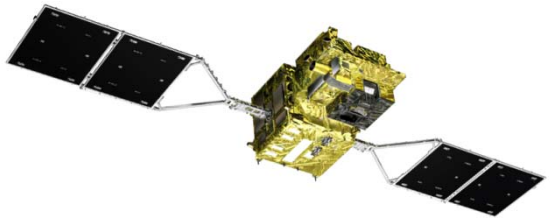


4.6 JAXA: Update on GCOM-C/SGLI

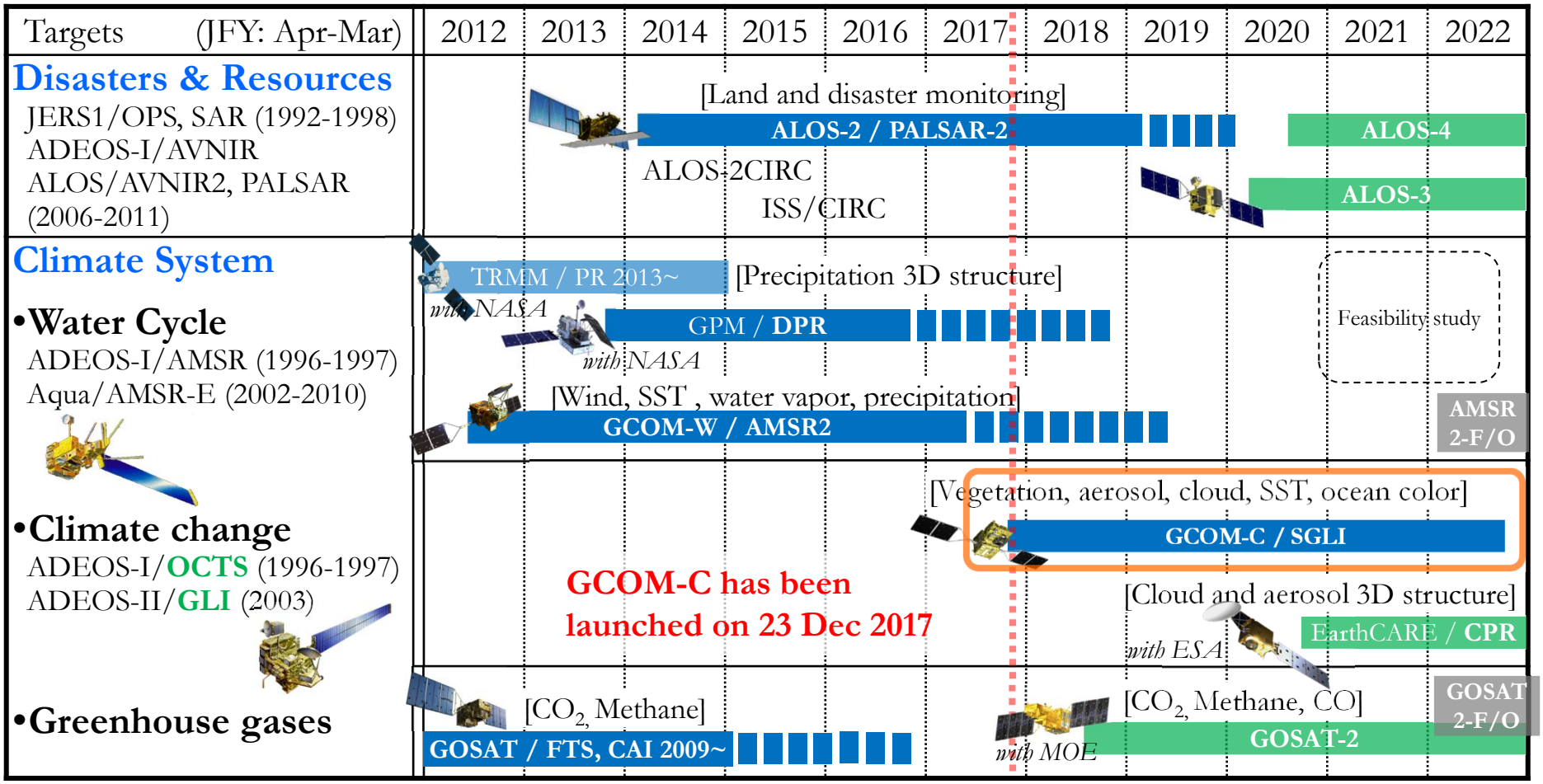
Hiroshi Murakami

JAXA/EORC

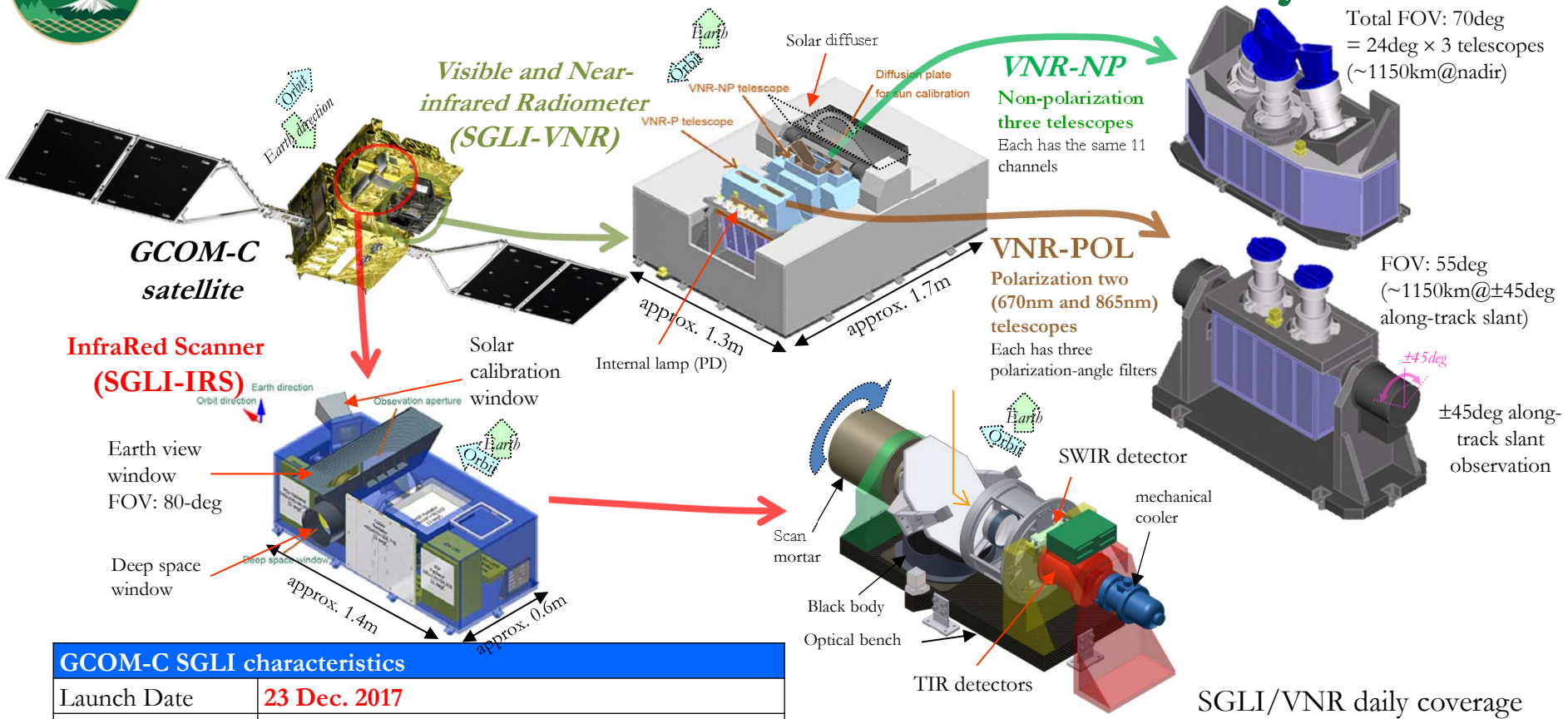
IOCCG-23 Committee Meeting

CNR Headquarters, Rome, Italy, 6-8 March 2018

1. JAXA Earth observation satellite missions

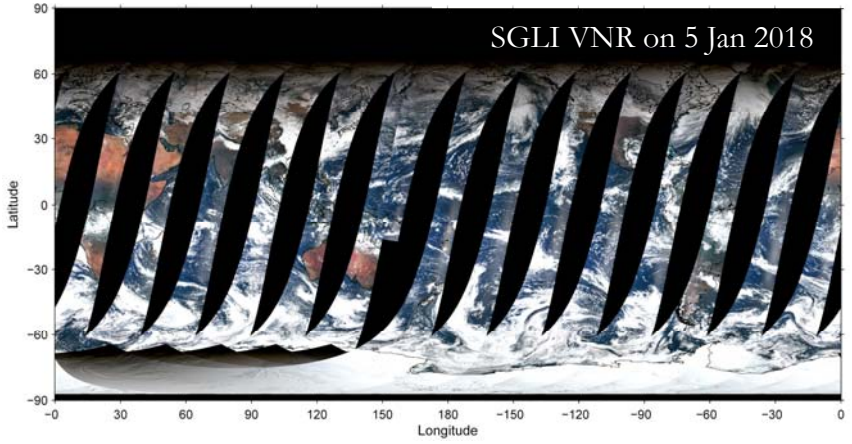


2. GCOM-C/SGLI: Satellite/Sensor system.



