The status and initial validations of GOCI-Ⅱ

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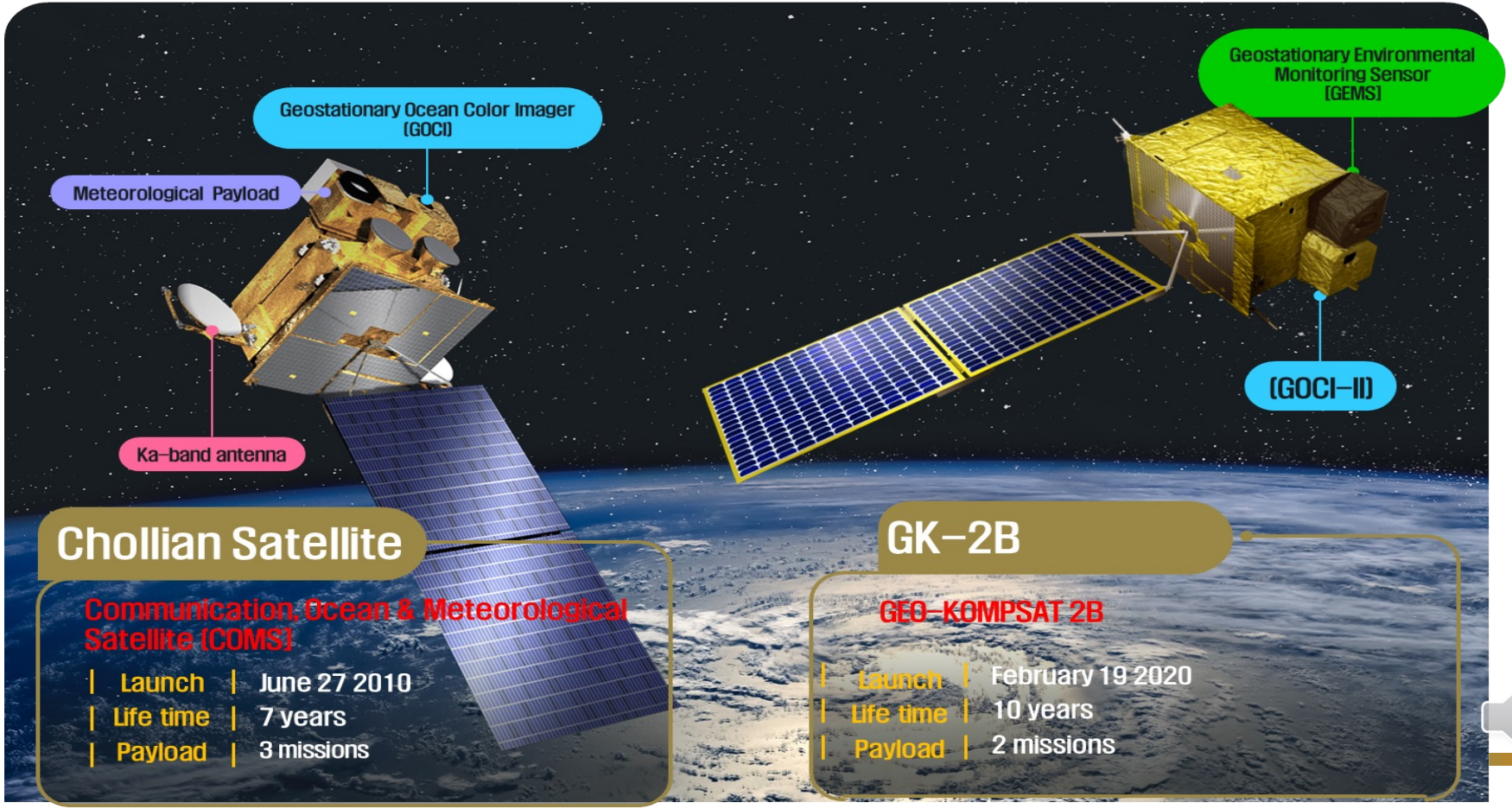
Jong-Kuk Choi (with all NOSC and KOSC staffs)

