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Current Status of GCOM-C/SGLI SST

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1. Introduction

The Japan Aerospace and Exploration Agency (JAXA) launched the Global Change Observation Mission (GCOM) -Climate satellite on 23 December 2017. GCOM-C aims at contributing the global climate watch and forecast by the monitoring of geophysical parameters related to the global climate system. The Second Generation Global Imager (SGLI) is the optical sensor aboard the GCOM-C satellite. SGLI succeeds the Global Imager (GLI) aboard the Advanced Earth Observing Satellite (ADEOS)-II. SGLI consists of two components: the Visible and Near-infrared Radiometer (VNR) and the Infrared Scanner (IRS). SGLI has the swath width of 1,150 km for VNR and 1,400 km for IRS, and has switchable spatial resolution from 250 m to 1 km (Fig. 1). GCOM-C flies on a sun-synchronous orbit, of which the descending local time is ~10:30 a.m., and obtains global data through scans during 2 or 3 days (Tables 1, 2).

SGLI SSTs are retrieved from the split window (SW) data of SGLI. The SST method for Himawari-8 SST(1) was modified and applied to SGLI, and the cloud masking method was newly developed.

Table 1 GCOM-C

Launch	23 December 2017 from Tanegashima Space Center
Launch Vehicle	HII-A
Weight	2,000 kg
Power	4 kw
Design Life	5 years
Orbit	Sun-synchronous
Altitude	798 km
Inclination	98.6 degrees
Equator crossing local time (descending)	10:30 ± 15 min.

Table 2 SGLI channels for SST

Ch.	Wave length	IFOV
VN8	673.5 nm	250/1000
SW2	1380 nm	1000
T1	10.8 um	250/1000
T2	12.0 um	250/1000

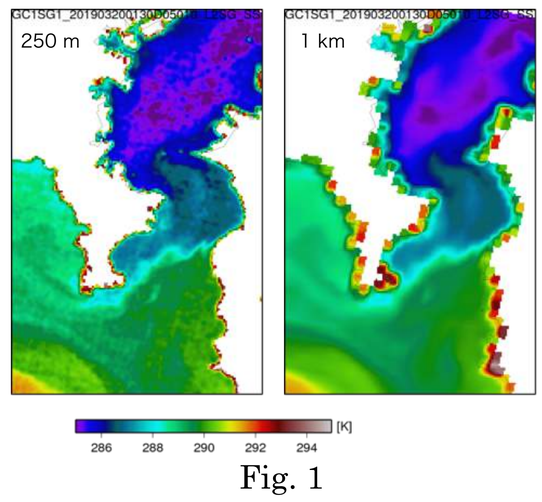

Fig. 1

2. SST method

The SST method for Himawari-8 SST(1) was modified and applied to the split window data of SGLI.

(a)Data
- SGLI SW (10.8 um, 12.0 um)
- Initial data (a priori)

(b)Formula

$$I_s = I_{s0} + \mathbf{a}\,(\mathbf{I}_{s1} - \mathbf{I}_{s0})$$

(c)LUT

Initial data and coefficients are generated by using NWP data and stored in a LUT (Table 3).

Table 3 LUT

Dim.	Parameter	Interval
1	T1	1.0 K
2	T1-T2	0.1 K
3	Satellite zenith angle	10.0 °

Table 4 QL

QL	Description
Cloudy	
Unknown	Unknown clear / cloudy
Unreliable	Unsuitable for quantitative use
Acceptable	Suitable for quantitative use
Good	

