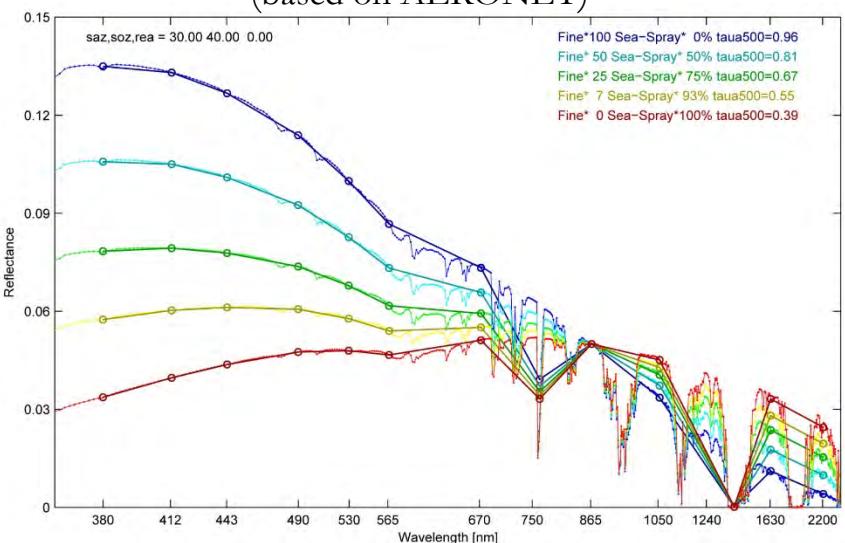
(a) Current version (Shettle and Fenn, 1979)

Aerosol reflectance

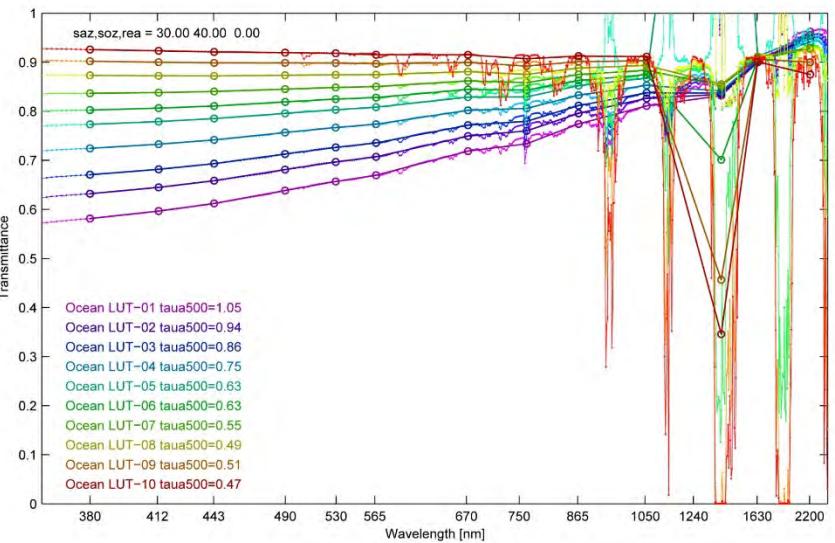


(b) Non-absorptive aerosol models by SGLI atmosphere group
(based on AERONET)

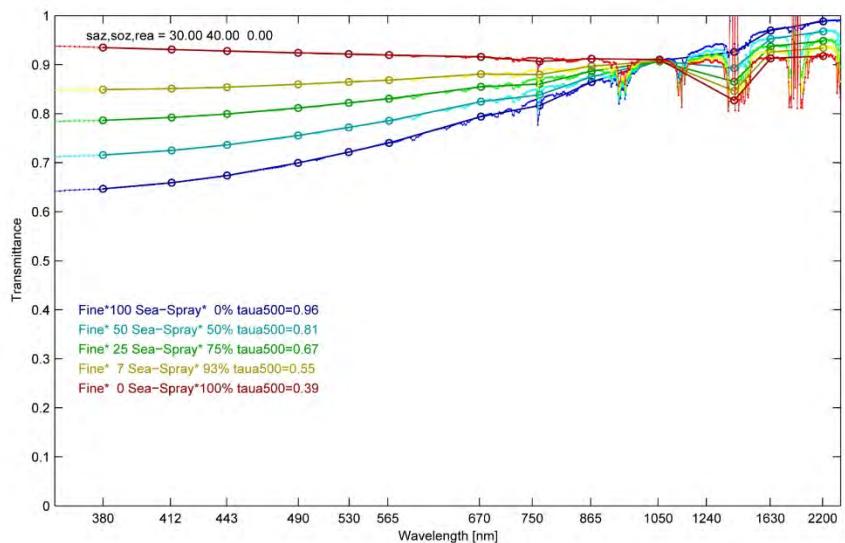
Reflectance



Aerosol transmittance



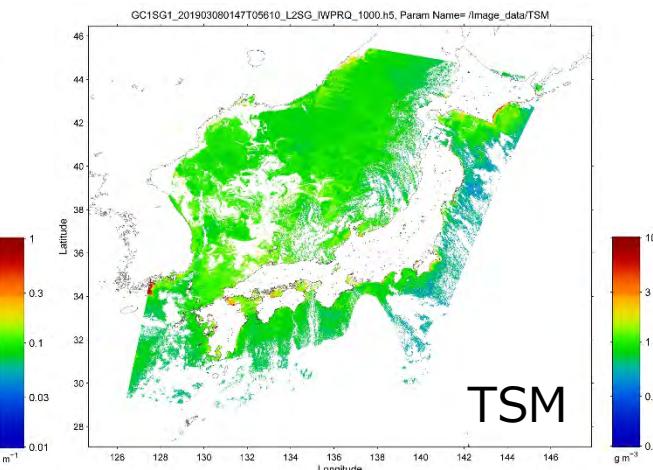
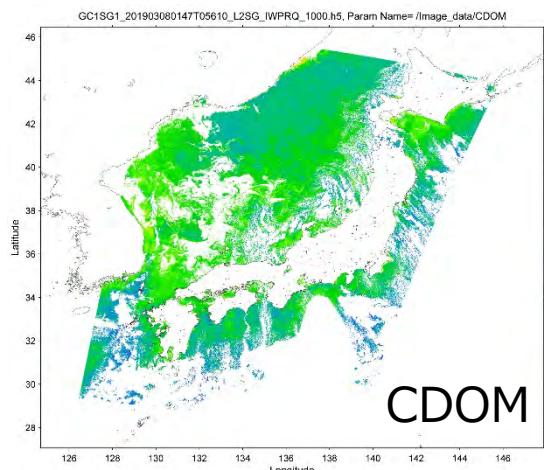
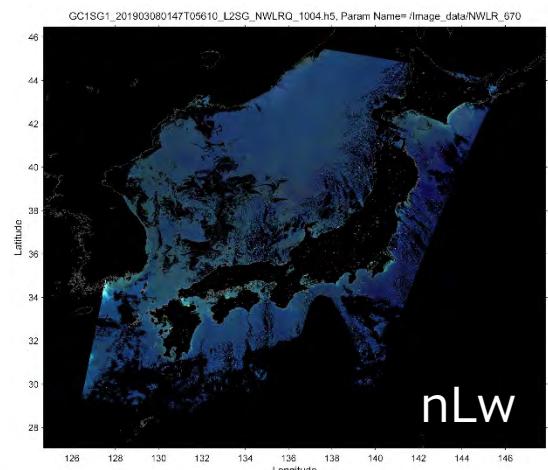
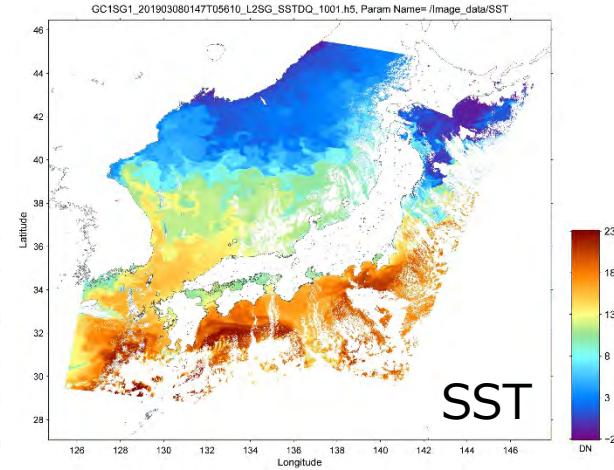
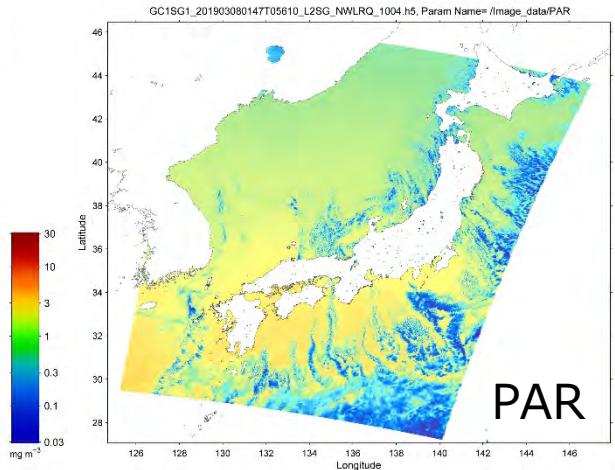
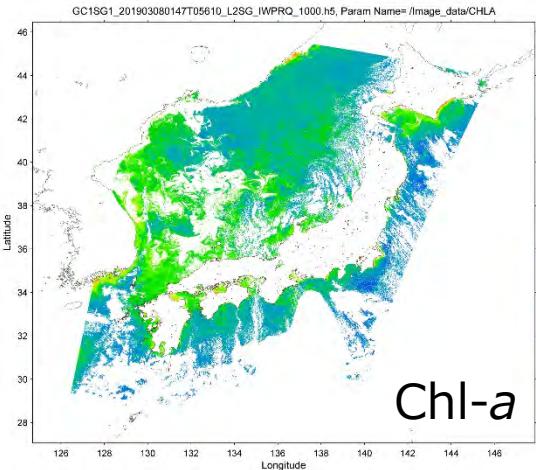
Transmittance

