Present Status of GOCI and Preliminary GOCI-2 Mission & User Requirements

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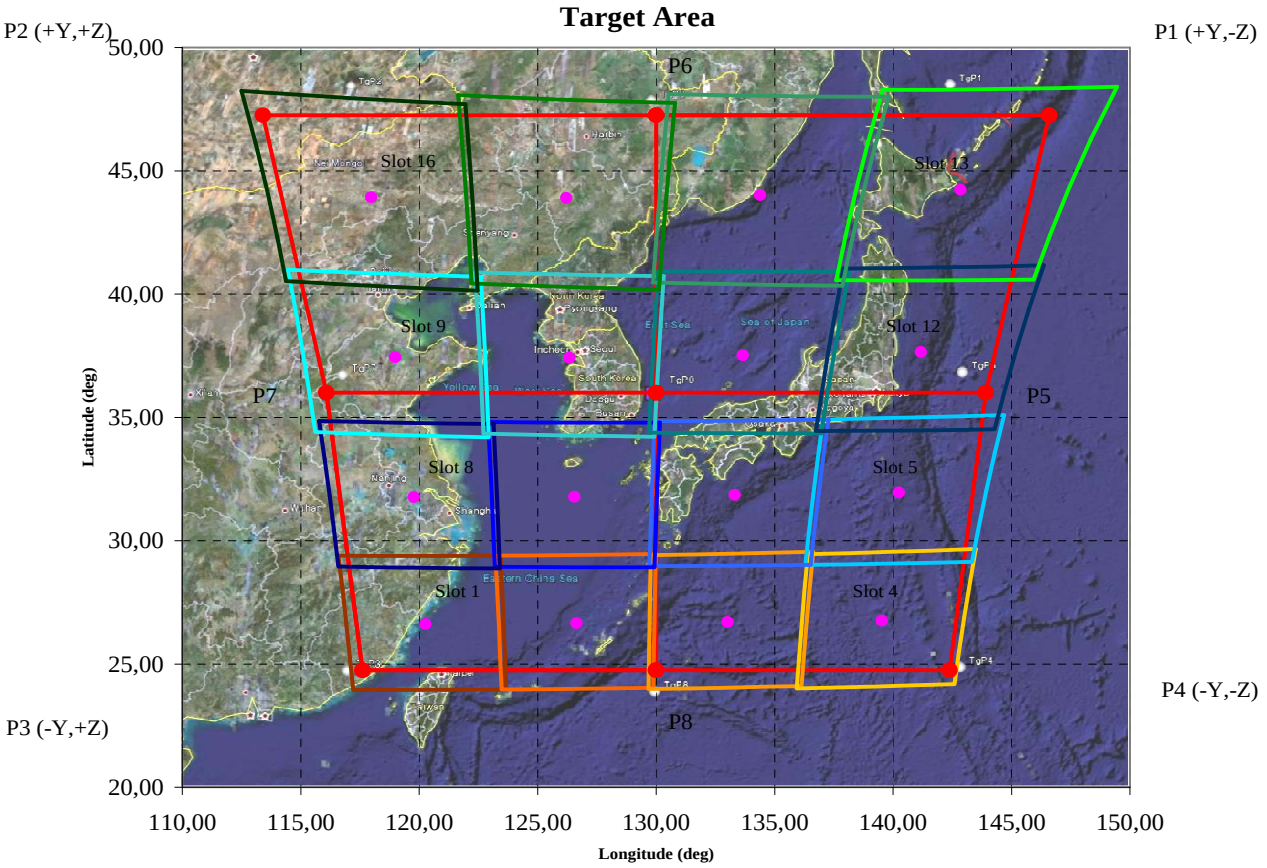
Mission of GOCI

- Detecting, monitoring and predicting short term biophysical phenomena
- Studies on biogeochemical variables and cycle
- Detecting, monitoring and predicting noxious or toxic algal blooms of notable extension
- Monitoring the health of marine ecosystem
- Coastal zone and resource management
- Producing an improved marine fisheries information to the fisherman communities

User Requirements

- GSD : 500m x 500m
- Target Area : 2,500km x 2,500km



User Requirements

- **Spectral Requirements**
  - State-of-the-art filter fabrication techniques
  - Intensified Optical analysis to satisfy High SNR

Ch.	Band Center	Band width	SNR	Primary use
B1	412nm	20nm	1077	Yellow substance and turbidity
B2	443nm	20nm	1199	Chlorophyll absorption maximum
B3	490nm	20nm	1316	Chlorophyll and other pigments
B4	555nm	20nm	1223	Turbidity, suspended sediment
B5	660nm	20nm	1192	Baseline of fluorescence signal, Chlorophyll, suspended sediment
B6	680nm	10nm	1093	Atmospheric correction and fluorescence signal
B7	745nm	20nm	1107	Atmospheric correction and baseline of fluorescence signal
B8	865nm	40nm	1009	Aerosol optical thickness, vegetation, water vapor reference over the ocean

User Requirements

- Comparison with other Ocean Color Sensor
  - High ground resolution
    - Sufficient for coastal monitoring
  - Very long focal length
    - For high ground resolution at GEO
  - Relatively high SNR in the spec. level with low deviation
    - Longer integration time is required at GEO

Sensor	Focal Length	Ground resolution	SNR
OSMI	128.9mm	1km	350~450 (Spec.)
SeaWiFS	114.9mm	1km	800~1200 (PFT)
MERIS	67.3mm	1.2km/300m	400~1900 (PFT)
MODIS	114mm	1.0km/250m	900~1400 (PFT)
GOCI	1171mm	<500m	1009~1316 (Spec.)