KOSC

I. Overview

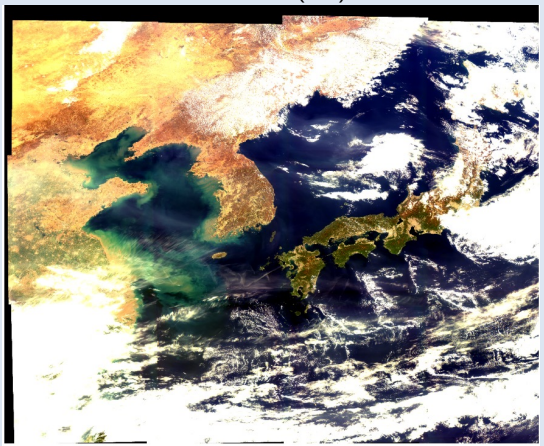
Overview of GOCI/GOCI-II



Current Status of GOCI/GOCI-II

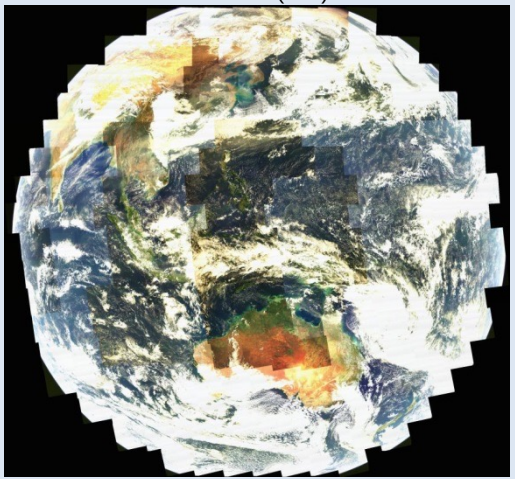
	~2019	2020	2021	2022~2030
GOCI	in operation		※ mission officially ended in March, 2021	
GOCI-II	prelaunch	launch → IOT	Public service for Level 1 data (Oct. 2020, KHOA)	
			Public service for 26 products (Jan. 2021, KHOA)	

GOCI-II(LA)



13:15, 23 March 2020, (KST)

GOCI-II(FD)



14 March 2020

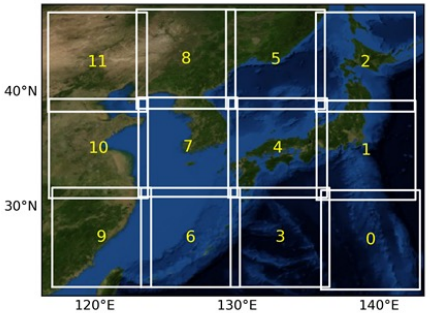
* KHOA : Korea Hydrographic and Oceanographic Agency

GOCI/GOCI-II Specifications

	GOCI	GOCI-II
Observation mode	Local (2,500 km × 2,500 km) -	Local (2,500 km × 2,500 km), Full Disk (12,800 km × 12,800 km)
No. of slot	16 slots / Local –	12 slots / Local, 235 slots / Full Disk
Spatial resolution	500 m	250 m
Temporal resolution	8 times / Local (00:15 UTC ~ 07:15 UTC) -	10 times / Local (23:15 UTC ~ 08:15 UTC) 1 time / Full Disk (20 UTC~ 10 UTC)
Spectral resolution	412 nm, 443 nm, 490 nm 555 nm, 660 nm 680 nm, 745 nm, 865 nm	380 nm, 412 nm, 443 nm, 490 nm 510 nm, 555 nm, 620 nm, 660 nm 680 nm, 790 nm, 745 nm, 865 nm Wide Band

Observation Mode

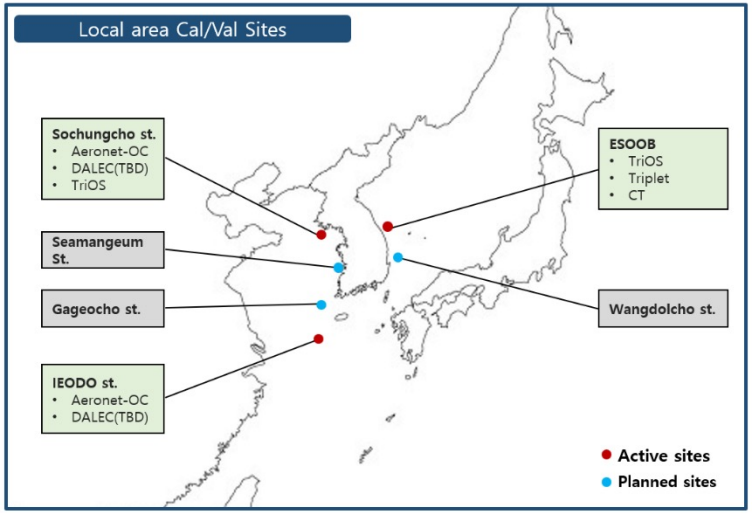
Local Area (LA)