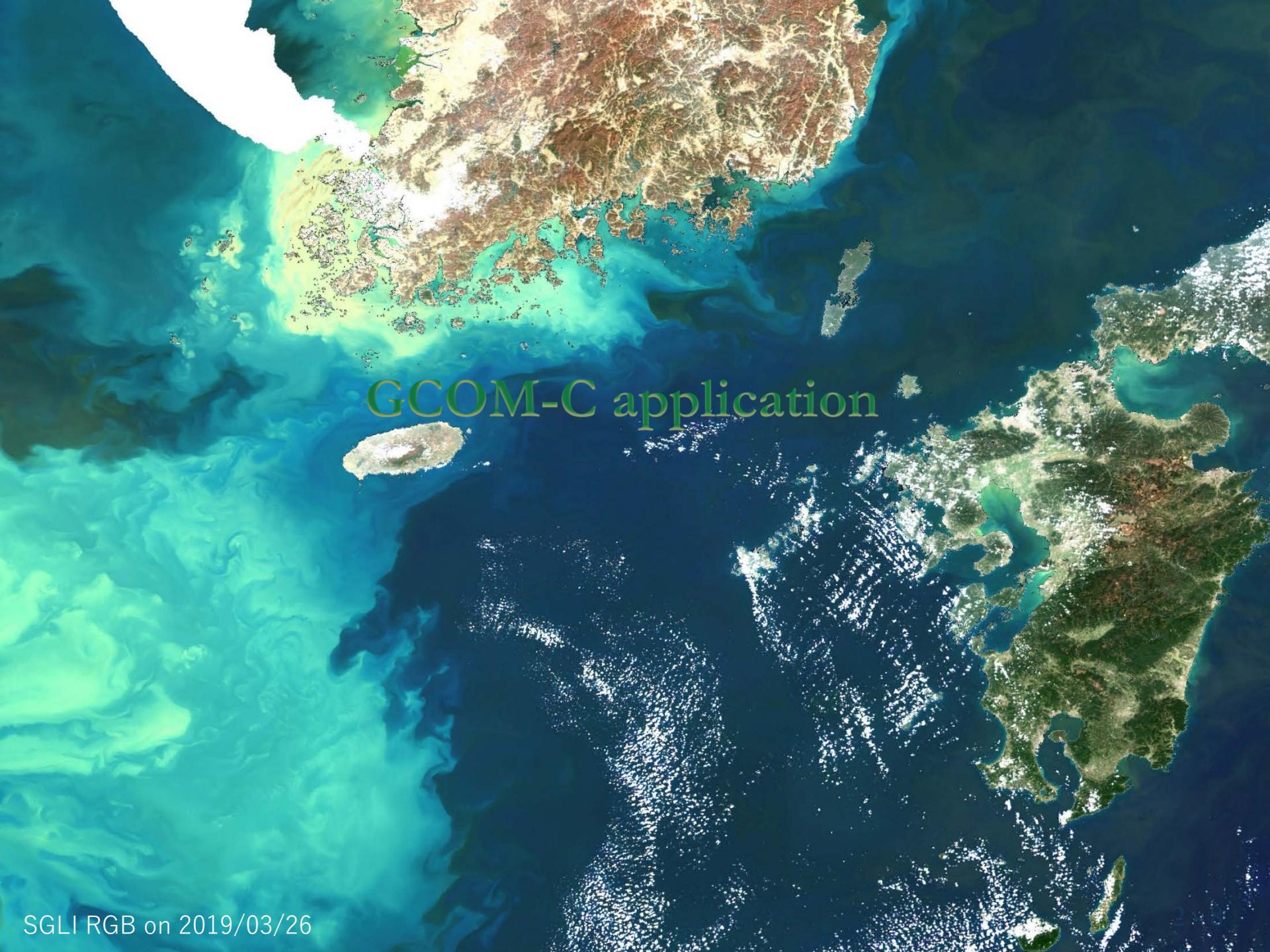


3. GCOM-C product distribution

- ✓ SGLI standard products have been released to the public via G-Portal (<https://gportal.jaxa.jp/gpr/>)