GOCI vs. SeaWiFS (Common)

Central wavelength (nm)	SeaWiFS (bandwidth, nm)	GOCI (bandwidth, nm)	Primary Use
412	1(20)	1(20)	Yellow substance and turbidity
443	2(20)	2(20)	Chlorophyll absorption maximum
490	3(20)	3(20)	Chlorophyll and other pigments absorption, K(490)
510	4(20)		Chlorophyll absorption
555	5(20)	4(20)	Suspended sediment
660		5(20)	Fluorescence base 1, chlorophyll, suspended sediment
670	6(20)		Atmospheric correction
680		6(10)	Fluorescence signal, atmospheric correction
745		7(20)	Atmospheric correction, Fluorescence base 2
765	7(40)		Atmospheric correction, aerosol radiance
865	8(40)	8(40)	Aerosol optical thickness, vegetation, Water vapor reference over the ocean

Difference with SeaWiFS : 510nm not included, 670(20)nm -> 660(10)nm, 680nm added

Bandwidth of GOCI band6 (680 nm) is 10 nm for Flu. tech.

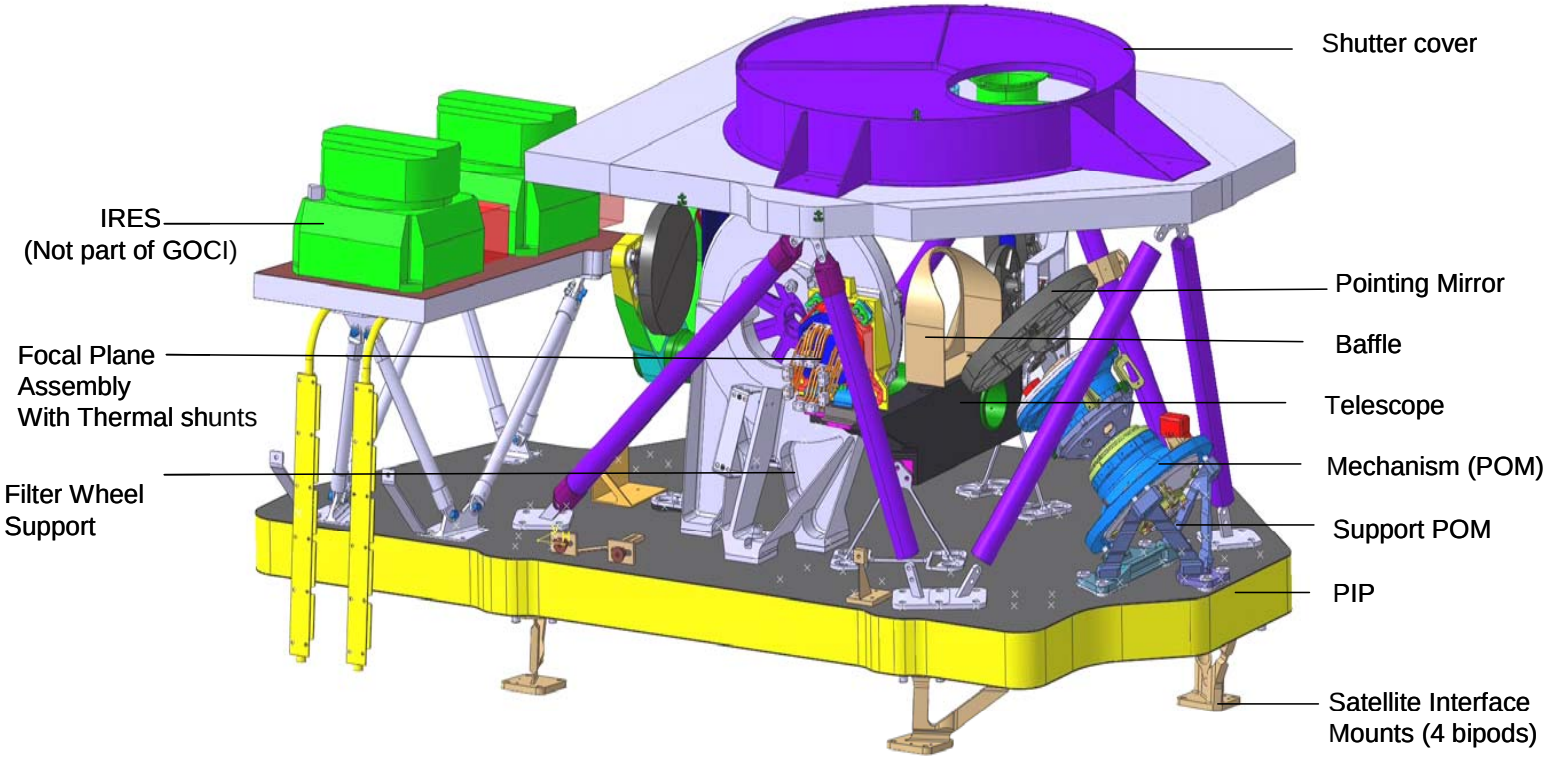
GOCI vs. SeaWiFS (Differences)