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

SGLI/VNR daily coverage

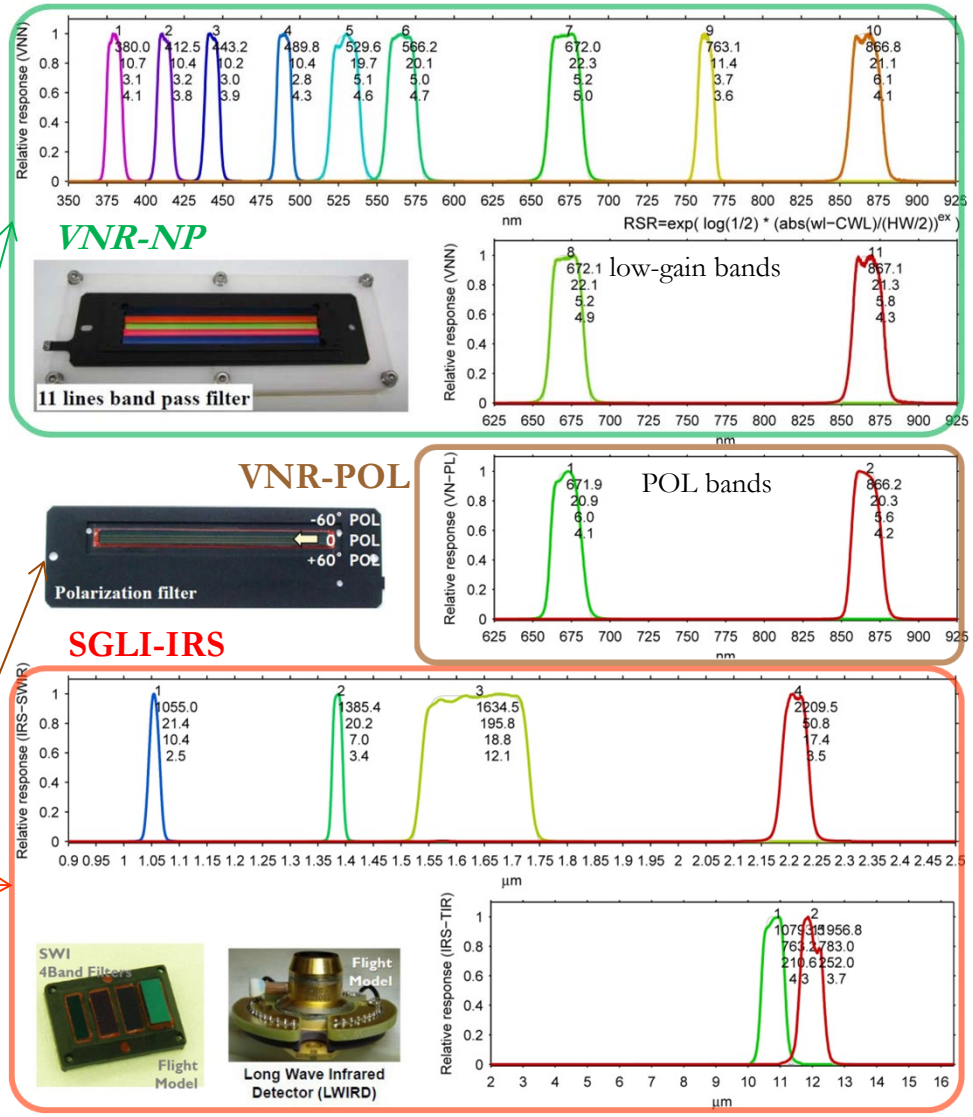


2. GCOM-C/SGLI

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

Specification of SGLI spectral bands						
CH	λ	Δλ	L_{std}	L_{max}	SNR@L_{std}	IFOV
	nm		$W/m^2/sr/\mu m$ K: Kelvin		- K: NEΔT	m
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