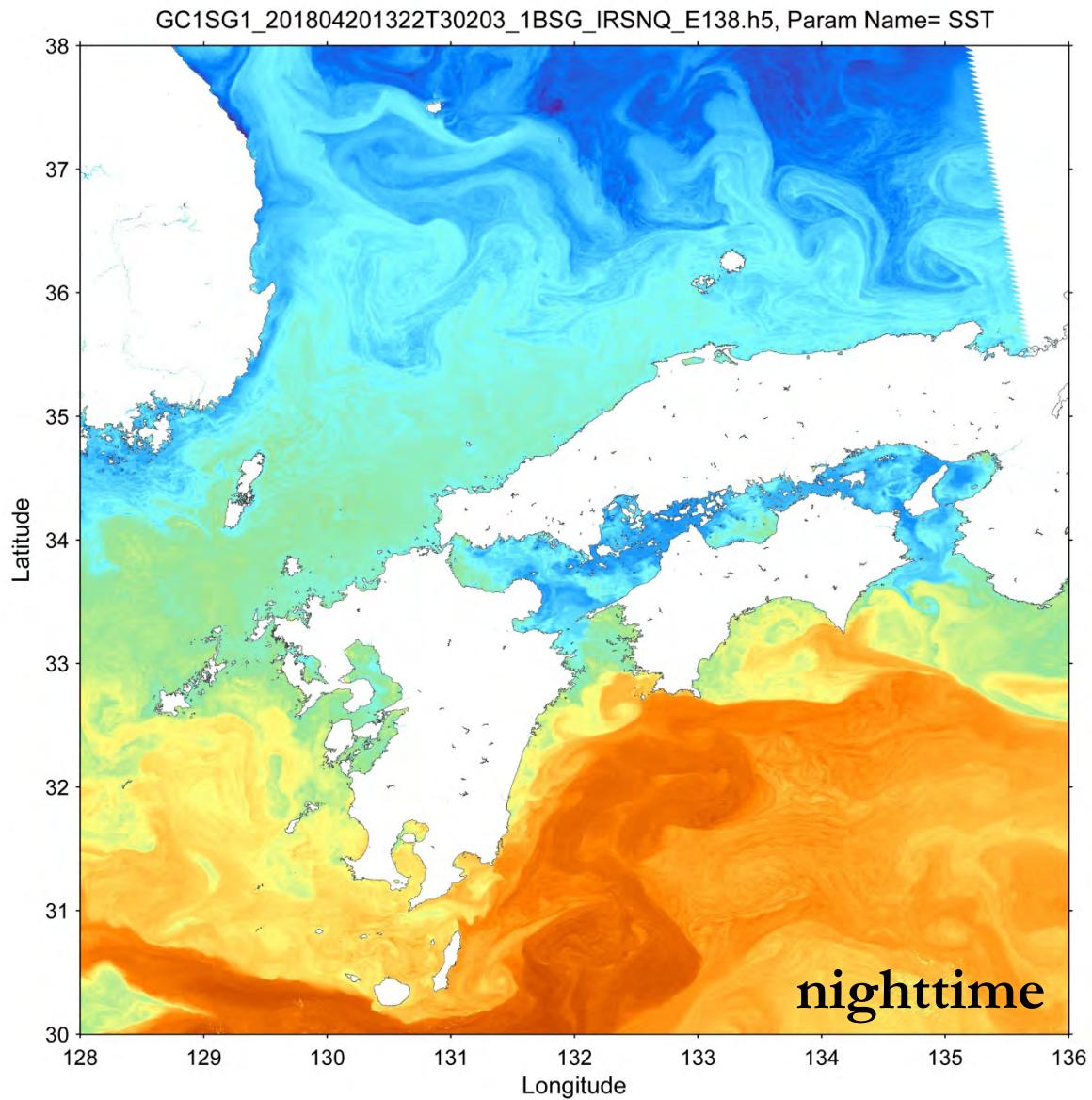
Level-2 Ocean product examples on 8 March 2019