	SeaWiFS	GOCI
Altitude	700-800 km	36,000 km
Scanning type	1-axis scanning	Staring-frame capture
Spatial resolution	1000 m	500 m
Spectral range	400-900 nm	400-900 nm
Temporal resolution	1 day	1 hour
Sun-Satellite position	stable	variable
Coverage	global	Local
Previous algorithms	Case-1 (Case-2)	No previous result

Bi-directional correction & local bio-optical algorithm are required

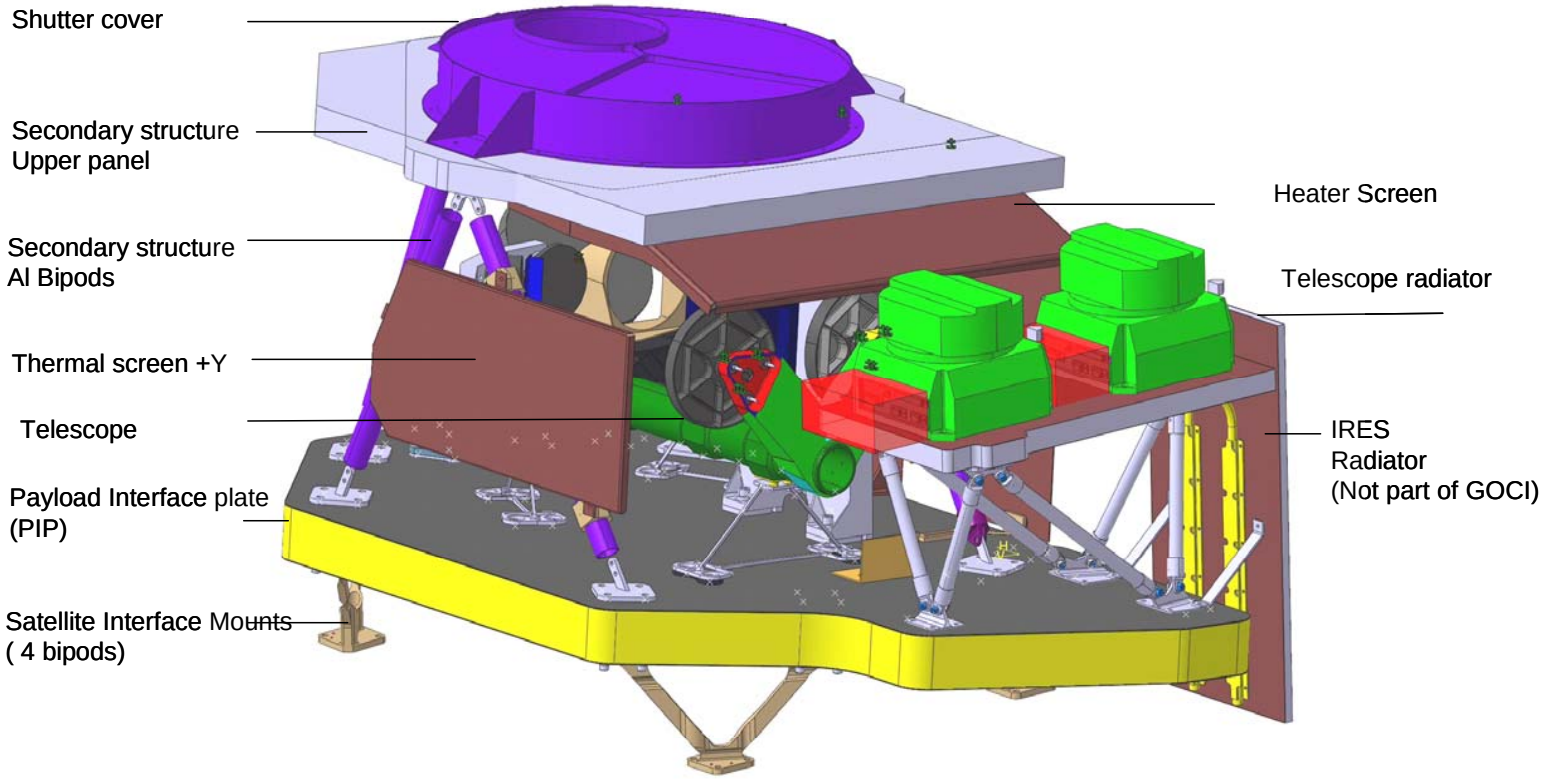
GOCI Design : Overview

- GOCI Main Unit Overview (1/2)
  - Mass Budget : 83.305kg
  - Power Budget : 106W (Max)