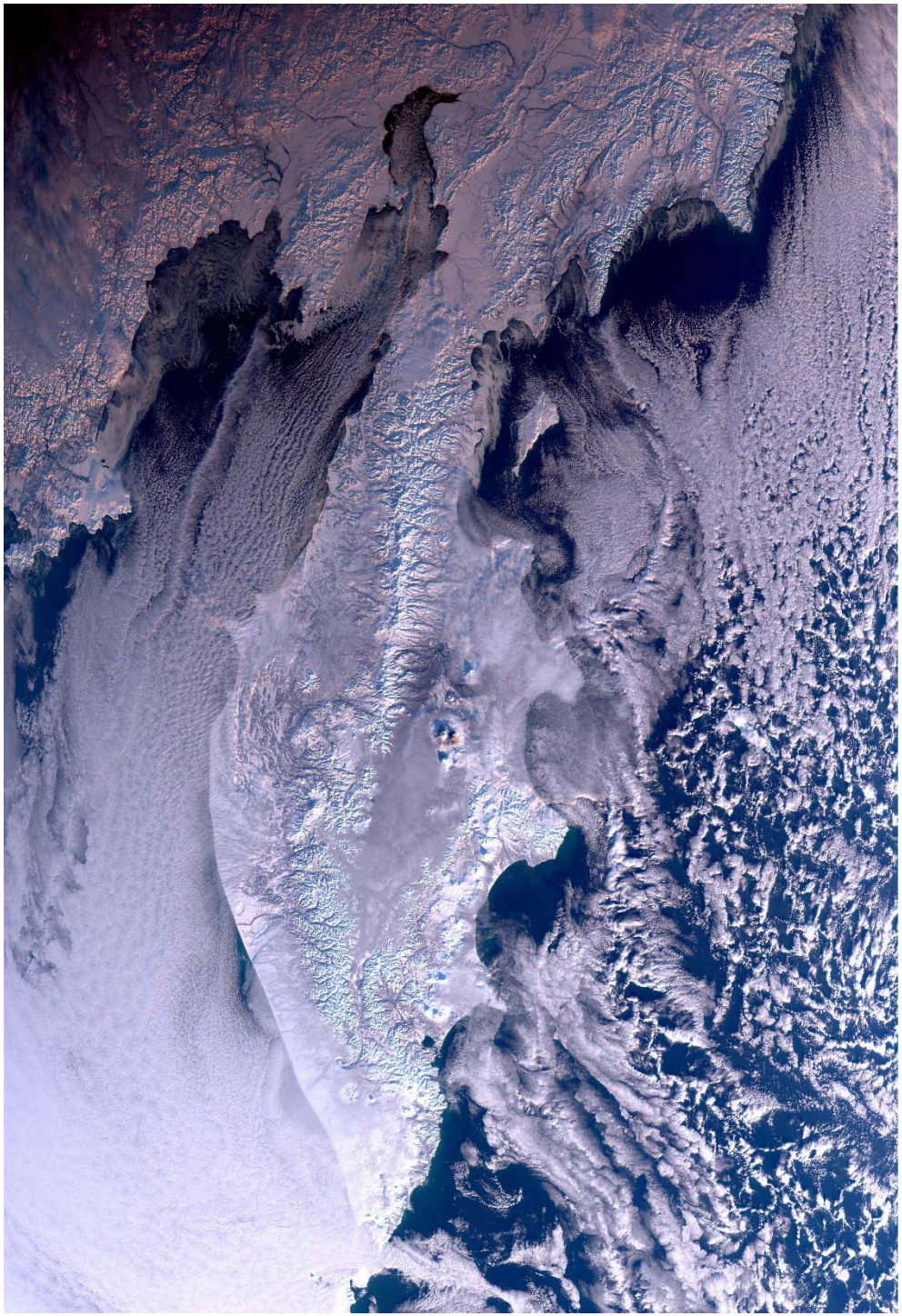
Multi-angle obs. for 674nm and 869nm



Uchikawa, T., K. Tanaka, Y. Okamura, S. Tsuida, and T. Amano, "Proto Flight Model (PFM) performance and development status of Cisible and Near Infrared Radiometer (VNR) on the Second-generation Global Imager (SGLI)", SPIE Asia-Pacific Remote sensing, Beijing, China, 9264-27, 2014.

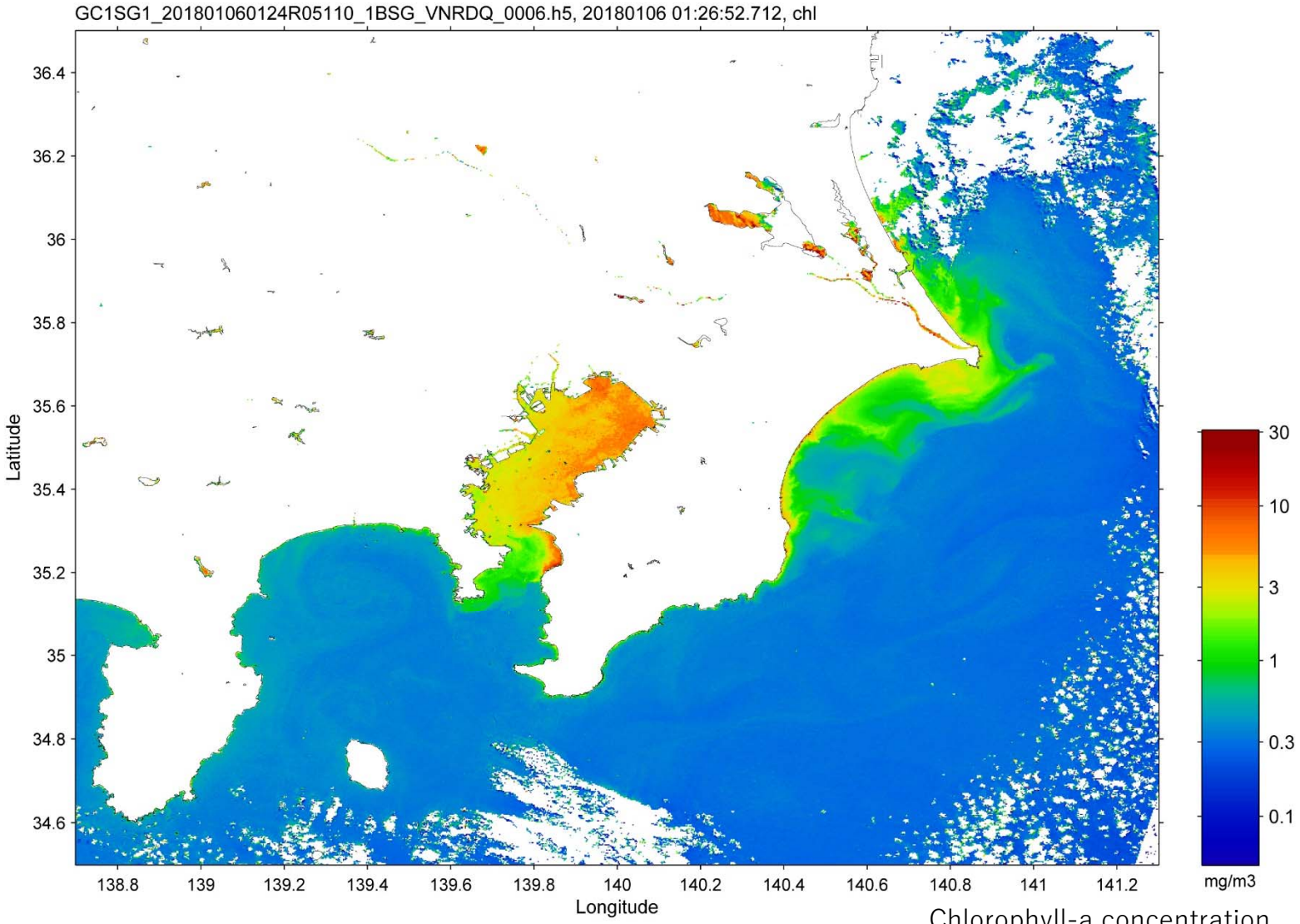
Tanaka, K., Y. Okamura, T. Amano, T. Hosokawa, and T. Uchikita, "The development status of Second Generation Global Imager Infrared Scanning Radiometer (SGLI-IRS)", SPIE Asia-Pacific Remote sensing, Beijing, China, 9264-15, October, 2014.