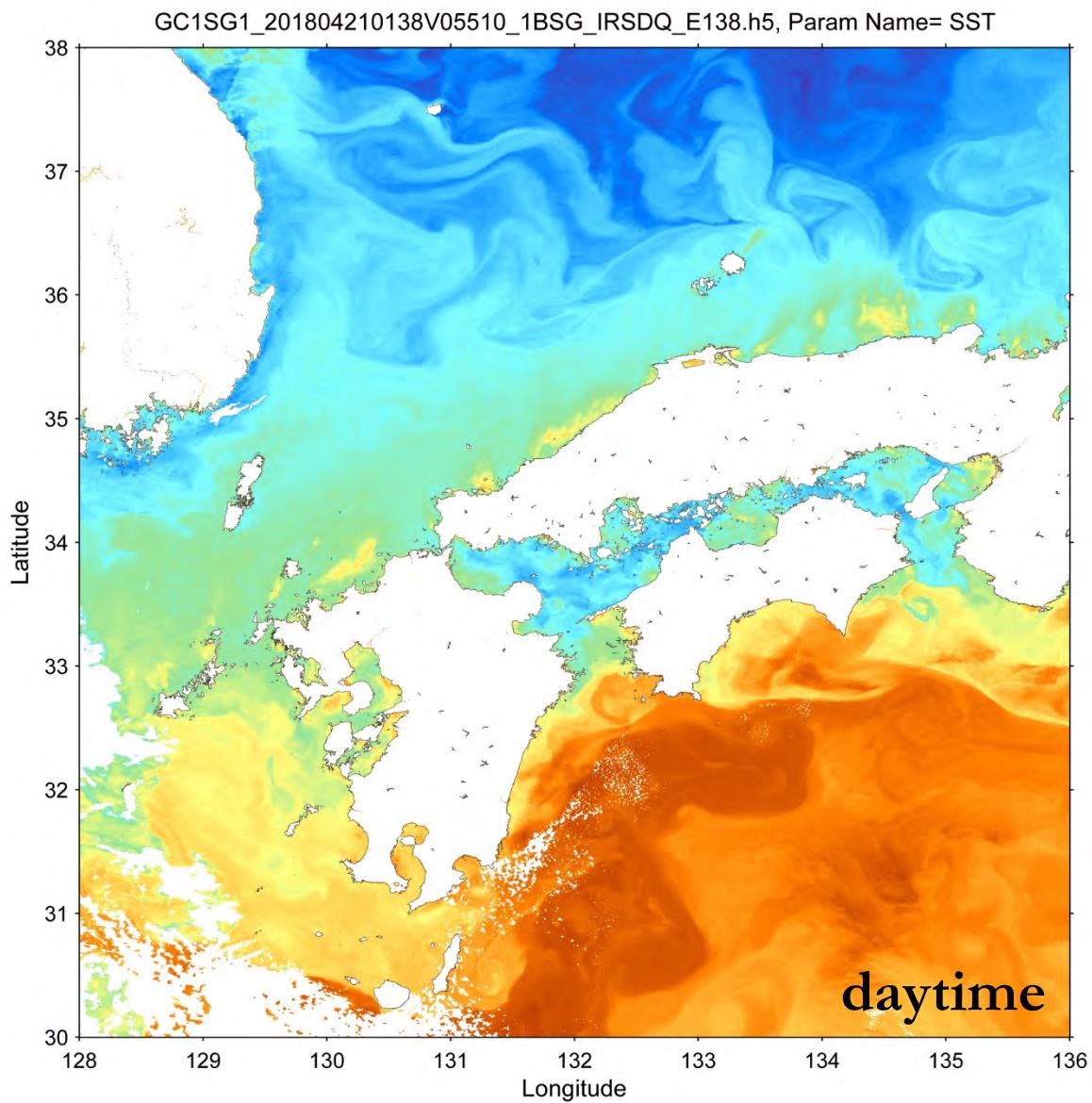
GCOM-C application

4. GCOM-C application: 250-m coastal SST



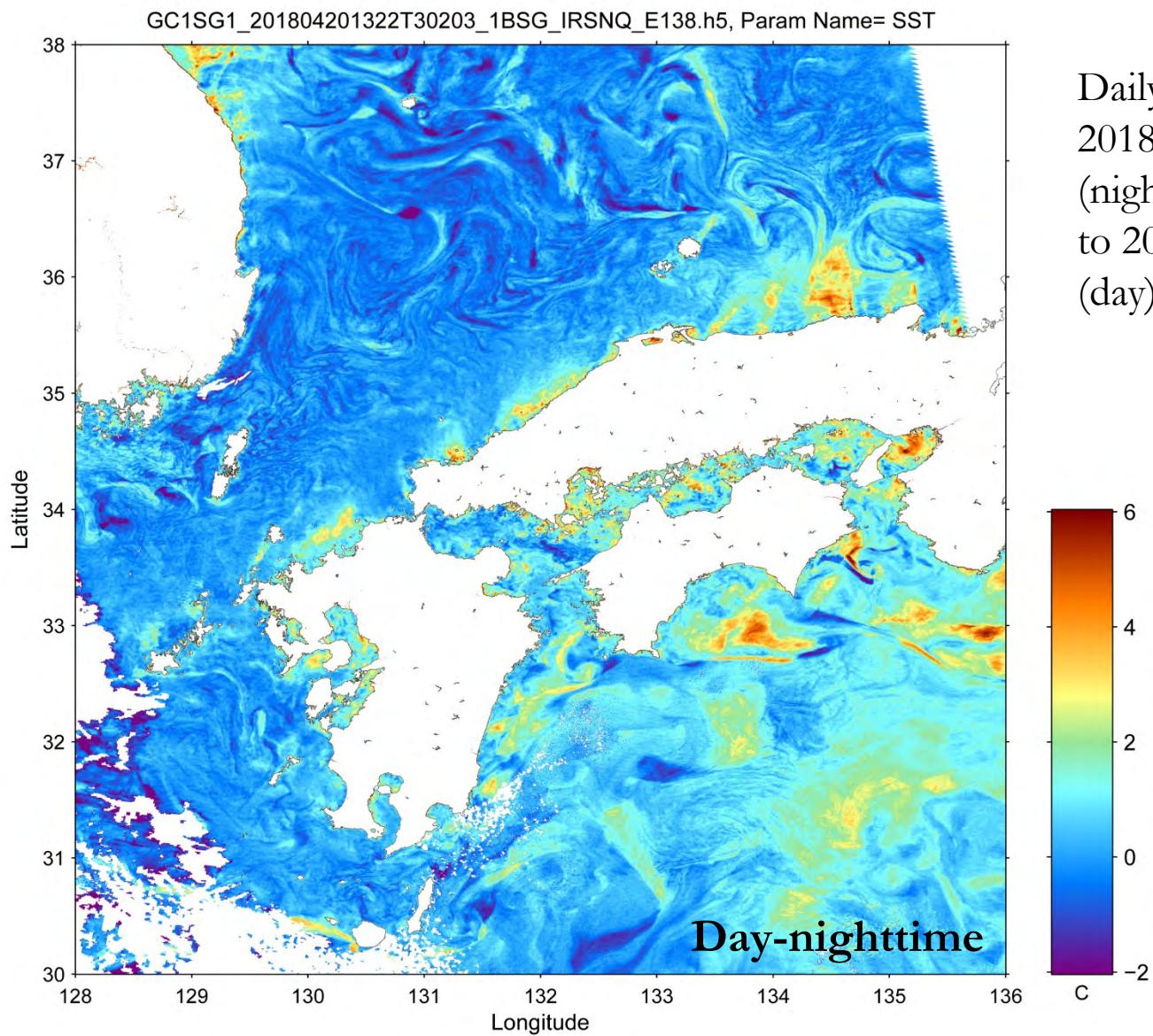
Daily change of SST from
2018/4/20 13:22 UT
(night)
to 2018/4/21 01:38 UT
(day)