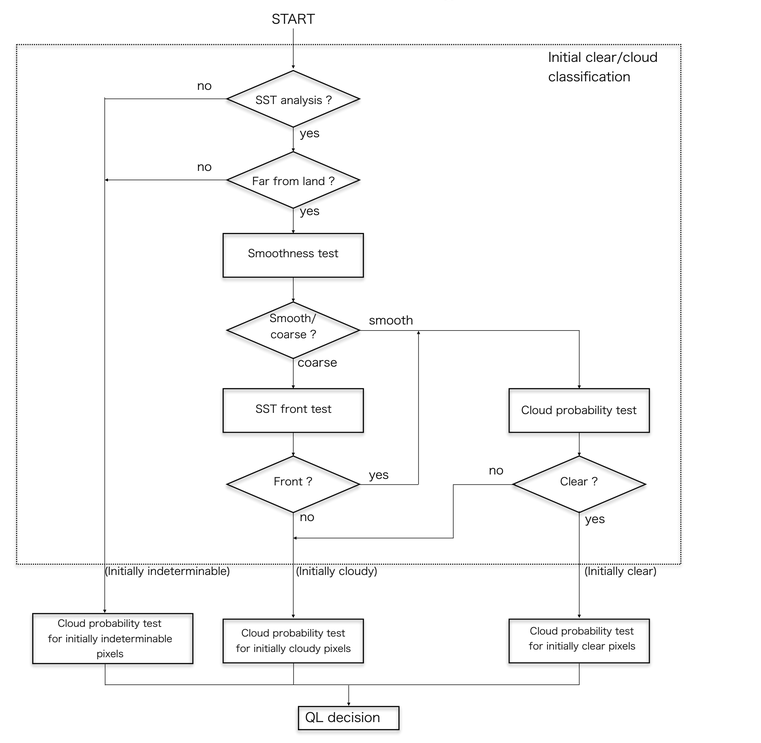

Fig. 2 Cloud masking flow (right)
The flow shown by the figure is still temporary. The cloud masking method still have some issues and needs improvements.

3. Cloud masking

Cloud masking is made by a combination of clustering of retrieved SSTs and Bayesian, where clustering divides determined SSTs into clear/cloud clusters based on SST uniformity (Fig. 2).

(a)Data
- SGLI (673.5 nm, 1.38 nm, 10.8 um, 12.0 um)
- Determined SST
- SST analysis (nighttime only)

(b)Result

Given by QL (Table 4, Fig. 3).

(c)Issues

There are still some issues should be improved, e.g.,
- false clouds around SST fronts
- cloud masking in coastal area
- cloud masking for inland water
- cloud masking for nighttime, and so on.

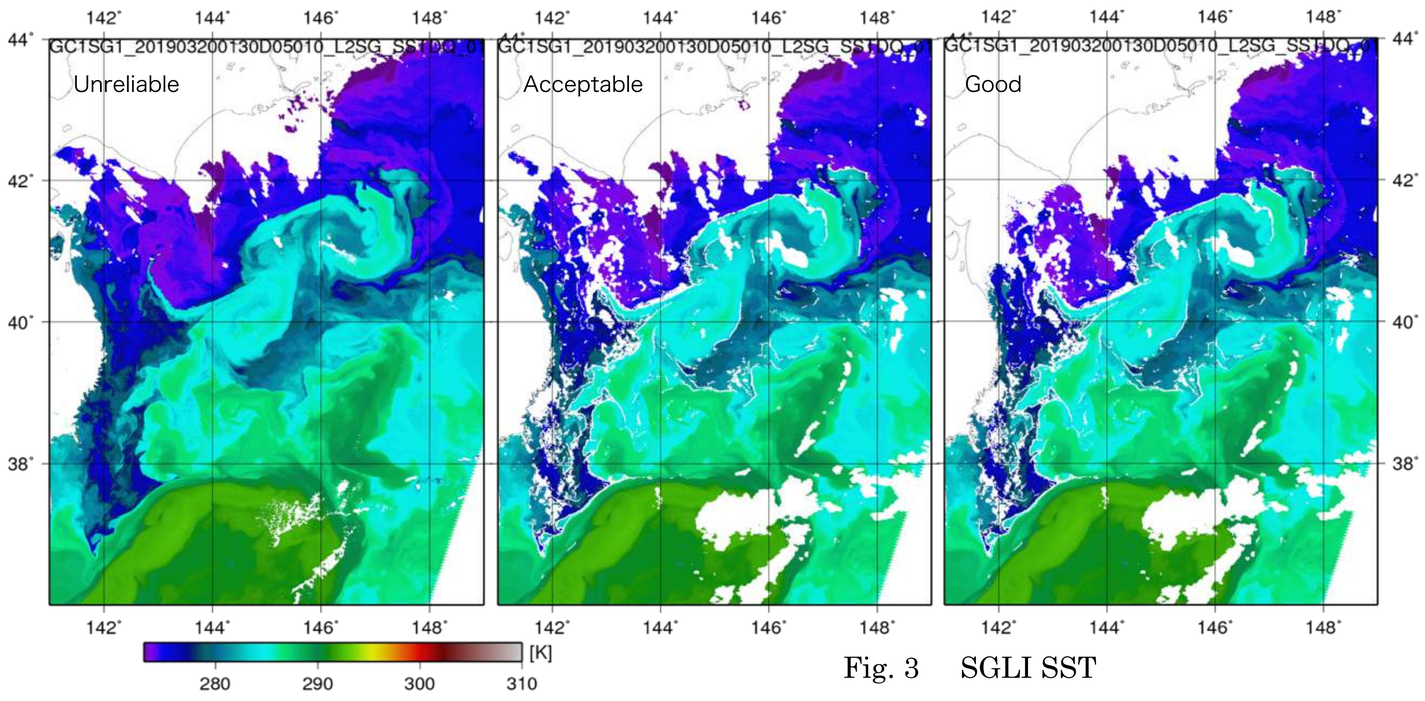

Fig. 3 SGLI SST

4. Validation

SGLI SST was validated by comparison with buoy data within the match-up window with the size of 3 hr x 3 km. Buoy data were downloaded from the iQuam of NOAA(2). The result shows good agreements between SGLI SST and buoy data (Fig.4, Table 5).