3. GCOM-C/SGLI acquired images



The SGLI first scene on 1 Jan. 2018.
Kamchatka Peninsula

3. GCOM-C/SGLI acquired images: Tokyo Bay

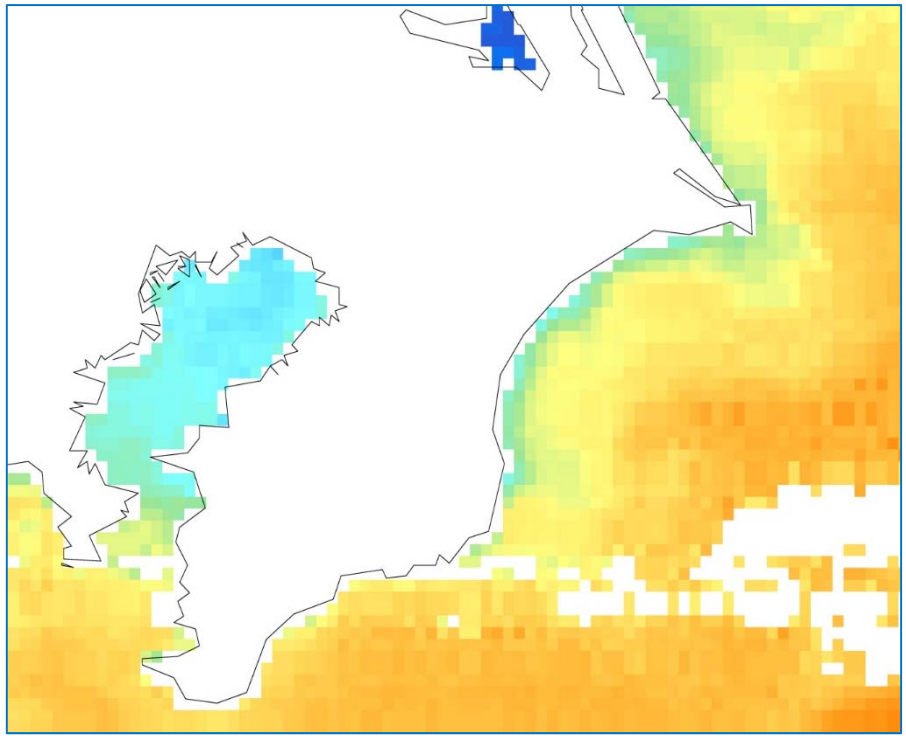


250-m image acquired on Jan 6 2018

Chlorophyll-a concentration
(not validated)

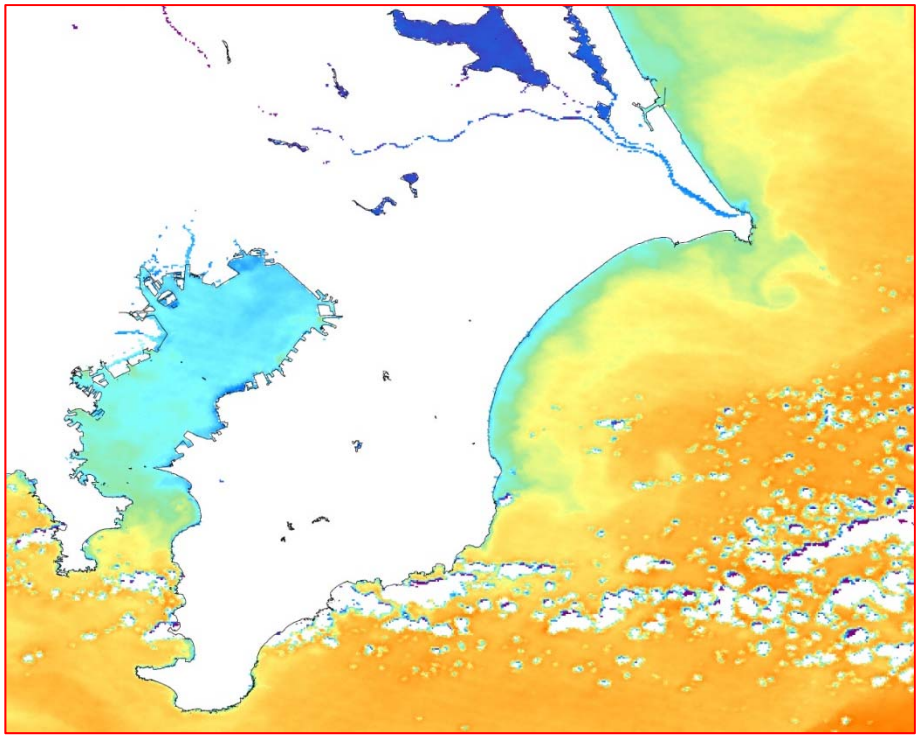
3. GCOM-C/SGLI acquired images: Tokyo Bay Sea surface temperature

Himawari-8 AHI (2km)



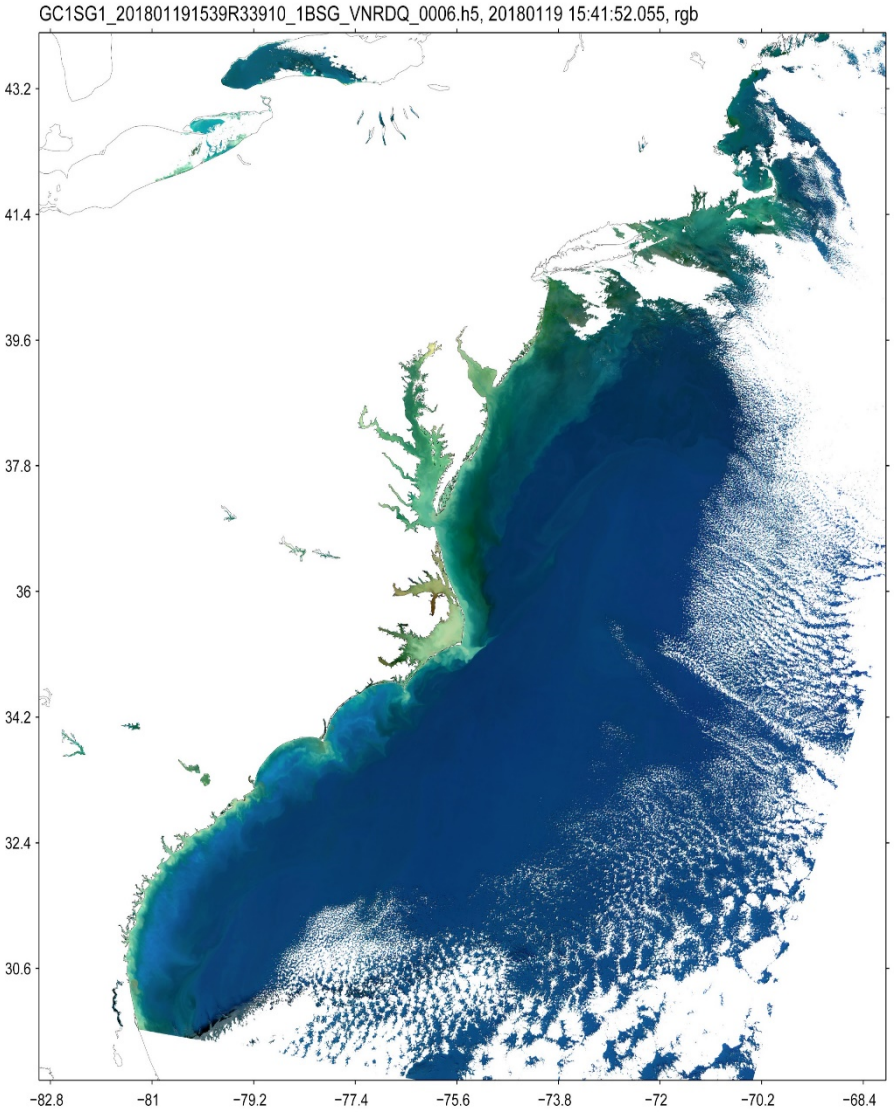
UT01:00-1:50 average on 24 Jan 2018

GCOM-C/SGLI (250m)