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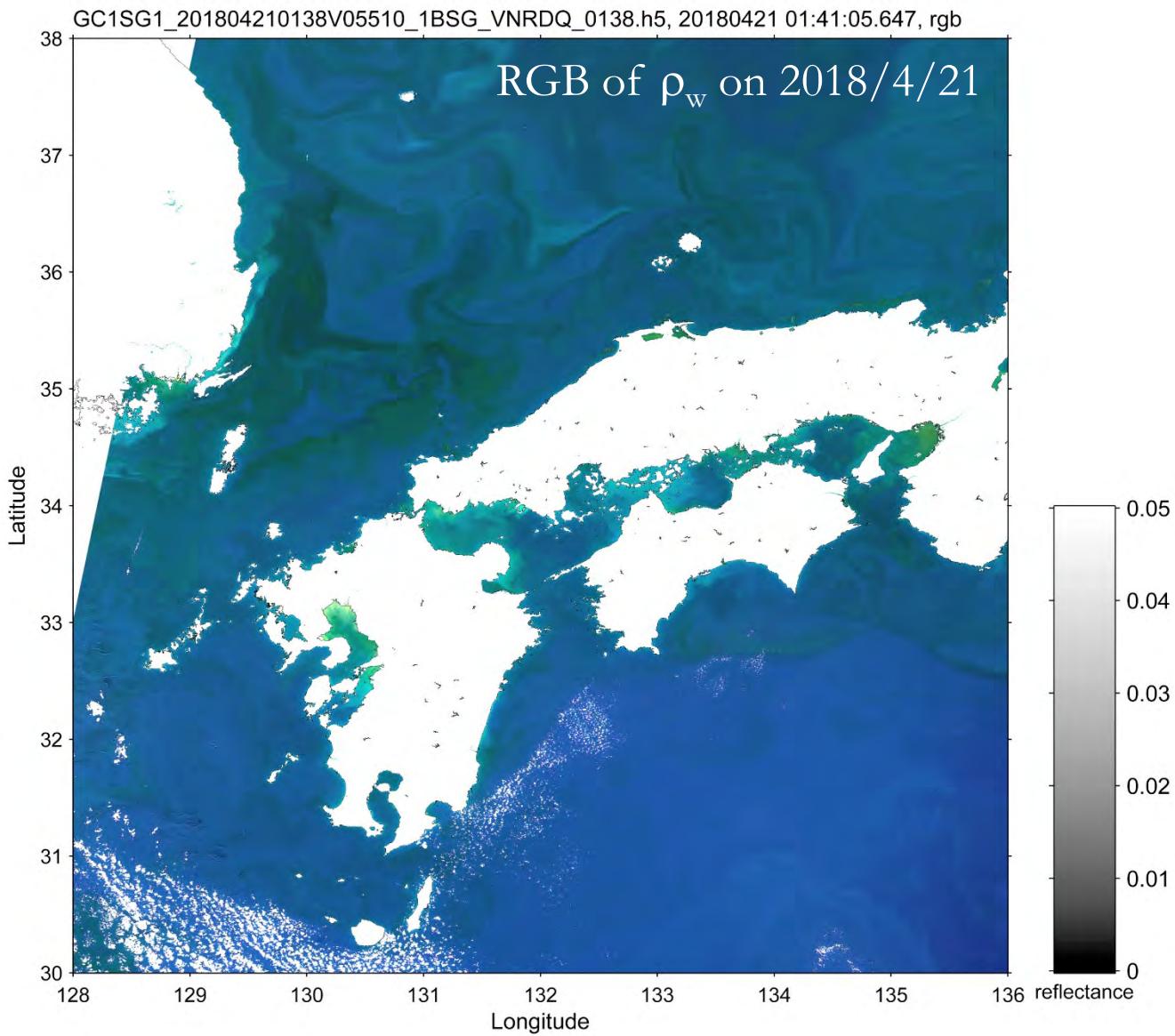
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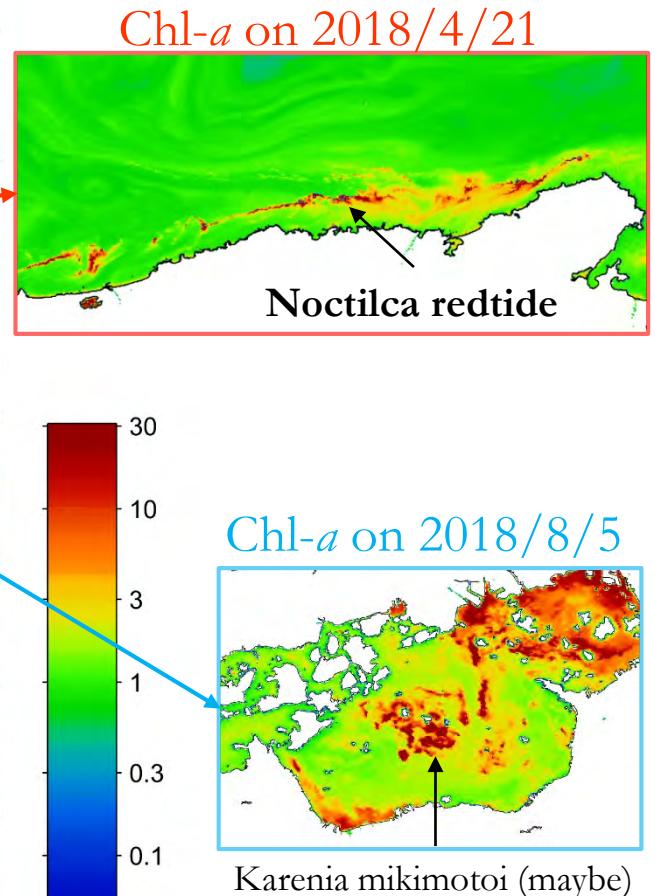
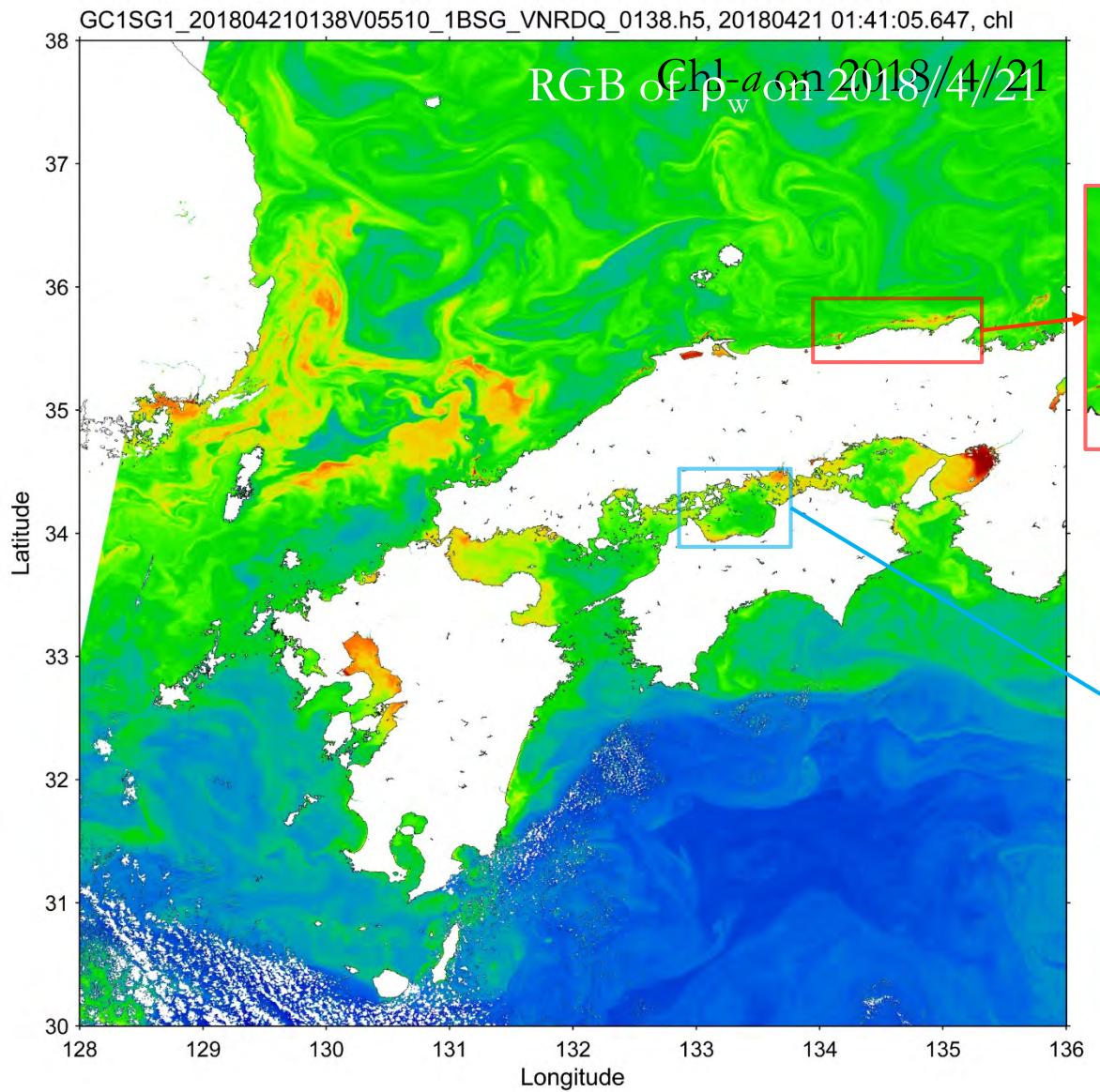