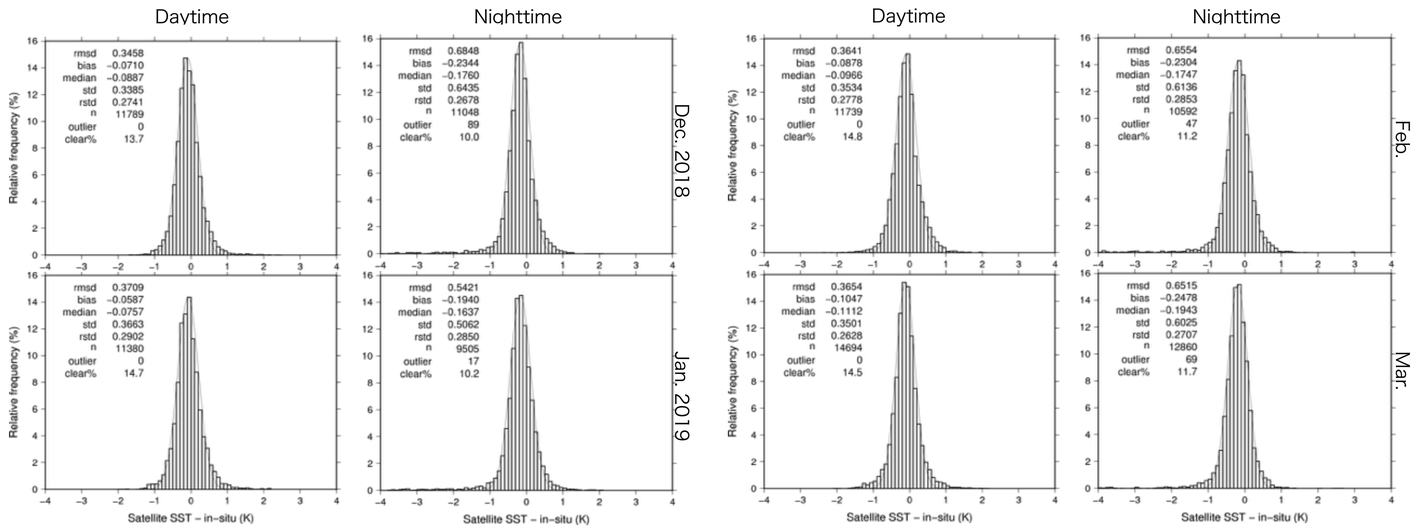

Fig. 4 SGLI SST (good) vs buoy (Dec. 2018 - Mar. 2019)

5. Summary

SGLI SSTs are retrieved from the SW data obtained by GCOM-C/SGLI. SST determination is based on the method for H8 SST, and a new method has been introduced for cloud masking. The comparison result of SGLI SST and buoy data shows good agreement between them. Meanwhile, the cloud masking method still has some issues. To improve those issues, SGLI SST is being updated still now. SGLI SSTs are available on the internet at JAXA's G-portal(3), and the latest version is available at the JASMES site(4).

Table 5 Statistics for Dec. 2018 - Mar. 2019

	Daytime						Nighttime					
QL	Bias (mean)	Bias (median)	SD	RSD	outlier* %	Clear %	Bias (mean)	Bias (median)	SD	RSD	outlier*	Clear %
Unreliable	-0.62	-0.32	1.15	0.48	1.0	47.2	-0.48	-0.37	0.62	0.43	<< 0.1	41.0
Acceptable	-0.11	-0.12	0.37	0.28	<< 0.1	14.1	-0.24	-0.18	0.63	0.28	<< 0.1	10.8
Good	-0.082	-0.095	0.35	0.28	<< 0.1	14.0	-0.24	-0.18	0.63	0.28	<< 0.1	10.8

Acknowledgement

NWP data for the initial values and coefficients for SGLI SST were generated by JMA. Analyzed SSTs for cloud masking are provided by JMA. Buoy data were downloaded from the iQuam of NOAA.

References
(1)Y.Kurihara, H. Murakami, and M. Kachi. Sea surface temperature from the new Japanese geostationary meteorological himawari-8 satellite. GRL, 2016. dos: 10.1002/2015GL067159.
(2)iQuam, NOAA: https://www.star.nesdis.noaa.gov/sod/sst/iquam/
(3)G-Portal, JAXA: https://www.gportal.jaxa.jp/gp/top.html
(4)JASMES, JAXA: https://kuroshio.eorc.jaxa.jp/JASMES/index_catalog.html