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

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<td><strong>Disasters &amp; Resources</strong></td>
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<td><strong>Climate change</strong></td>
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<td><strong>Greenhouse gases</strong></td>
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**Mission status**
- **On orbit**
- **Development**
- **Study**
- **Pre-phase-A**
2. GCOM-C/SGLI
Global Change Observation Mission – Climate, named "SHIKISAI"

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<tr>
<th>GCOM-C SGLI characteristics</th>
<th>Speciation of SGLI spectral bands</th>
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<tr>
<td>Launch Date: 23 Dec. 2017</td>
<td>CH</td>
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<tr>
<td>Weight: 2,000kg</td>
<td>nm</td>
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<tr>
<td>Orbit: Sun-synchronous</td>
<td>VN1</td>
</tr>
<tr>
<td>(descending local time: 10:30),</td>
<td>VN2</td>
</tr>
<tr>
<td>Altitude: 798km, Inclination: 98.6deg</td>
<td>VN3</td>
</tr>
<tr>
<td>Mission Life: 5 years (3 satellites; total 13 years)</td>
<td>VN4</td>
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<td>Scan: Push-broom electric scan (VNR: VN &amp; P)</td>
<td>VN5</td>
</tr>
<tr>
<td>Wisk-broom mechanical scan (IRS: SW &amp; T)</td>
<td>VN6</td>
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<tr>
<td>Scan width: 1150km cross track (VNR: NP &amp; POL)</td>
<td>VN7</td>
</tr>
<tr>
<td>1400km cross track (IRS: SWIR &amp; TIR)</td>
<td>VN8</td>
</tr>
<tr>
<td>Spatial resolution: 250m, 500m, 1km</td>
<td>VN9</td>
</tr>
<tr>
<td>Polarization: 3 polarization angles for POL</td>
<td>VN10</td>
</tr>
<tr>
<td>Along track tilt: Nadir for VN, SW and TIR, &amp; +/-45 deg for POL</td>
<td>VN11</td>
</tr>
<tr>
<td>VNR-NP</td>
<td>POL1</td>
</tr>
<tr>
<td>Non-polarization three telescopes Each has the same 11 channels</td>
<td>POL2</td>
</tr>
<tr>
<td>VNR-POL</td>
<td>SW1</td>
</tr>
<tr>
<td>Polarization two telescopes (670nm and 865nm) Each has three polarization-angle filters</td>
<td>SW2</td>
</tr>
<tr>
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<td>SW3</td>
</tr>
<tr>
<td></td>
<td>SW4</td>
</tr>
<tr>
<td>InfraRed Scanner (SGLI-IRS)</td>
<td>TIR1</td>
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<td>TIR2</td>
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AERONET-OCv3 Ariake-Tower in Ariake-Bay, Japan, has been operated since April 2018

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

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

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

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

Chl-a
PAR
SST
nLw
CDOM
TSM
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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Daily change of SST from 2018/4/20 13:22 UT (night) to 2018/4/21 01:38 UT (day)
4. GCOM-C application: 250-m Ocean Color

RGB of $\rho_w$ on 2018/4/21
4. GCOM-C application: 250-m Ocean Color

Chl-a on 2018/4/21

RGB of p\textsubscript{w} on 2018/4/21

Chl-a on 2018/4/21

Noctilca redtide

Chl-a on 2018/8/5

Karenia mikimotoi (maybe)
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

2018/09/19 Rain 2018/09/28 Typhoon 2018/10/01 2018/10/02

ρw RGB

Chl-a

SST
4. GCOM-C application:
Floating Algae in the East China Sea

✓ 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: Floating Algae in the East China Sea

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: Possibility of polarimetry
4. GCOM-C application: Possibility of polarimetry

SGLI Polarization reflectance \( \sqrt{Q^2+U^2} \) at 866nm on 26 Mar. 2019
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