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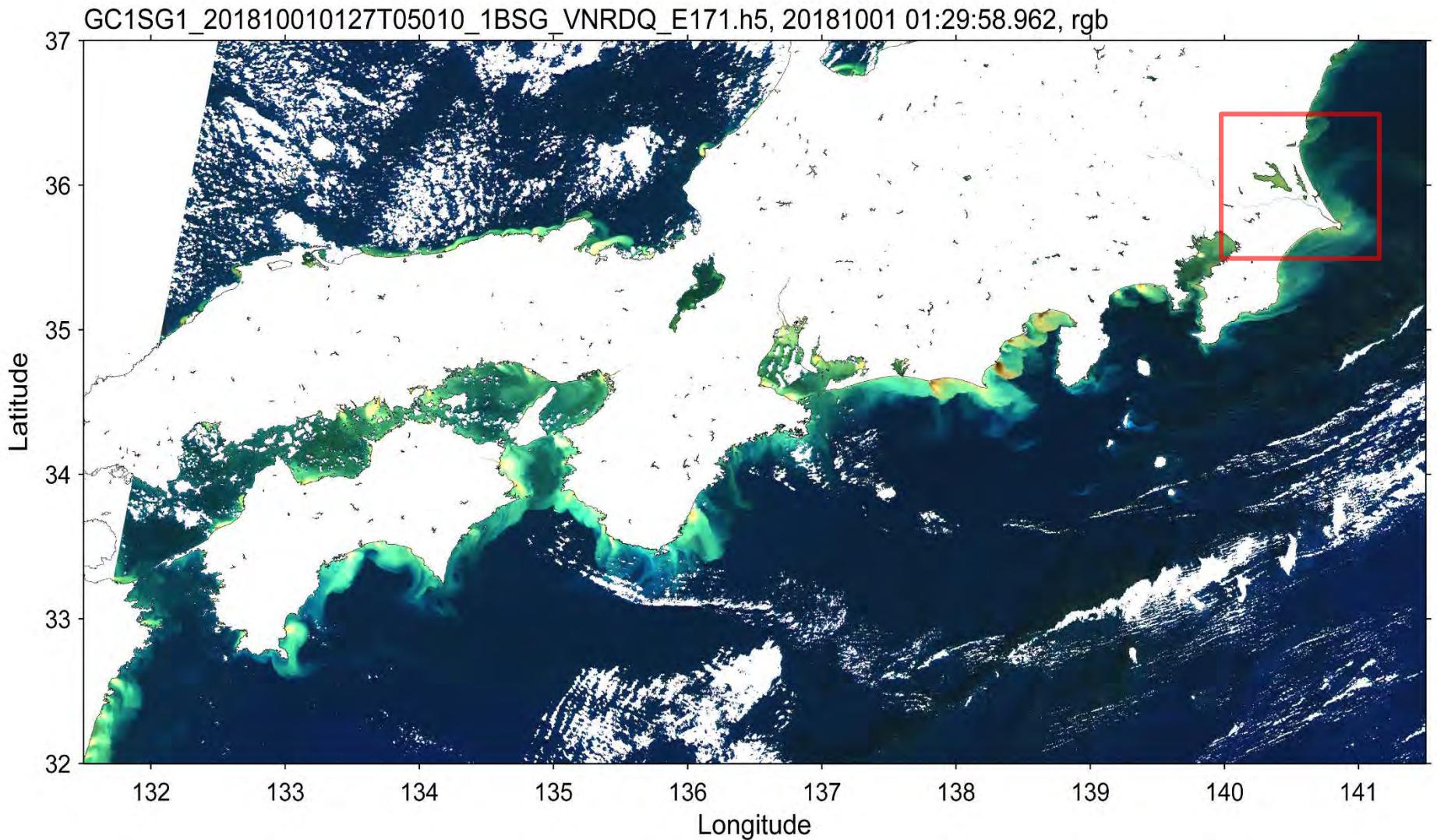
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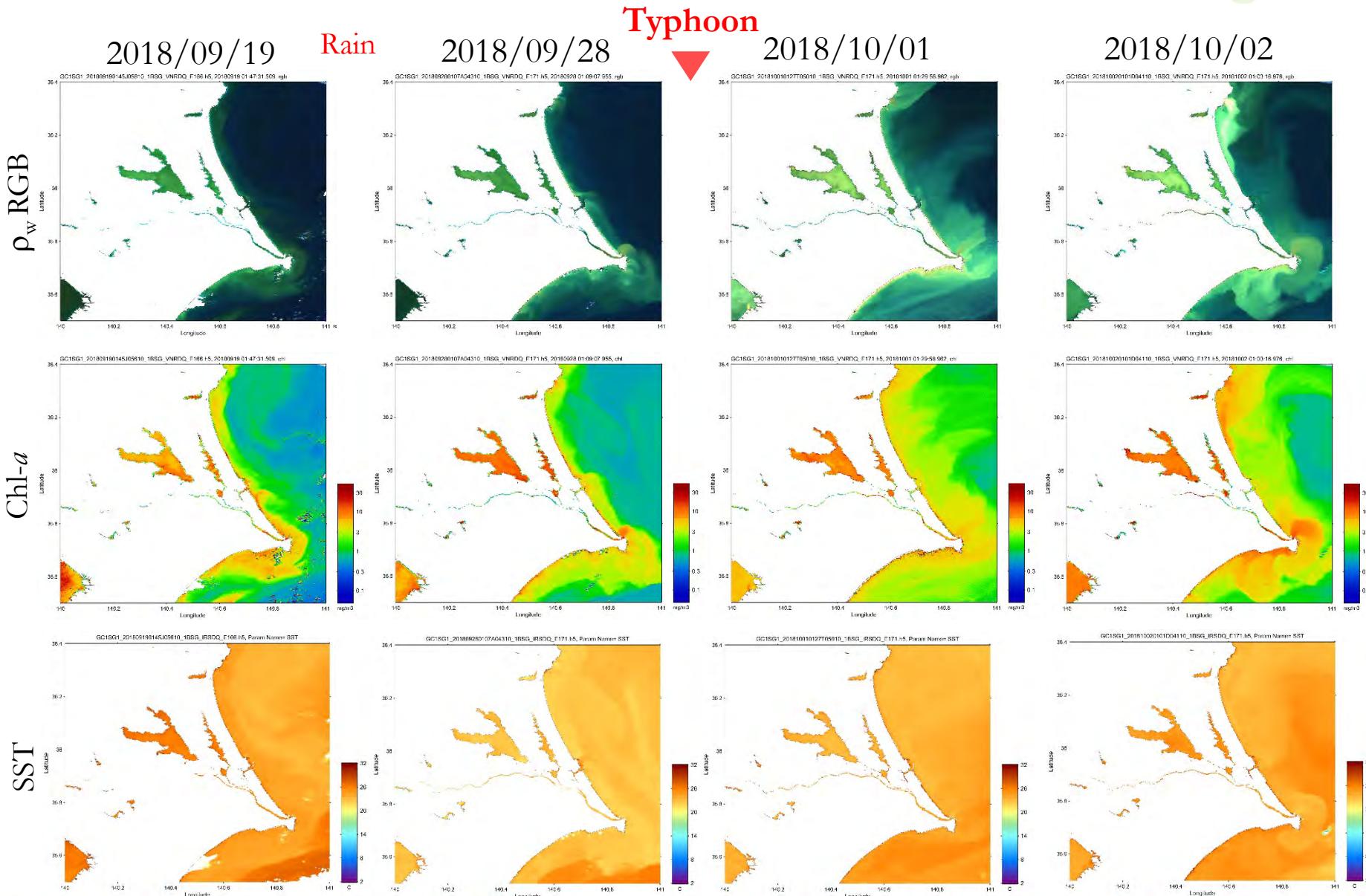