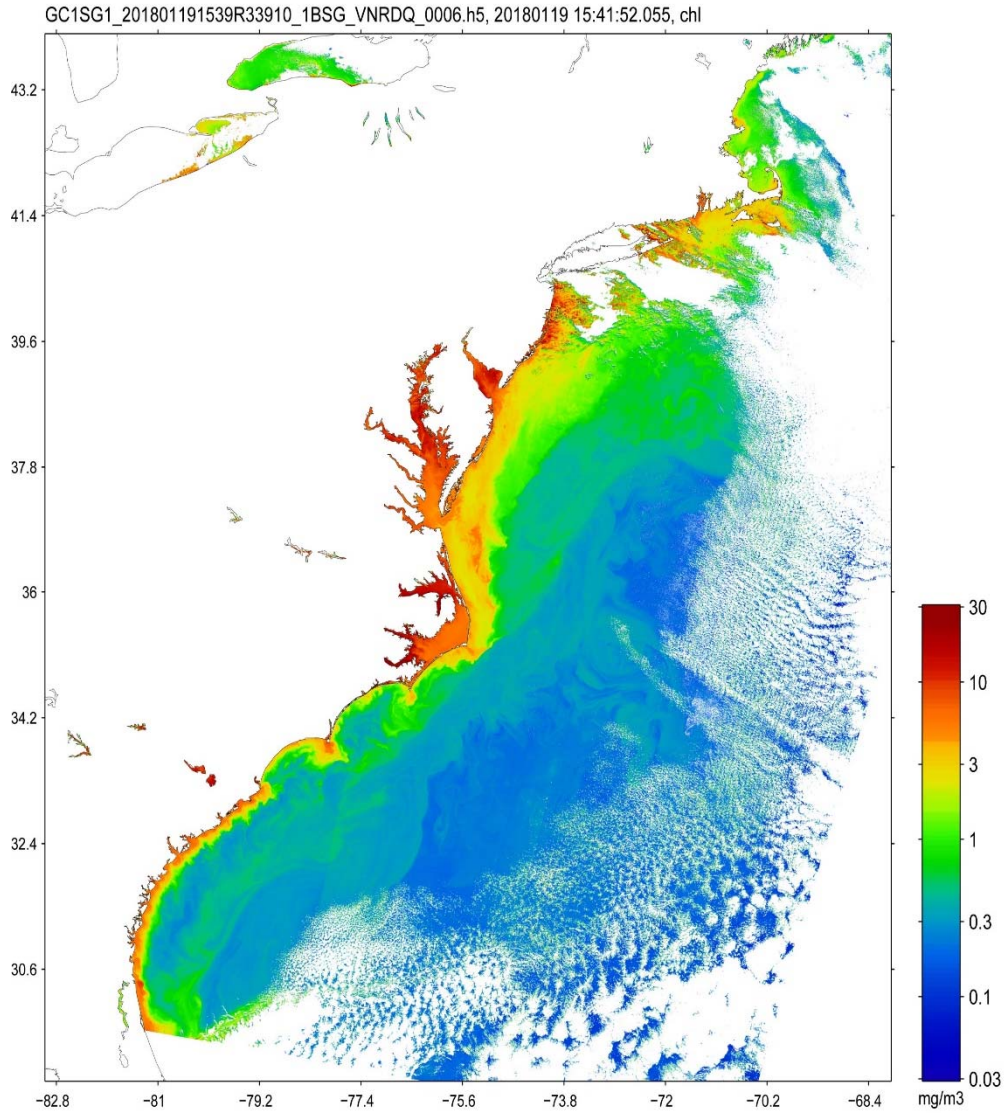


UT01:40 on 24 Jan 2018

3. GCOM-C/SGLI acquired images: the US East Coast

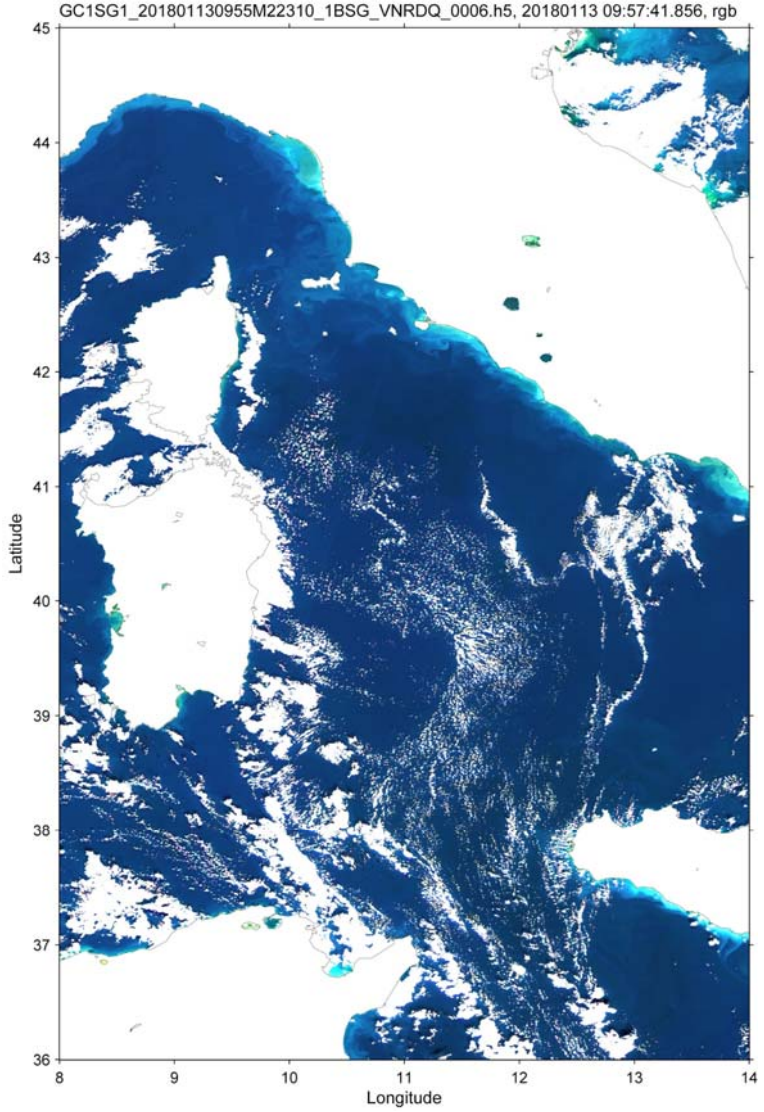


RGB of water-leaving reflectance on 19 Jan 2018

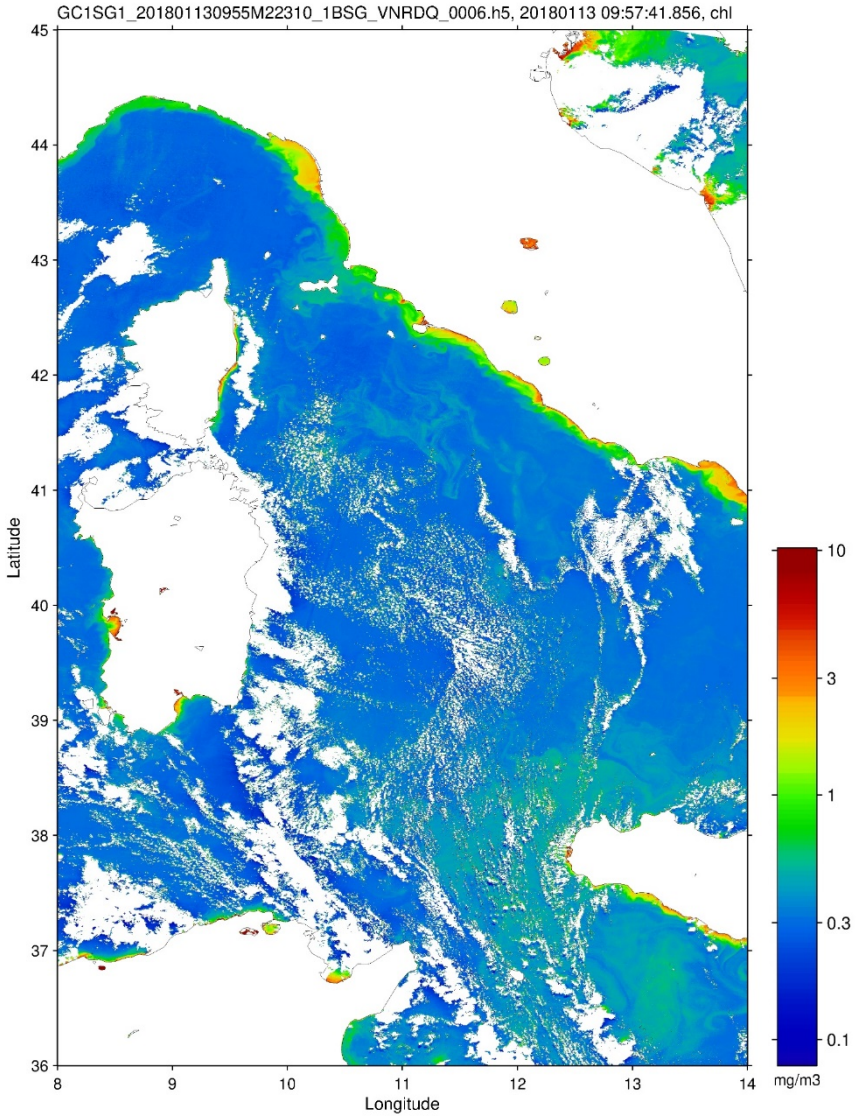