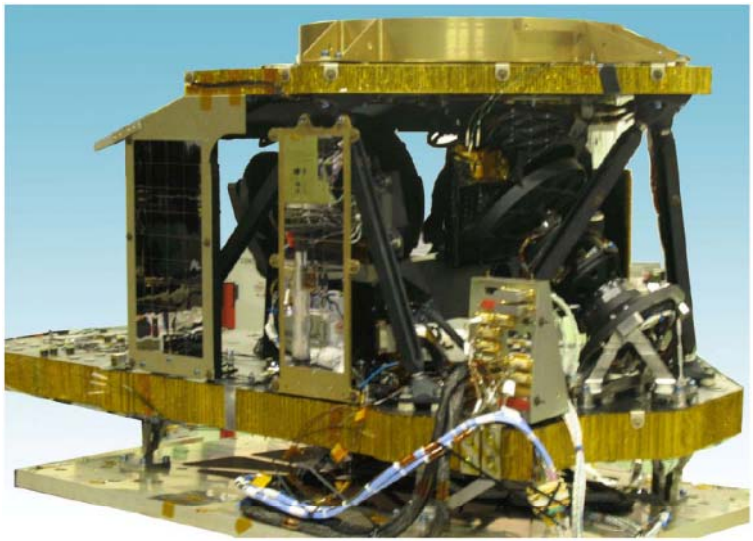
GOCI Design : Overview

- GOCI Main Unit Overview (2/2)
  - Mass Budget : 83.305kg
  - Power Budget : 106W (Max)

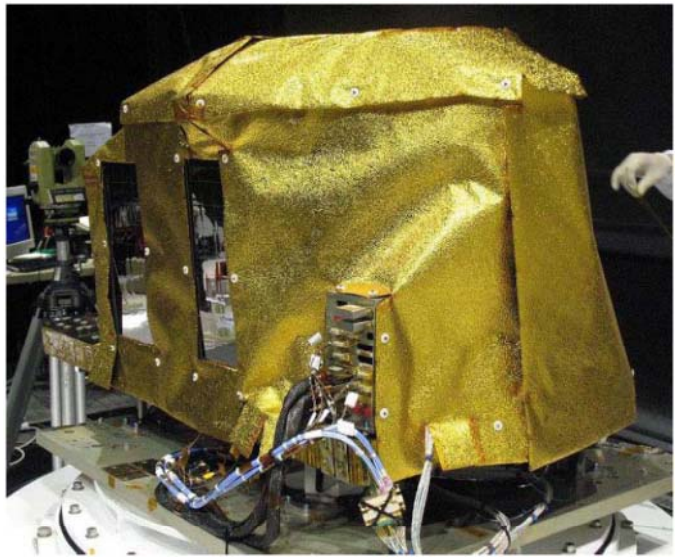


GOCI Development

- **GOCI Assembly and Integration**
  - No discrepancy in GOCI subsystem level test & integration.
  - GOCI Integration is successfully completed.



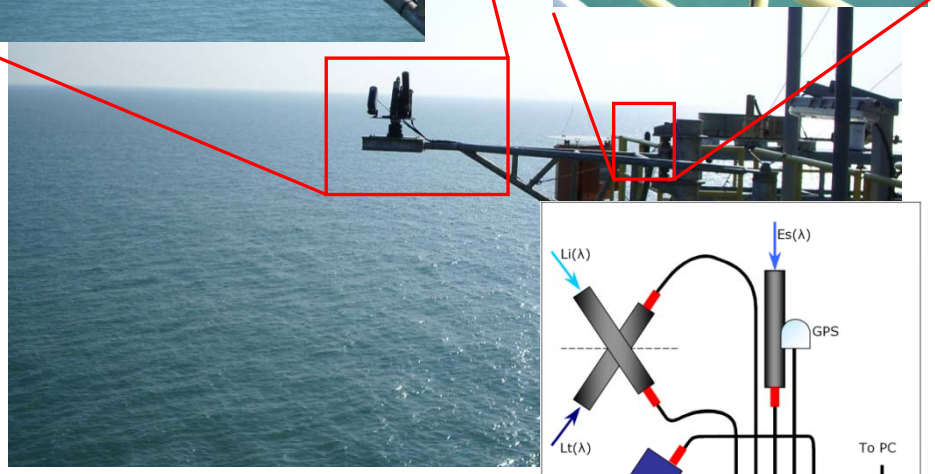
GOCI Main Unit before MLI Mounting



GOCI Main Unit with MLI

Cal/Val Activity for GOCI

- Lw and Ed obtained from spectroradiometer of IEODO & GAGEOCHO(2009) Ocean Research Station
- SeaPrism(Cimel, France) will be installed.



Following Activities

- Straylight at B2, B3 and Ghost at B6, B8 has been characterized by KORDI/KARI/Astrium and ground processing S/W will be developed by KORDI.

- Updated radiometric calibration algorithm and MTF De-convolution algorithm will be verified during IOT(In Orbit Test) period.

- Launch Schedule : Early 2010

GOCI-2 Mission & User Requirements

GOCI-2 Mission

- Succession and expansion of the GOCI missions
- Global Area (Full Disk)
  - Establishment of Ocean Observation System to monitor long-term climate change

    Evaluation of the Primary Productivity in Ocean -> CO2 absorption capability of Ocean -> Estimating 'global warming'
  - Ocean Environment Monitoring

    Variation of eco-system
- Local Area
  - Environment Monitoring for the efficient management of coastal waters

    Fresh water/Polluting material drifts & spreads, Pollution of coastal waters
  - Production of fishing ground environment information

    Searching fishing ground, Monitoring of aquaculture environment in coastal waters
- Common
  - For reducing the damage by disaster and catastrophe in Ocean, real time ocean environment monitoring