4. GCOM-C application: Coast and Lake



- ✓ Large river discharge after the heavy rain (Typhoon) on 2018/10/01

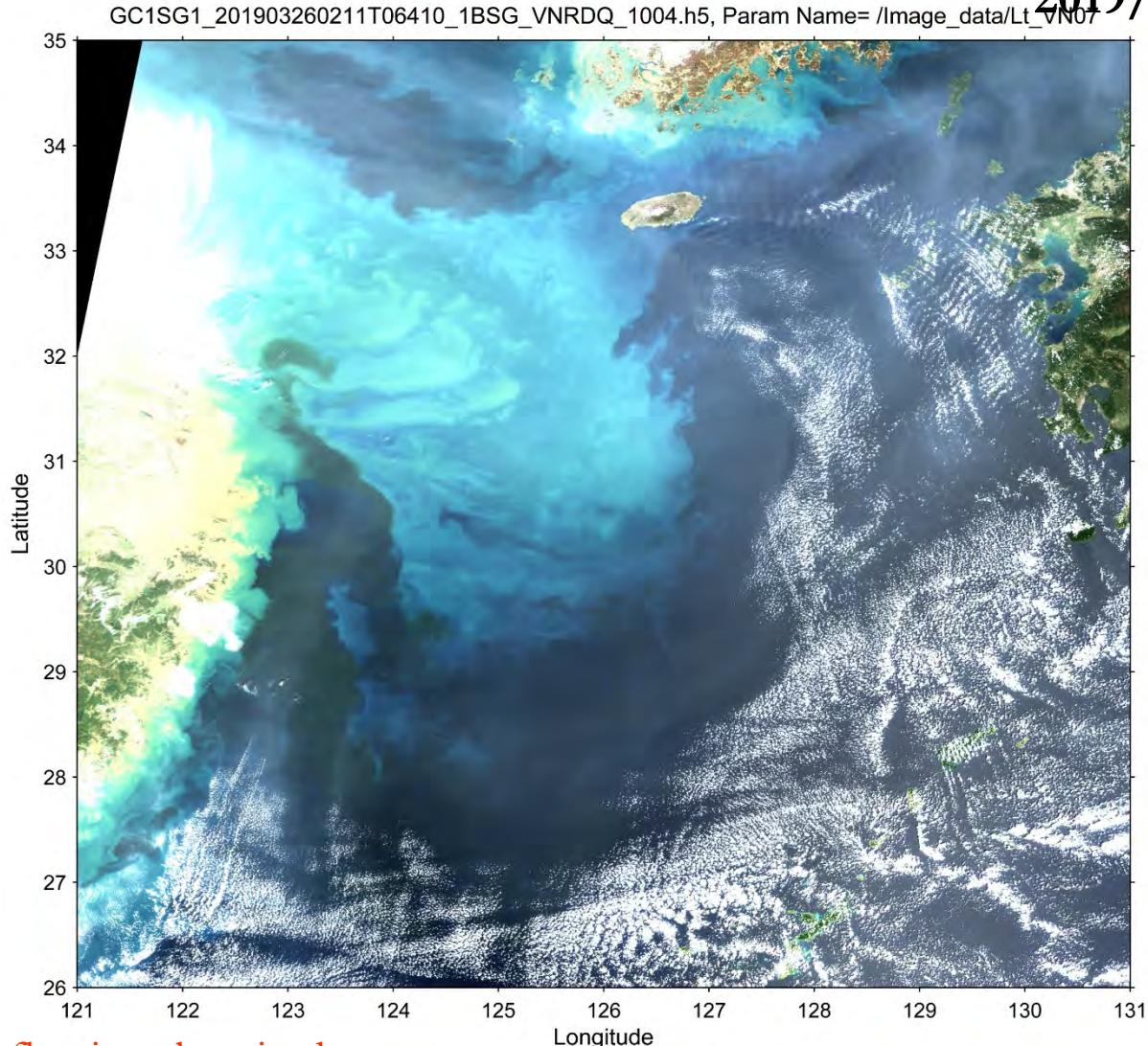
4. GCOM-C application: Coast and Lake



4. GCOM-C application:

Floating Algae in the East China Sea

2019/03/26



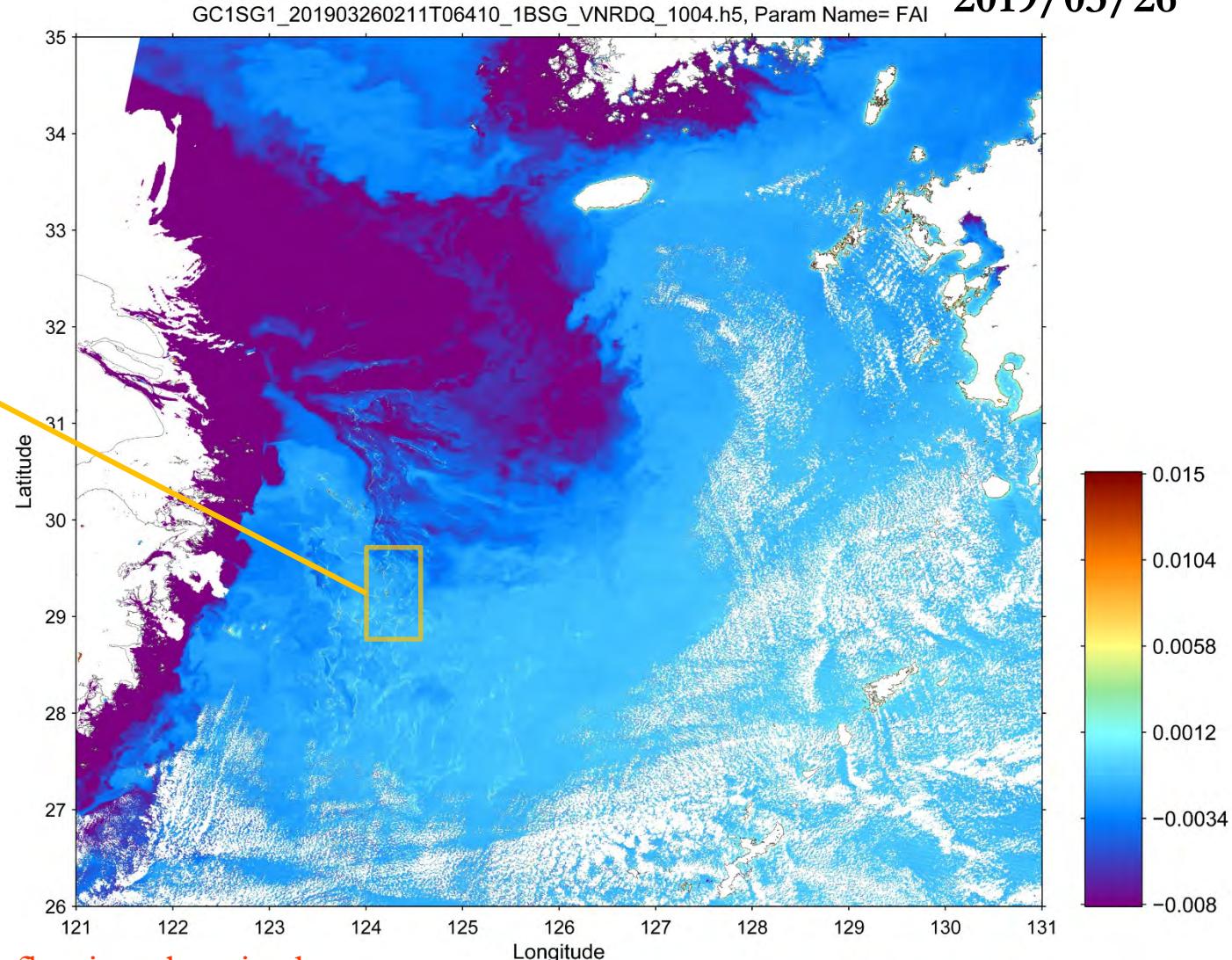
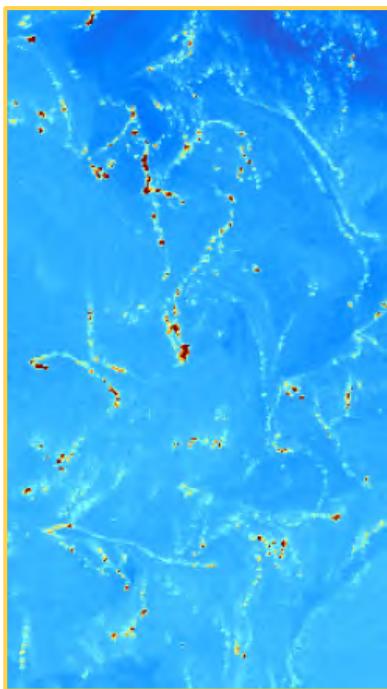
- ✓ SGLI captured many floating algae in the East China Sea in the Spring 2018 and 2019

Floating Algae Index (C. Hu, 2009)