Chl-a on 19 Jan 2018 (not validated)

3. GCOM-C/SGLI acquired images: Italian Peninsula

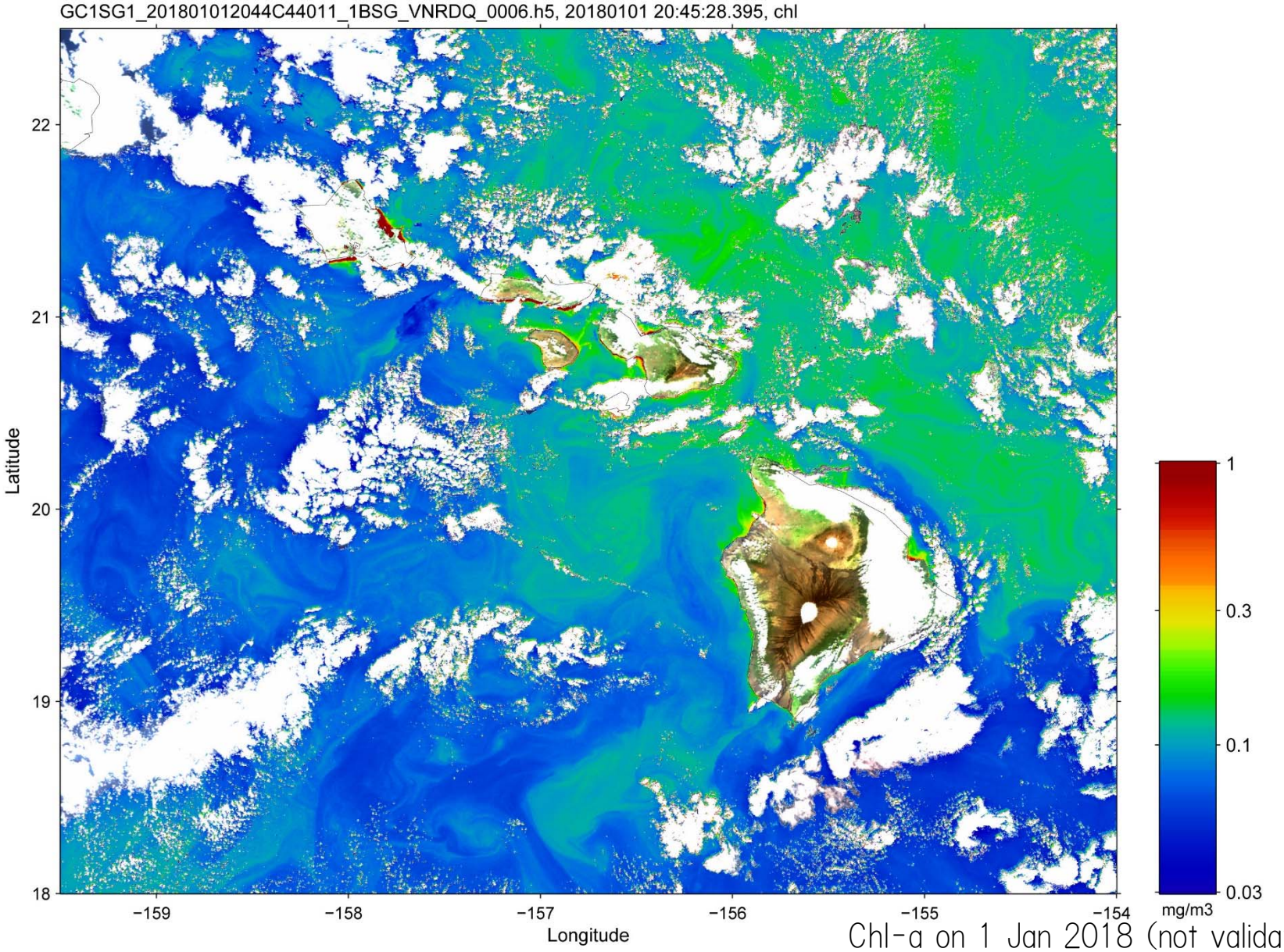


RGB of water-leaving reflectance on 13 Jan 2018



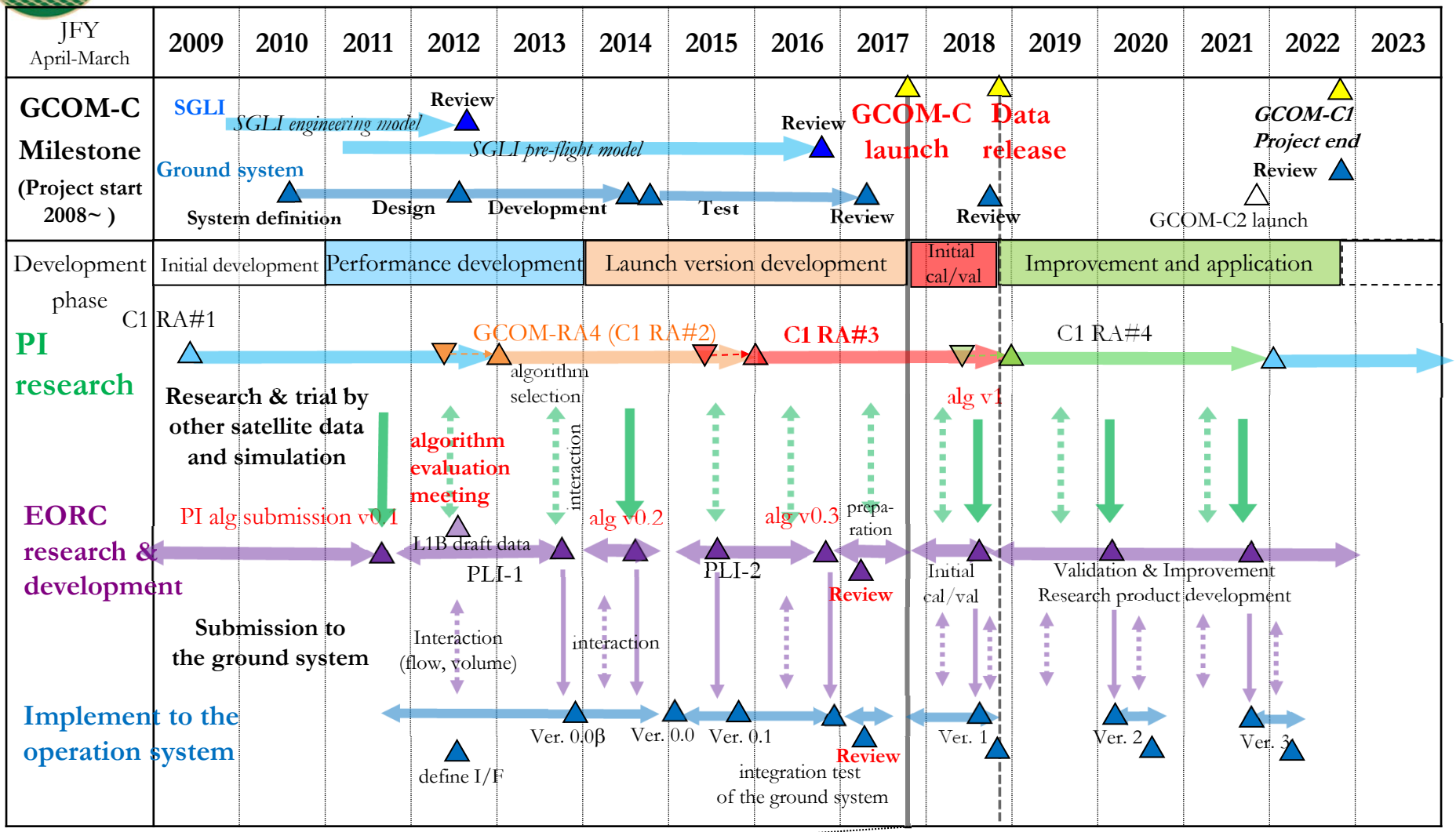
Chl-a on 13 Jan 2018 (not validated)