    Spreads of red tide, Monitoring of oil spill & tidal wave

Features of GOCI-2

- Main Feature
  - High temporal resolution
    => Observation by every hour
  - Wide area coverage
    => Full disk Coverage (1/3 of the full Earth surface)
  - Local area coverage
    => Monitoring on the region of Korean Peninsula
  - High & Medium spatial resolution
    => 250m at local area & 1km at full disk coverage
  - High reliability
    => High SNR & MTF, Increased Spectral bands

GOCI-2 User Requirments

- **Key Requirements**
  - Spectral Band : 13 bands (cf. GOCI = 8 Bands)
  - Resolution(GSD) : < 250m (cf. GOCI = 500m)
  - Temporal Resolution : 1 hour, 8 times per day.
  - Observation Coverage
    - Local Area(ex. Special Event Area) - GSD: ~250m
    - Full Disk Coverage - GSD: ~1000m
  - Nighttime Observation (like DNB in VIIRS)
    - Additional Panchromatic Filter
      - Panchromatic Filter (400~900nm)
      - Dedicated Low Noise Detector for Nighttime Observation

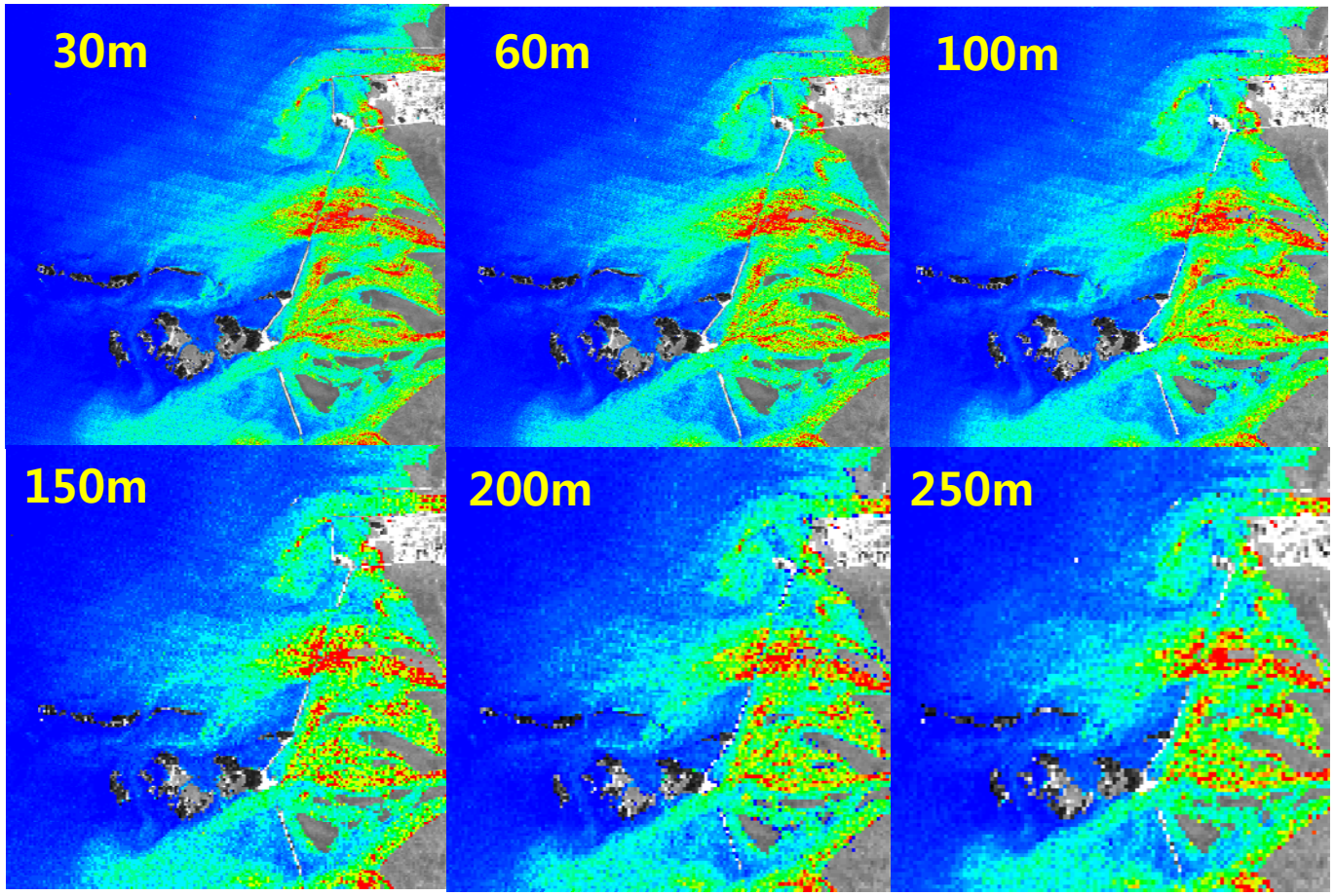
GOCI-2 User Requirments

- Comparison with GOCI

	GOCI	GOCI-2
Orbit type	GEO	GEO
# of Bands	8	13
Spatial Resolution	500m x 500m	250m x 250m 1km x 1km
Coverage	Local Area (2500km x 2500km)	Local Area (1800km x 1800km, selectable) Full disk
SNR	~1000	~ 1000
Temporal Resolution	1 Hour	1 Hour

