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SST data from SGLI onboard the Shikisai satellite

Yukio Kurihara (kurihara@triple-i.co.jp)(1), Kazunori Ogata(2), Hiroshi Murakami(2), Misako Kachi(2)
(1) Triple-i, Shibuya-ku, Tokyo, Japan, (2) Japan Aerospace Exploration Agency (JAXA), Tsukuba, Ibaraki, Japan

Introduction

The Japan Aerospace Exploration Agency (JAXA) launched a Sun-synchronous orbital satellite: the Global Change Observation Mission-Climate (GCOM-C) satellite, SHIKISAI, on 23 December 2017. SHIKISAI carries an optical sensor: the Second Generation Global Imager: SGLI (Table). SSTs are determined from the split-window data of SGLI. It is noteworthy that SGLI has the spatial resolution of 250m which will be powerful on the monitoring of coastal regions, inland seas, and so on. SGLI SSTs will be provided by JAXA.

Algorithm and data

SGLI SSTs are determined by using the split window data measured at 10.8- (T1) and 12-micron (T2) channels. The SST algorithm is based on the quasi-physical method developed for Himawari-8[1]. We modified the method for the split window data for the application to the SGLI data. Parameters are calculated from the simulated SGLI data. RTM used for the simulation calculation is RTTOV of NWPSAF, and the NWP data were provided by JMA.

Cloud/clear algorithm is based on the Bayesian inference method. Cloud probability for each pixel is calculated as the posterior probability of the given data, such as the satellite data, a priori data, etc. We use PDFs generated by using statistics. Only the visible data measured at the 673.5 nm channel (VN8) is currently used. Split window data and SST analysis will be used in future because the amount of data is not enough for PDF based on the statistics yet. The preliminary PDF is generated by using the data for three months from February to April in 2018.

Table. SGLI Channel specifications

Ch.	λ [nm]	Δλ [nm]	L_{std}, L_{max} [W/m²/sr/μm]		SNR at L_{std}	IFOV [m]
VN1	380	10	60	210	675	250 / 1000
VN2	412	10	75	250	800	250 / 1000
VN3	443	10	64	400	517	250 / 1000
VN4	490	10	53	120	865	250 / 1000
VN5	530	20	41	350	482	250 / 1000
VN6	565	20	33	90	1040	250 / 1000
VN7	673.5	10	23	62	1002	250 / 1000
VN8	673.5	20	25	210	549	250 / 1000
VN9	763	8	40	350	1646	250 / 1000
VN10	868.5	20	8	30	491	250 / 1000
VN11	868.5	20	30	300	498	250 / 1000
P1	670	20	20	250	655	1000
P2	865	20	30	300	723	1000
SW1	1050	20	57	248	951	1000
SW2	1380	20	8	103	346	1000
SW3	1640	200	3	50	100	250 / 1000
SW4	2210	50	1.9	20	379	1000
Ch.	**λ [μm]**	**Δλ [μm]**	**T_{std}, T_{max} [K]**		**NEΔT at T_{std}**	**IFOV [m]**
T1	10.8	0.7	300	340	0.39	250 / 500 / 1000
T2	12.0	0.7	300	340	0.69	250 / 500 / 1000