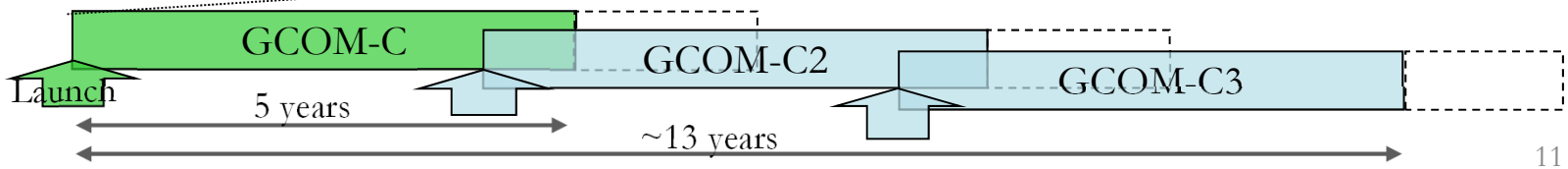
3. GCOM-C/SGLI acquired images: the Hawaiian Islands



Chl-a on 1 Jan 2018 (not validated)

4. Product development: plan



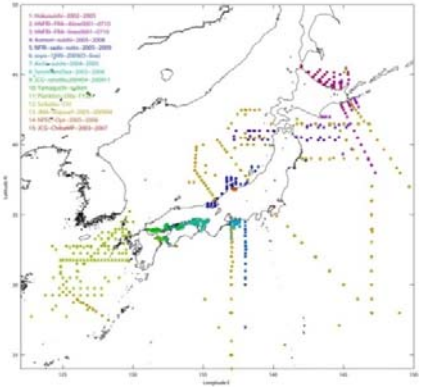


4. Product development: GCOM-C ocean products

Category	Product	Grid size	Release threshold (L+1 year)	Standard accuracy (L+ 5year)	Target accuracy (L+5year)
Standard	Normalized water leaving radiance (incl. cloud detection)	250m (coast), 1km (offshore), 4km (global)	60% (443~565nm)	50% (<600nm), 0.5W/m^2/str/um (>600nm)	30% (<600nm), 0.25W/m^2/str/um (>600nm)
	Atmospheric correction param		80% (AOT@865nm)	50% (AOT@865nm)	30% (AOT@865nm)
	Photosynthetically available radiation		20% (10km/month)	15% (10km/month)	10% (10km/month)
	Chlorophyll-a concentration		–60~+150% (offshore)	–60~+150%	–35~+50% (offshore), –50~+100% (coast)
	Total suspended matter		–60~+150% (offshore)	–60~+150%	–50~+100%
	Colored dissolved organic matter		–60~+150% (offshore)	–60~+150%	–50~+100%
	Sea surface temperature	250m or 500m (coast), 1km (offshore), 4km (global)	0.8K (daytime, 500m)	0.8K (day&night time, 500m)	0.6K (day&night time, 500m)
Research	Euphotic zone depth	250m (coast), 1km (offshore), 4km (global)	NA		30%
	Inherent optical properties		NA		a(440): RMSE<0.25, b_{bp}(550): RMSE<0.25
	Ocean net primary productivity	500m (coast), 1km (offshore), 4km (global)	NA		70% (monthly)
	Phytoplankton functional type	250m (coast), 1km (offshore), 4km (global)	NA		error judgment rate of large/ small phytoplankton dominance<20%; or error judgment rate of the dominant phytoplankton functional group <40%
	Redtide		NA		error judgment rate <20%
	multi sensor merged ocean color		NA		–35~+50% (offshore), –50~+100% (coast)
	multi sensor merged SST	500m (coast), 1km (offshore)	NA		0.8K (day&night time)

5. Cal/Val plan

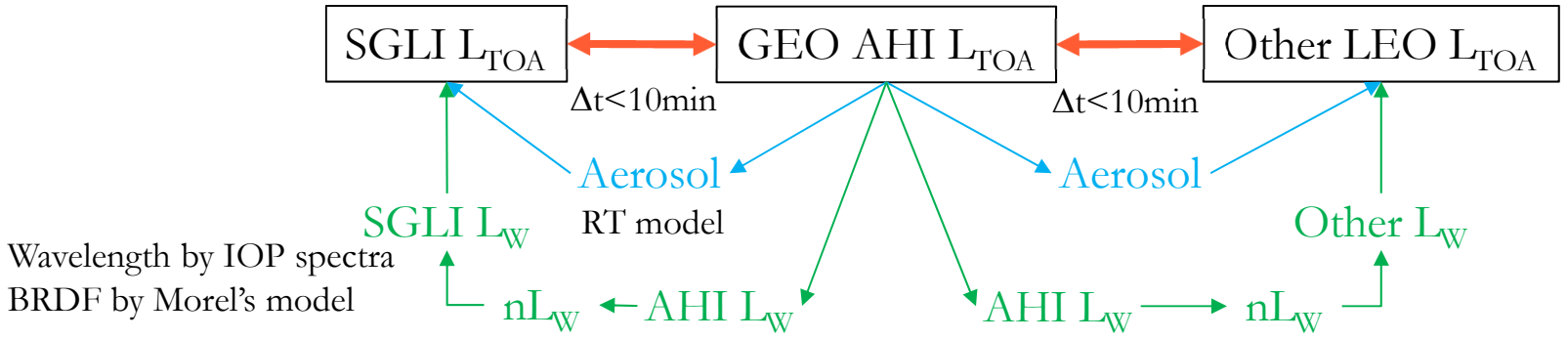
Plan of the post-launch in-situ measurements