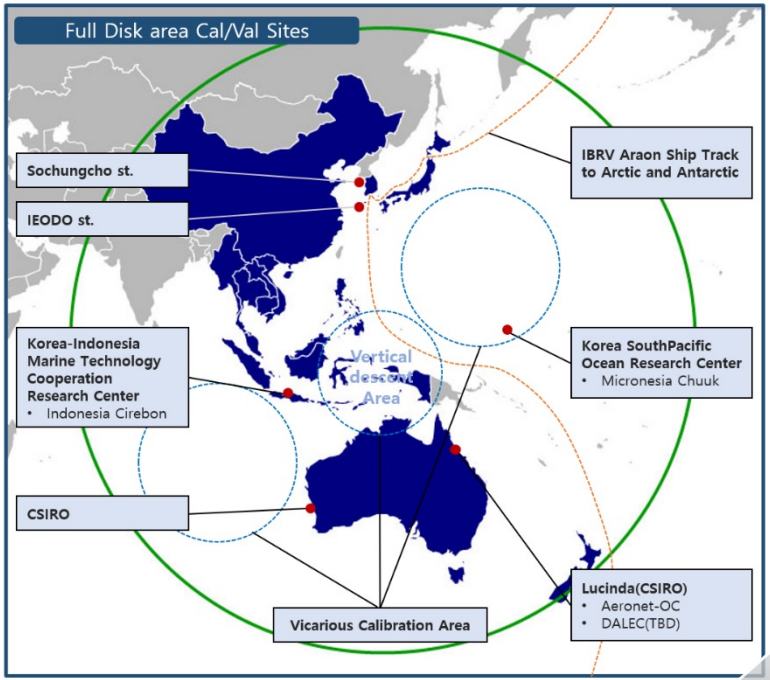


Full Disk (FD)

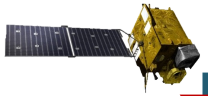
Collection of CAL/VAL data

Plan for collecting CAL/VAL data





Project on GOCI-II accuracy enhancement



GOCI-II Launch (2020.02)

Rrs, CHL, TSM, CDOM (basic ocean color products) have been generated and publicly provided without securing accuracies

GOCI-II mission life time ('20~'29, 10 years)

	'15	'16	'17	'18	'19	'20	'21	'22	'23	'24	'25	'26	'27	'28	'29	'30
GOCI-II	algorithms for 26 GOCI-II products were developed using simulation data (initial algorithm not validated)							'Accuracy enhancement of GOCI-II'								

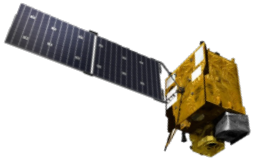
Establishing Cal/Val standardization and improving accuracy at international level

- Development of technology for cal/val of GOCI-II products
- Research on algorithm improvement for GOCI-II products
- Development of atmospheric correction technique based on the integration of GeoKompsat-2A/2B

GOCI-II 26 L2 products

Category	Products	Abbreviation
AC	Rayleigh Corrected Reflectance	R_{hoC}
	Remote Sensing Reflectance	R_{rs}
	Absorption Coefficients	A
	Backscattering Coefficients	B_b
OC	Diffuse Attenuation Coefficient	K_d
	Secchi Disk Depth	Z_{sd}
	Chlorophyll-a Concentration	Chl
	Total Suspended Material Concentration	TSS
	Colored Dissolved Organic Matter	CDOM
OCEAN	Floating Algae	FA
	Marine Fog	MF
	Red Tide Index	RI
	Sea Ice	SI
OCEAN	Primary Production	PP
	Chlorophyll-a Front	CF
	Sea Surface Current	SSC
	Low Sea Surface Salinity	LSSS
	Fishing Ground Information	FGI
AERO	Aerosol Optical Depth	AOD
	Aerosol Type, including DUST	AT
	Aerosol Type	
LAND	Land Surface Reflectance	LSR
	Land Surface Albedo	LSA
	Normalized Difference Vegetation Index	NDVI
	Enhanced Vegetation Index	EVI
	Land Cover	LC

Public Service for GOCI-II



GK-2B Satellite
35,786Km (128.2E)

Satellite operation
(KARI)

KOSC
(KIOST)

Generating L1, L2

NOSC
(KHOA)