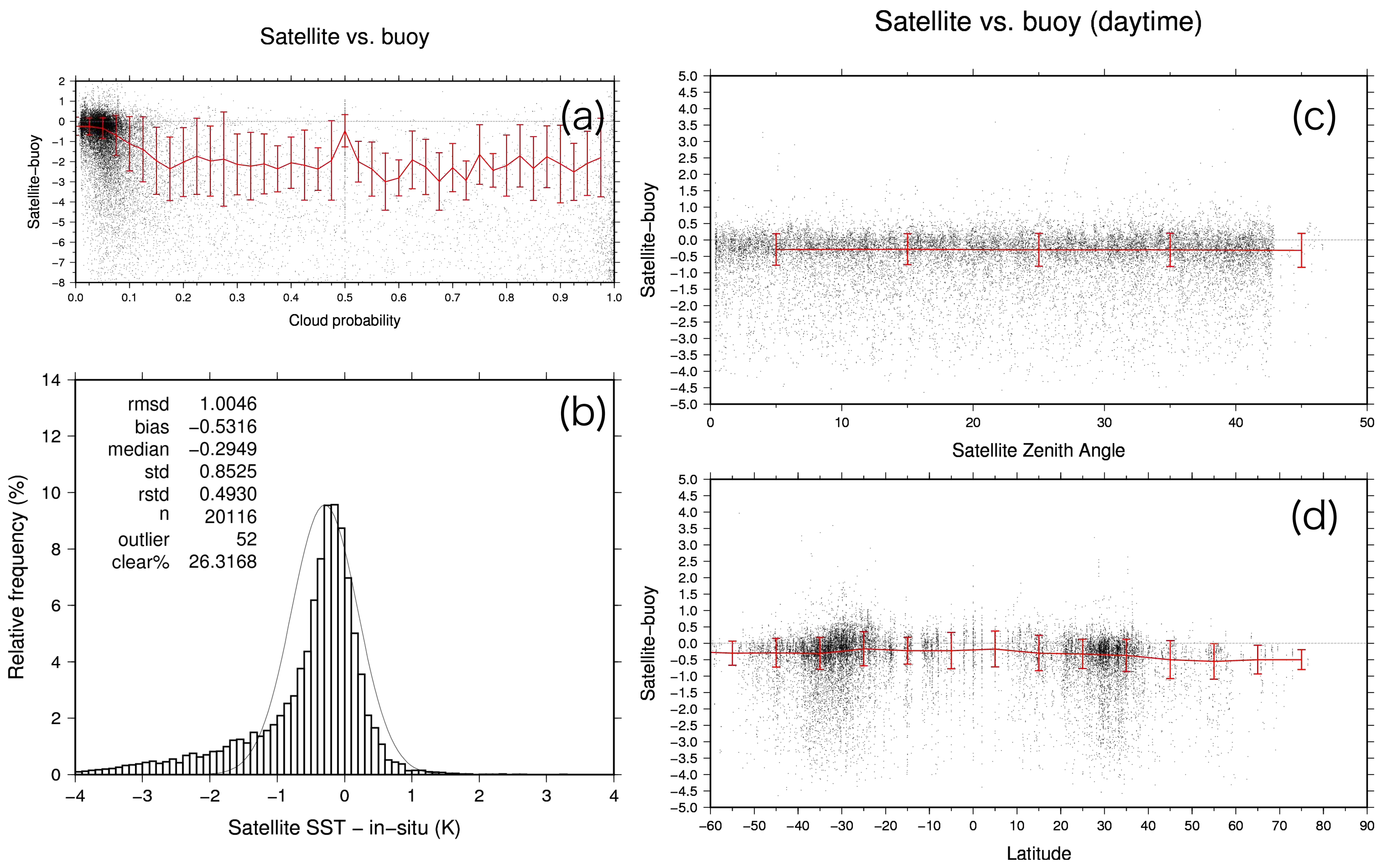

Fig. 1. Validation result

Result and discussions

We validated the SGLI SST that its cloud probability is less than 0.1. This threshold is chosen from the statistics for each cloud probabilities(Fig.1 (a)). The validation is made by the comparison with buoy data[2]. Except for the long cold tail shown by the histogram, the result shows good agreement between SGLI SST and buoy data(Fig.1 (b)). Biases and STDs are stable at each satellite zenith angle, meanwhile, latitudinal dependency is likely to be shown for the bias(Fig.1 (c) and (d)).

The long cold tail is likely to be caused by the insufficient amount of the data and by using only visible data and is expected to be improved by the use of additional PDFs. Latitudinal biases are possibly caused by the SST algorithm; however, the improvement fate algorithm will be left for future.