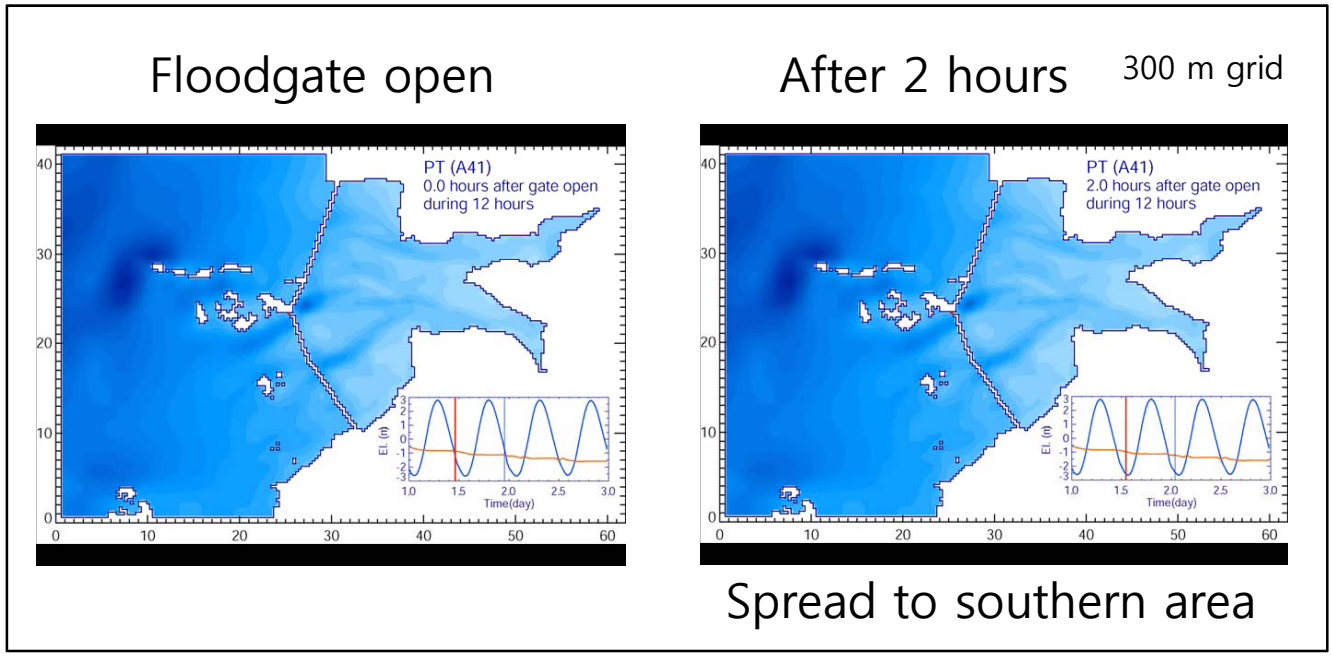
GOCI-2 User Requirments

- **Spatial Resolution Requirement**
  - < 250m (GOCI : 500m)



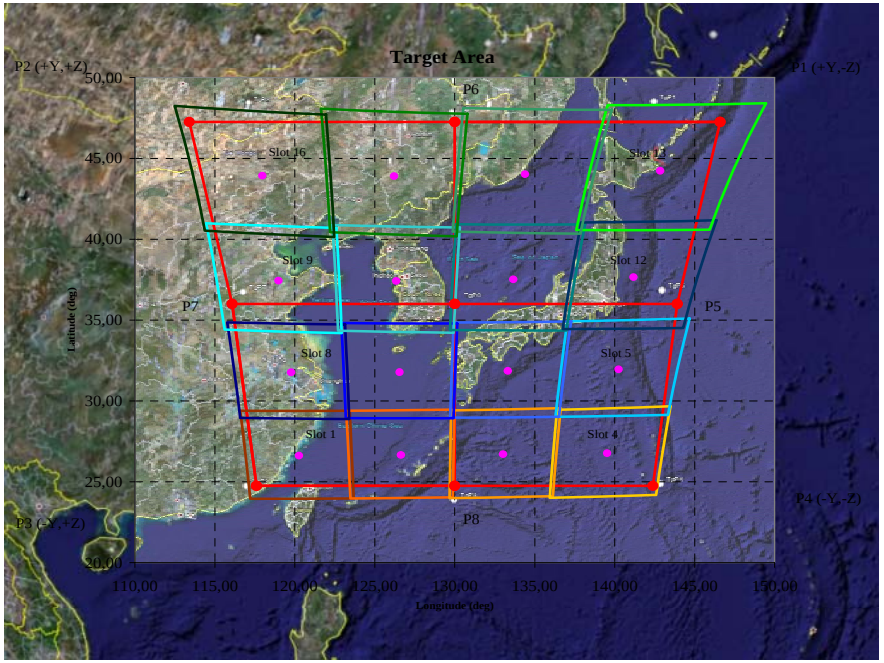
GOCI-2 User Requirments

- **Temporal Resolution**
  - 1hour, 8 times/day(day time) (same as GOCI) – Local Area
  - 4 times/day(day time) – Full Disk (Global Area)
  - Purpose : To observe the behavior of Tidal Flat, Red Tide, etc.