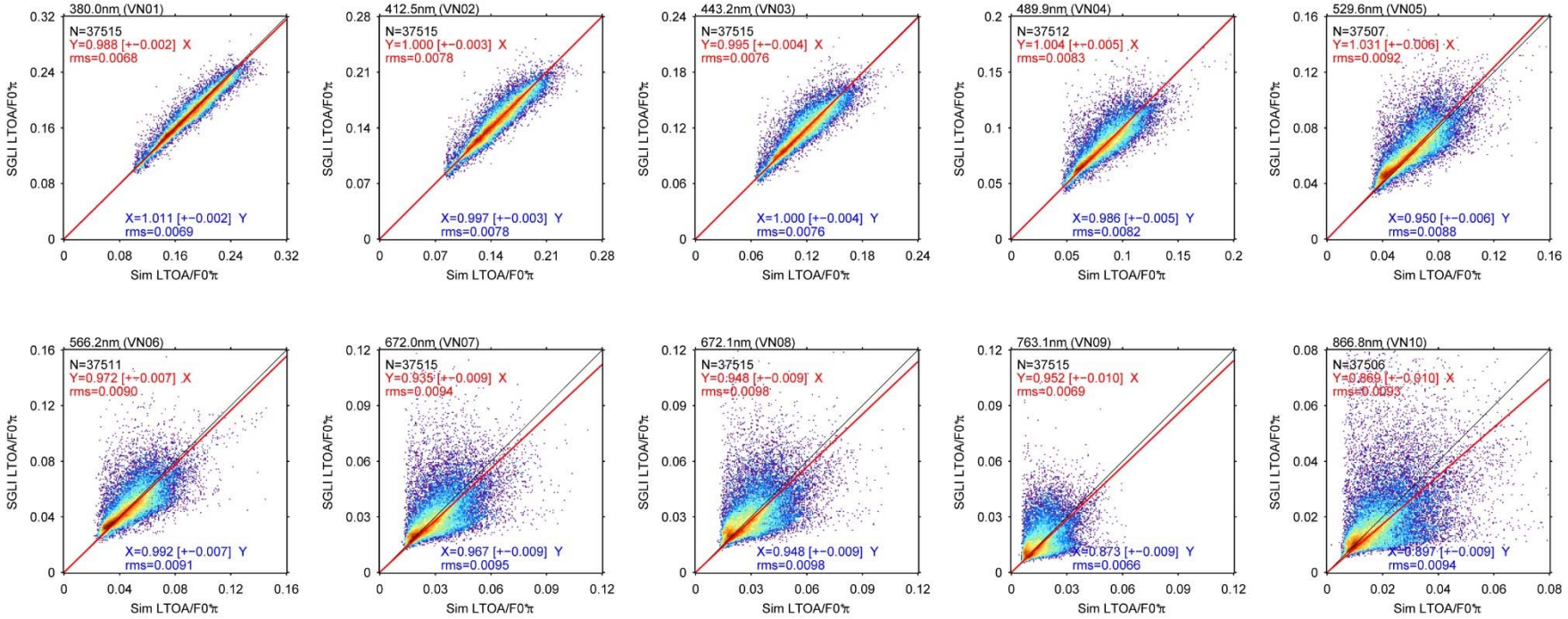


- **Regular cruises**
  - Univ. cruises around Japan: Funka-bay, Ariake-bay, Tokyo-bay, Toyama-bay, Ise-Bay, Seto-inland sea, Akkeshi..
  - Fishery agency (JAXA's optical instruments will be operated)
  - Japanese in-land waters by Univ. and institutes

- **Offshore campaigns**
  - Hakuho-maru in the north western Pacific in Nov.- 2017
  - JAMSTEC Shinsei-maru in offshore Fukushima (May. 2018)
  - University ships (Nagasaki-maru (East China Sea), Kakuyo-maru (East China Sea), Osyoro-maru, Ushio-maru, Umitaka-maru, Bousei-maru)
- **International database/possible collaboration**
  - Collaboration with Korea and Asian communities (e.g., AWOC)
  - (Vical) MOBY, BOUSSOLE
  - Aeronet-OC (New Ariake site)
  - NOAA, NASA, Sentinel-3
- **Cross validation with other sensors**: AHI, GOSAT-2, MODIS, VIIRS, OLCI, GOCI,..

5. Cal/Val plan:
Cross-cal of SGLI and AHI (Ocean area)

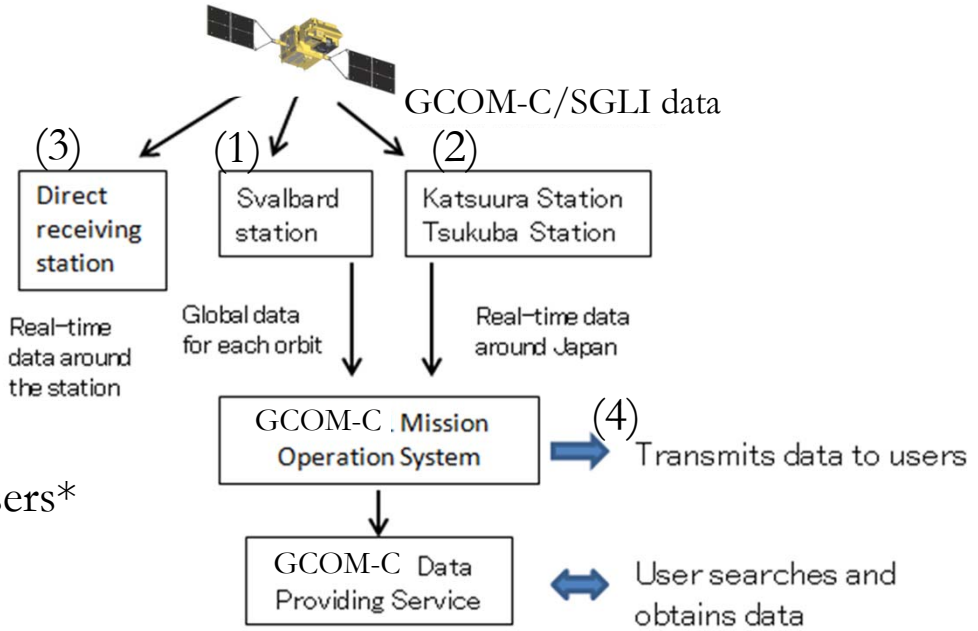




Preliminary results by global data on 5 Jan 2018

6. GCOM-C data distribution

1. **Svalbard downlink station**
   - Global observation data including all the 250-m & 1-km observation modes (Raw data ~6GB/path)
   - 14 or 15 passes (~90GB)/day
2. **Japanese near-real time station**
   - Near-real time distribution to specific users*
   - A backup of the Svalbard station
3. **Direct downlink capability at other local stations**
   - (3) and (4) are required to make agreement individually with JAXA.



✓ All standard products (L1, L2, L3) will be distributed by **Gportal-R** (released to the public one year after the launch)

✓ Free for both science and commercial purposes

***Near-real time users (can be increased)**

a) JAFIC (Fishery)
- Products: SST, Chl-a, Rrs (Mapped)
- Area: Coverage of Katsuura Station
- Latency: 3 hours after observation

b) JMA (Japan Metrological Agency)
- Product: L1B, aerosol, snow cover, SST, LST
- Area : global
- Latency: 70% by 3 hours and 95% by 12 hours after observation

7. Summary

- GCOM-C/SGLI has been launched on 23 December 2017.
- The SGLI observation and calibration functions have been confirmed in the Initial Check-Out period until March 2018.
- The first observation images of VNR-SWIR and TIR have been acquired successfully on 1 Jan. 2018 and 22 Jan 2018 respectively. The first internal-lamp calibration and moon calibration data has been acquired on 10 Jan 2018 and 31 Jan 2018, respectively.
- Sensor calibration model including detector offset, gain, geometries, and their temperature dependency will be confirmed and revised by the lamp, solar, moon, and earth observation data (vicarious calibration).
- GCOM-C Level-1 and geophysical data products (Level-2 and -3 data) will be evaluated by comparing in-situ observation data and other satellite products, and be released one-year after the launch.
- The next research announcement (for JFY2019-2021) will be in the summer of 2018.