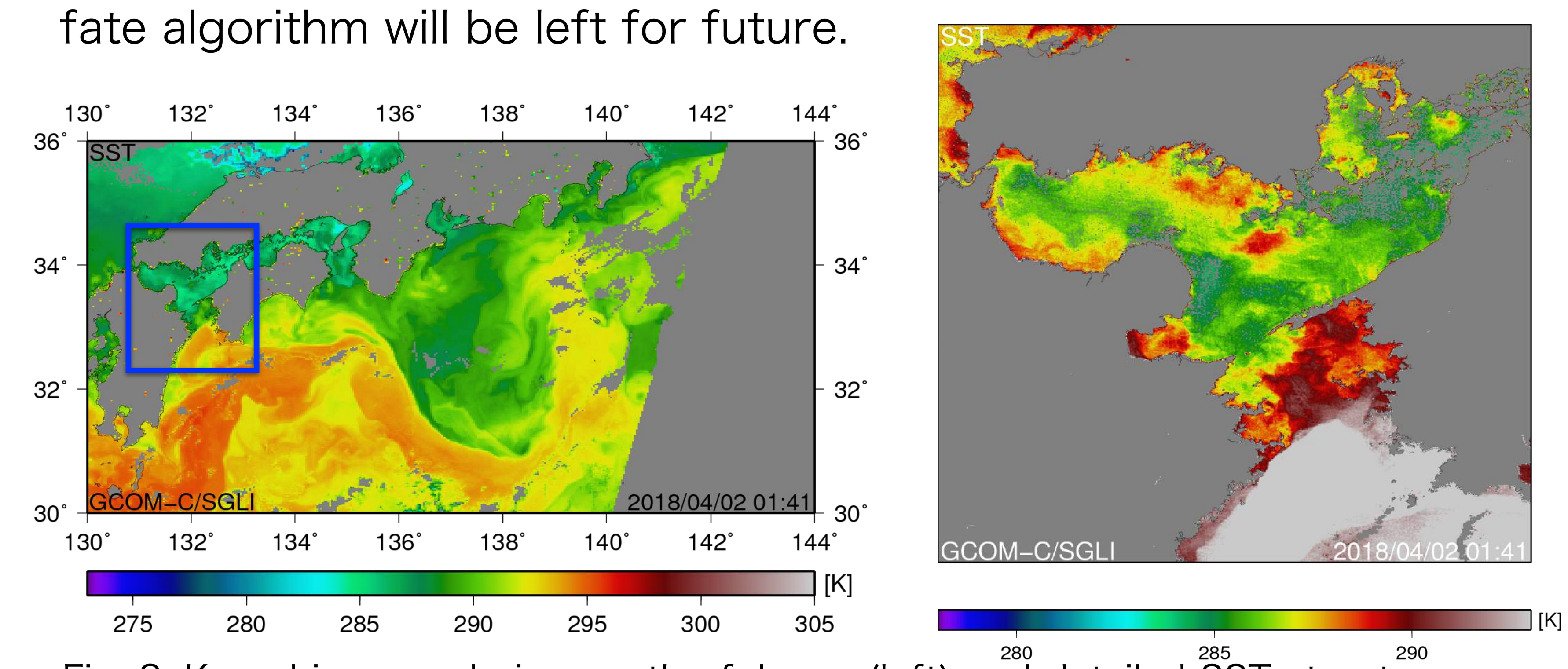

Fig. 2. Kuroshio meandering south of Japan (left) and detailed SST structures over the inland sea (right) captured by SHIKISAI.

Summary

SGLI SST product is under development as of the end of May 2018. A preliminary result shows good agreements between SGLI SSTs and the buoy data; however, cloud screening still needs to be improved. The SGLI SST product will be published from G-Portal of JAXA[3] by the end of 2018. SGLI SSTs are expected to improve the monitoring of coastal regions and inland seas with the 250m spatial resolution.

Acknowledgment

NWP data, that was used for the parameters of the quasi-physical method, was provided by JMA. Buoy data were downloaded from the in-situ SST quality monitor (iQuam) of NOAA.

References

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[2] NOAA in-situ SST quality monitor (iQuam), URL: https://www.star.nesdis.noaa.gov/sod/sst/iquam/

[3] JAXA Glove Portal System (G-Portal), URL: https://www.gportal.jaxa.jp/gp/top.html