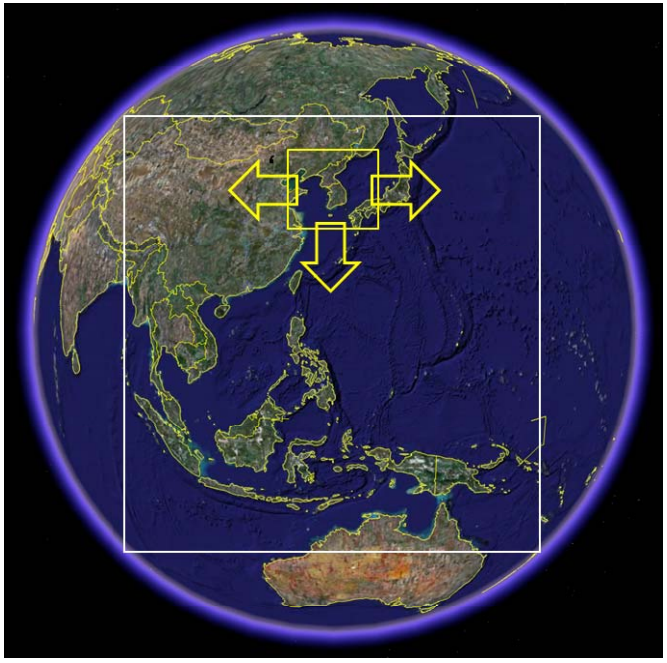


GOCI-2 User Requirements

- **Coverage: Selectable Local Area & Full Disk**
  - Local Area : 2,500km x 2,500km (GOCI) – GSD: 250m
    - Center Position :130E, 36N and user defined position & area
  - Full Disk : 12,800km x 12,800km (GSD : 1,000m)
  - Purpose : Monitoring of long term global climate change



Local Area



Full disk and selectable Local Area

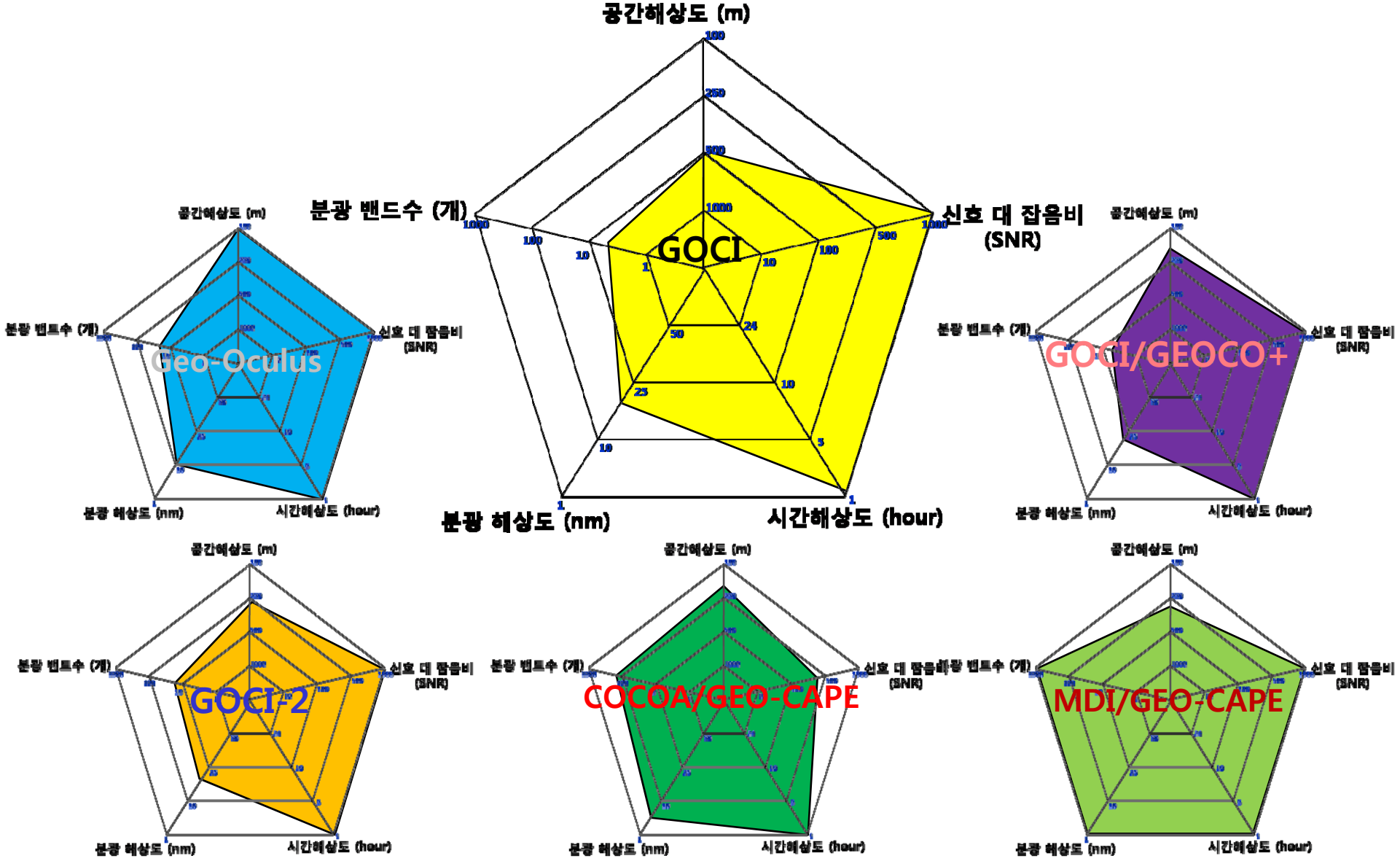
GOCI-2 User Requirements

- **Spectral Bands Requirements (TBD)**
  - 13 Bands (GOCI : 8 Bands)
  - Phytoplankton type verification, Nighttime Observation, Enhanced Atmospheric Correction Accuracy