GOCI-II Data Service

End User

WEB based service

Supporting organizatio n

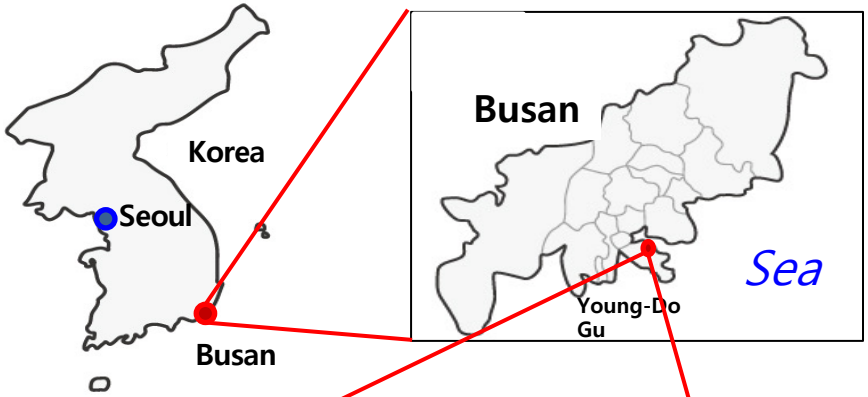
** National Ocean Satellite Center (NOSC) in Korea Hydrographic and Oceanographic Agency (KH*

National Ocean Satellite Center (NOSC)

NOSC (National Ocean Satellite Center) was established within KHOA (Korea Hydrographic and Oceanographic Agency) in May, 2019

- as a national satellite policy initiative for development and operation of ocean satellites
- a main host organization of the satellites GK-2B/GOCI-Ⅱ

→ *NOSC is in charge of GOCI-II data service*



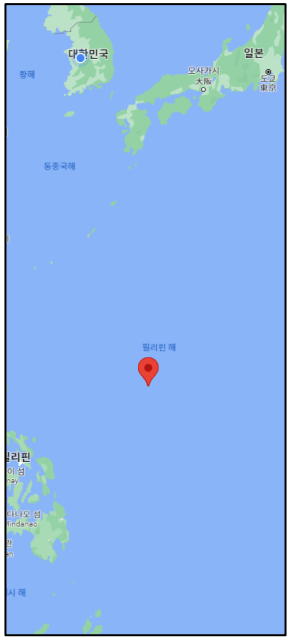
Public Service for GOCI-II by NOSC

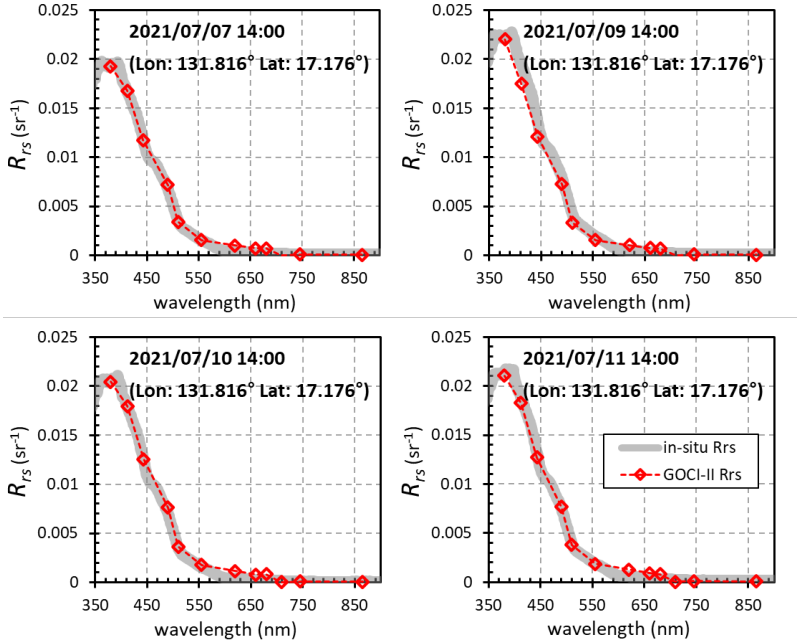
- **Establishment of new website and service is under planning to enhance user accessibility (From Oct. 2022)** **** webhard-based service is available until then***