4. GCOM-C application:

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2019/03/26

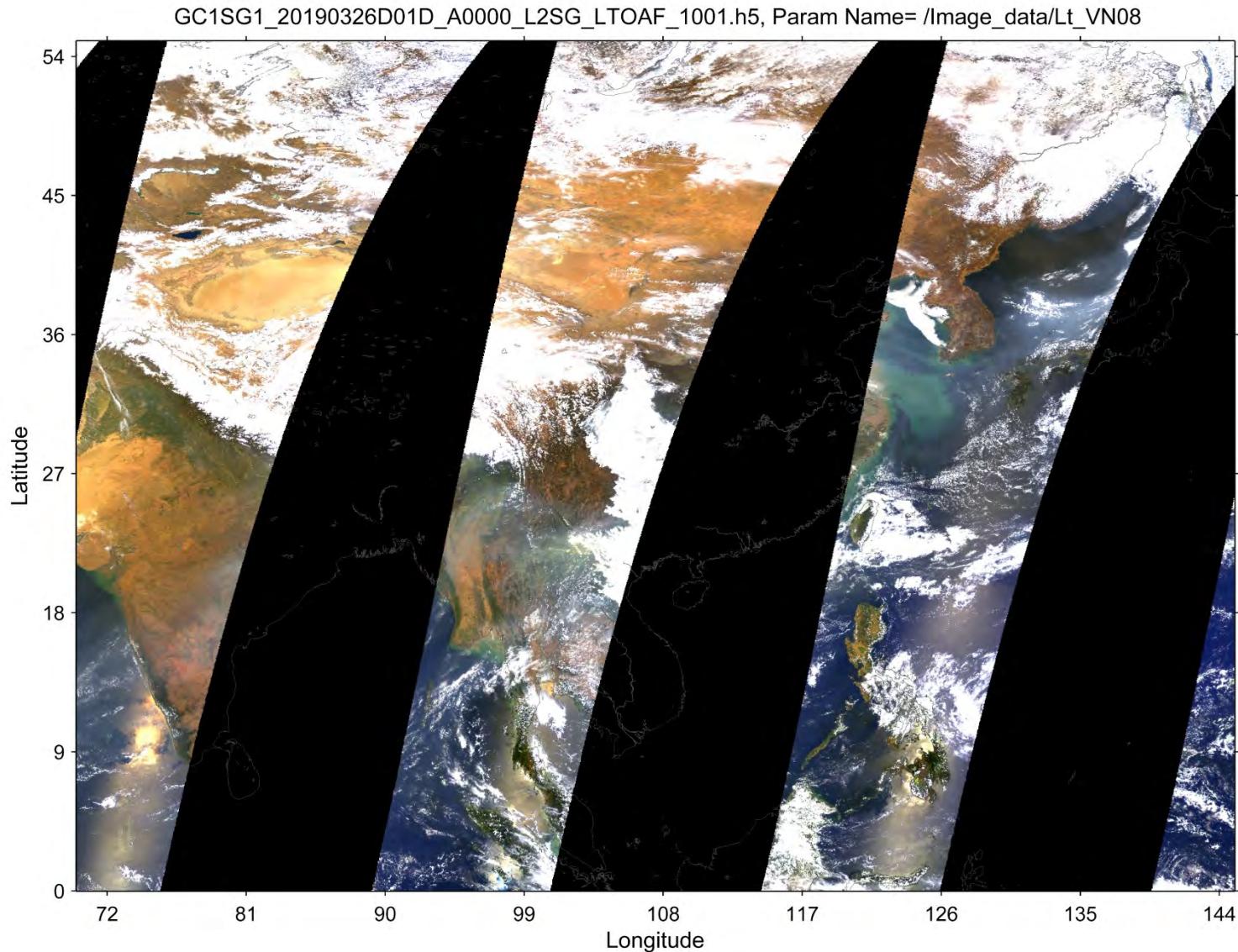


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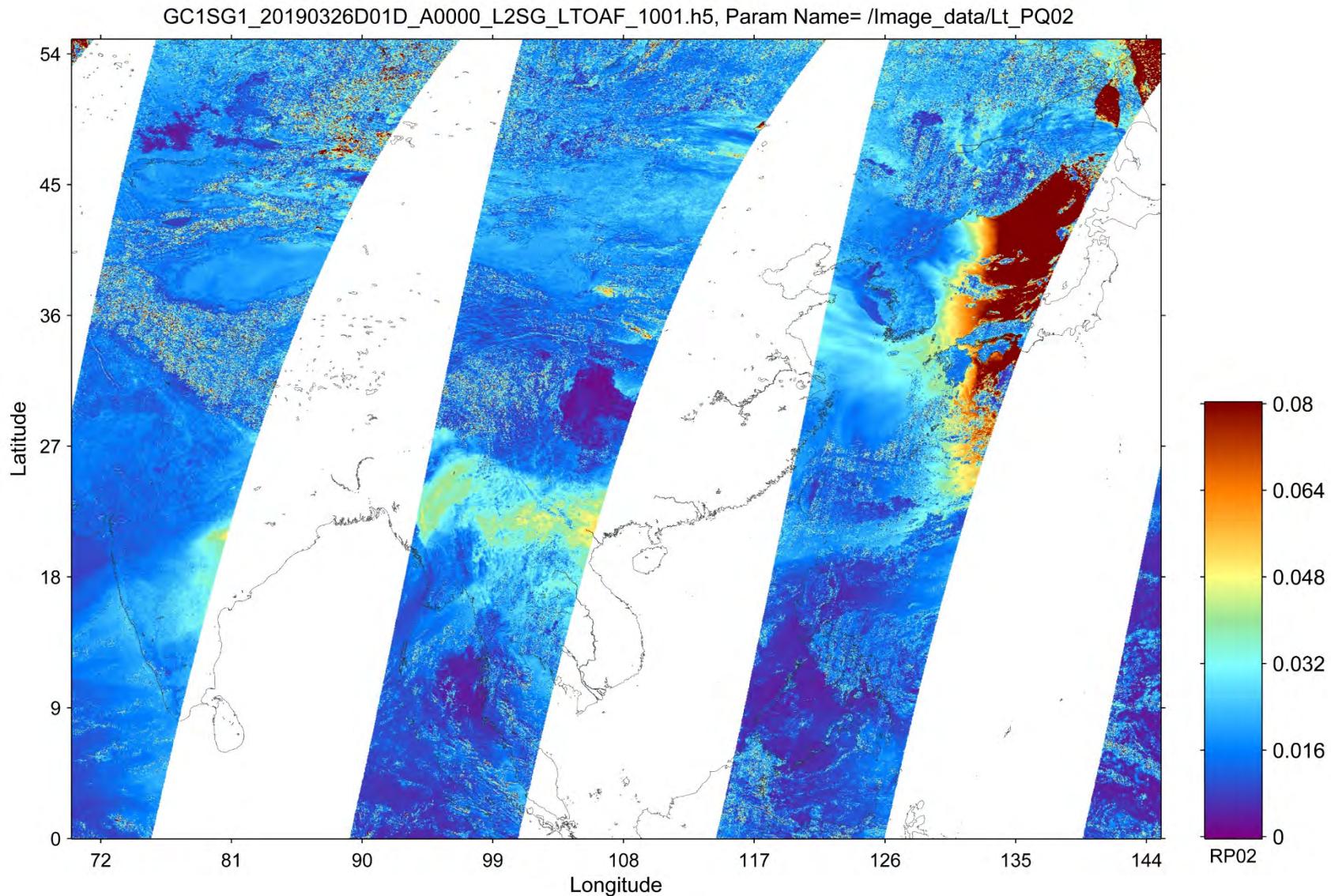
4. GCOM-C application: Possibility of polarimetry

GCOM-C
Global Change Observation Mission - Climate



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GCOM-C
Global Change Observation Mission - Climate



6. Summary

- GCOM-C/SGLI has been operated continuously since 1st Jan 2018
- GCOM-C standard products have been open through G-portal (<https://gportal.jaxa.jp/gpr/>) since 20 December 2018
- In the initial one-year operation of GCOM-C/SGLI, it has demonstrated 250-m resolution observation in the coastal areas:
 - Red tides around Japan,
 - River discharge after the heavy rain,
 - Floating algae in the East China Sea,
 - New application of the polarimetry (?)...
- Further quantitative applications need more investigation about relationship between coastal/local phenomena and optical characteristics