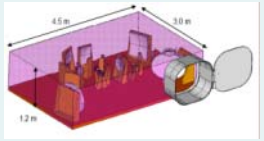
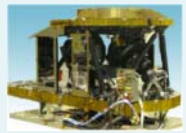
Radiance : W/m²/um/sr

Band	Heritage	Band Center	Band width	Nominal Radiance	Maximum Ocean Radiance	Saturation Radiance	Maximum Cloud Radiance	NEdL	SNR	Primary use
1	GOCI-2	380nm	20nm							CDOM
2	GOCI-B1	412nm	20nm	100.0	150.0	152.0	601.6	0.100	1000	Yellow substance and turbidity
3	GOCI-B2	443nm	20nm	92.5	145.8	148.0	679.1	0.085	1090	Chlorophyll absorption maximum
4	GOCI-B3	490nm	20nm	72.2	115.5	116.0	682.1	0.067	1170	Chlorophyll and other pigments
5	GOCI-2	520nm	20nm							Red Tide
6	GOCI-B4	555nm	20nm	55.3	85.2	87.0	649.7	0.056	1070	Turbidity, suspended sediment
7	GOCI-2	625nm	20nm							SS & Red Tide
8	GOCI-B5	660nm	10nm	32.0	58.3	61.0	589.0	0.032	1010	Baseline of fluorescence signal, Chlorophyll, suspended sediment
9	GOCI-B6	685nm	10nm	27.1	46.2	47.0	549.3	0.031	870	Atmospheric correction and fluorescence signal
10	GOCI-B7	745nm	20nm	17.7	33.0	33.0	429.8	0.020	860	Atmospheric correction and baseline of fluorescence signal
11	GOCI-2	765nm	20nm							Aerosol Properties, Atmospheric Properties
12	GOCI-B8	865nm	40nm	12.0	23.4	24.0	343.8	0.016	750	Aerosol optical thickness, vegetation, water vapor reference over the ocean
13		650nm	500nm	6.5E-6						Night Band (Night time fishing boat activities)

GOCI and other Missions



GOCI and other Missions

	MDI(Multi Discipline Imager) / GEO-CAPE -미국(NASA)	COCOA/ GEO-CAPE - 미국(NASA)	Geo-Oculus - 유럽(ESA)	GOCI/GEOCO+ - 프랑스 (CNES)	GOCI-2 - 대한민국	GOCI(Geostationary Ocean Color Imager) / COMS - 대한민국
				PASO		
분광 밴드 타입 (Spectral Bands Type)	Hyper-spectral Imager (1000 bands)	Hyper-spectral Imager (140 bands)	Multi-spectral Imager (23 bands)	Multi-spectral Imager (8 bands)	Multi-spectral Imager (13 bands)	Multi-spectral Imager (8 bands)
분광 밴드 (Spectral Bands)	300-556nm (B1) 340-1319nm (B2) 1240nm (B3) 1640nm (B4)	350-1050nm	317-1040nm (VNIR) 1375nm (SWIR) 3700nm (MWIR a,b) 10850nm (TIR1 a,b) 12000nm (TIR2 a,b)	413, 443, 490, 560, 665, 709, 754, 886nm	412, 443, 490, 520, 555, 605, 625, 660, 680, 745, 765, 865, 905nm	412, 443, 490,555,660,680,745, 865nm
분광 해상도 (Spectral Resolution)	0.75nm (B1) 0.8nm (B2) 40nm (B3, B4)	5nm	10~40nm (VNIR)	20~40nm	10~40m 500nm (Night Band)	20nm (B1~B5, B7) 10nm (B6) 40nm (B8)
신호 대 잡음비 (SNR)	> 1000 (B1, B2) > 500 (B3, B4)	> 400 (400~900nm)	1000	1000	1000	1000
공간 해상도 (Spatial Resolution)	300m	200m	100m ~ 1km	200m	250m	500m
관측 영역 크기 (Coverage)	500km	~ 500km	100km	TBD (Swath 500km)	2,500km, 12,500km Full Disk	2,500km
시간해상도(재관측 주기) 및 일일 촬영 회수 (Temporal Resolution)	< 1 hour (6 times/day)	< 1 hour (6 times/day)	1 hour (6~7 times/day)	1 hour (8 times/day)	1 hour (8 times/day)	1 hour (8 times/day)

Conclusion

1. GOCI-2 will have full disk coverage with higher resolution and 5 more bands than GOCI.

2. By the result of the tentative study, all user requirements are feasible.

3. Detailed feasibility study and system design will be followed.

Thank You