II. Initial validation & activities

Initial validation for atmospheric correction

Some match-ups from the Philippine Sea (case-1) from ship





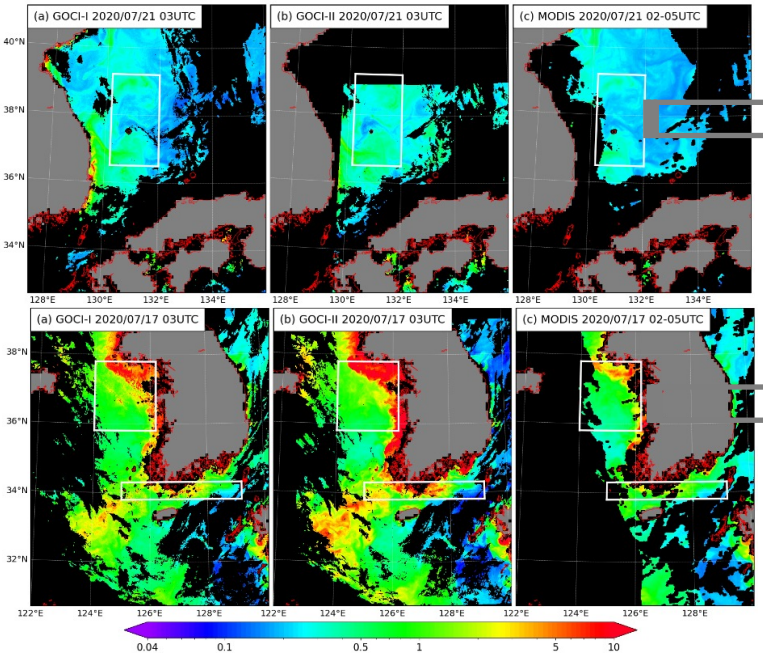
wavelength	MAPE (%)	RMSE (sr^{-1})
380 nm	7.9	0.00183
412 nm	3.5	0.00104
443 nm	3.9	0.00081
490 nm	5.7	0.00047
510 nm	7.7	0.00044
555 nm	8.9	0.00022
620 nm	150.5	0.00066
660 nm	167.8	0.00049
680 nm	183.1	0.00048

- blue (380~490 nm) and green (510, 555 nm) : highly accurate (92.7%)
- red (620, 660, 680 nm) : lower RMSE (avg. 0.000543) than blue and green (avg. 0.00082)

GOCI vs GOCI-II

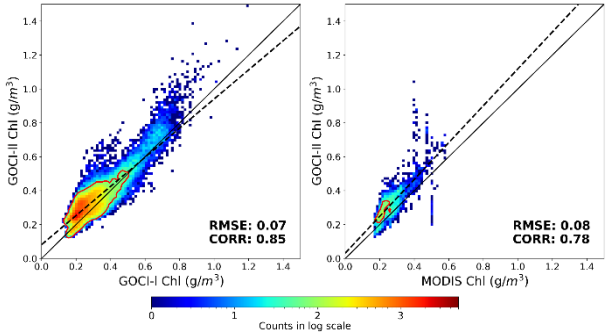
GOCI, GOCI-II, MODIS Chl-a (July 2020)

spatial distribution of GOCI-II CHL in Yellow Sea, South Sea and Ulleung Basin showed a good agreement with those of GOCI and MODIS

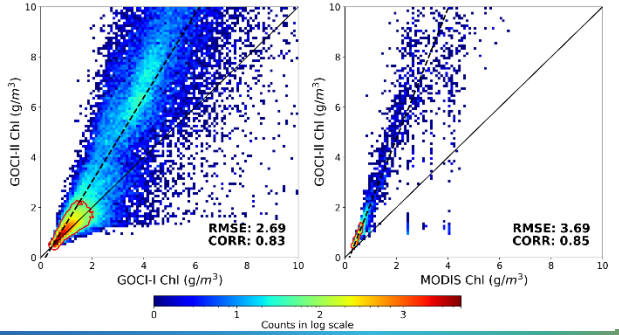


Park et al. 2021 (KJRS)

Case I water : low uncertainty and high correlation

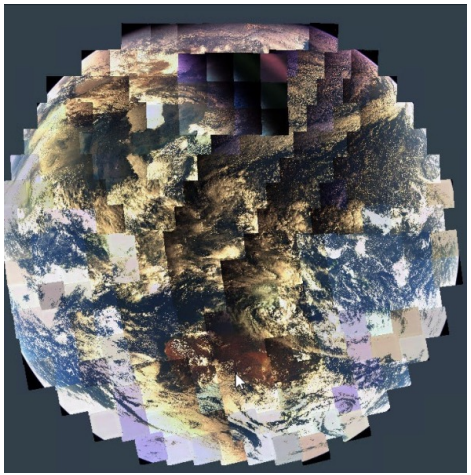


Case II water : GOCI-II showed overestimations

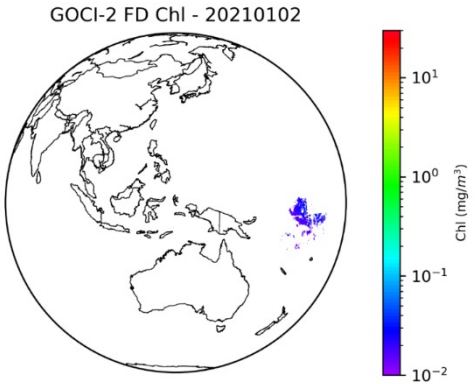


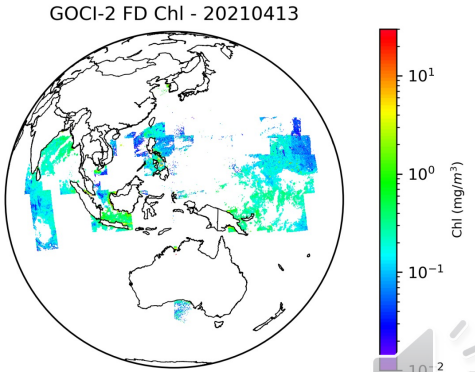
Full Disk Scheduling (1/2)

analyses on the initial schedule



Not captured
Atm. Corr. Failed
Low Quality of Atm. Corr.
Normal Quality of Atm. Corr.
High Quality of Atm. Corr.





Full Disk Scheduling (2/2)

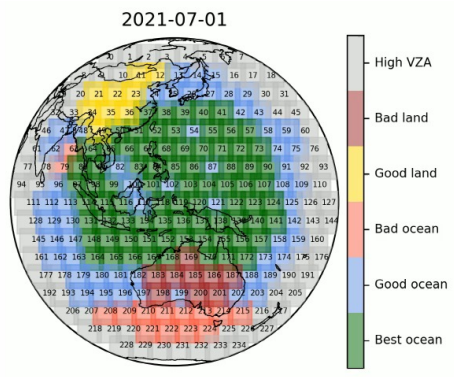
main adjustment

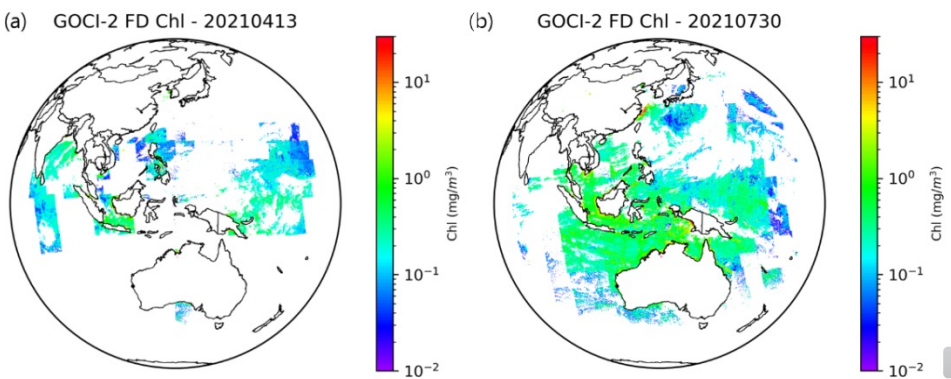
The considerations were subdivided as table, previously included only Solar Zenith Angle and Sun glint

→ more valid slots in the region of interest

Flag	Description
High VZA	VZA > 55 °
Bad land	land and SZA >= 70°
Good land	land and SZA < 70°
Bad Ocean	Glint > 0.006 or SZA >= 70°
Good Ocean	Glint < 0.006 and SZA < 70°
Best Ocean	Glint < 0.001 and SZA < 45° and VZA < 40°
Night	SZA > 80

* SZA (Solor Zenith Angle)
* VZA (Viewing Zenith Angle)
* Glint : Sun glint





Summary

- Mission of GOCI has officially ended at the end of March 2021, and GOCI-II data has been in public service since October 2020
- Atmospheric correction algorithm of GOCI-II showed a good performance in Case-I waters in terms of the comparison with matchups in the open sea
- GOCI-II CHL products were highly accurate with low uncertainties in Case-I waters and showed overestimation in Case-II waters in terms of the comparisons with GOCI and MODIS
- Adjusted FD schedule led to the acquisition of sufficient valid images in the open seas of Pacific region
- The quality management of FD uses research ships and overseas bases of KIOST, but it is necessary to establish an international CAL/VAL network

Thank you !!!