Use of ACSPO VIIRS L3U SST in MGDSST

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Introduction

MGDSST (Merged satellite and in-situ data Global Daily Sea Surface Temperature)

- JMA's operational SST analysis
- Global, 0.25 ° x 0.25 ° grid resolution, daily
- Input: AVHRR (NOAA-18, 19, MetOp-A), AMSR2, Windsat, in situ
- Biases of satellites' data are corrected using in situ SSTs
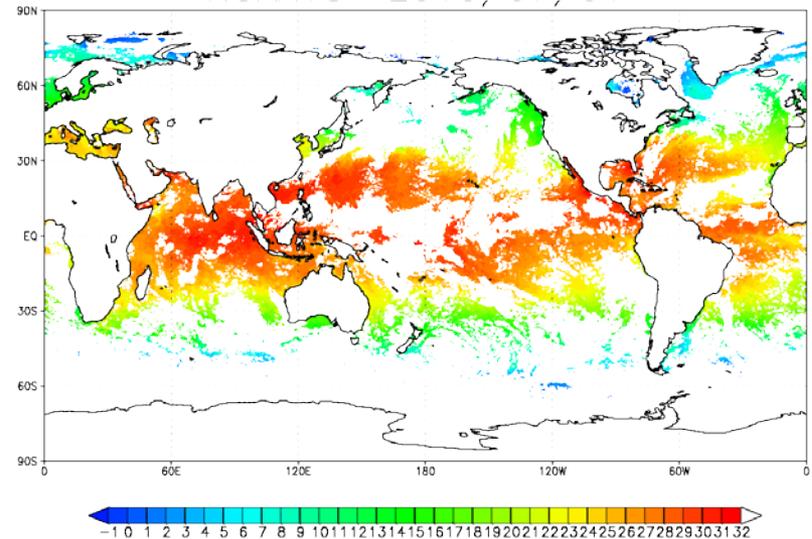- Scale decomposed space-time Optimal interpolation

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ACSPO VIIRS L3U SST (1)

- JMA has routinely acquired ACSPO VIIRS L3U SST (ver.2.40) from NOAA Server.
- The coverage of VIIRS SSTs are superior to that of AVHRR.

sNPP/VIIRS SSTs 2015/07/01
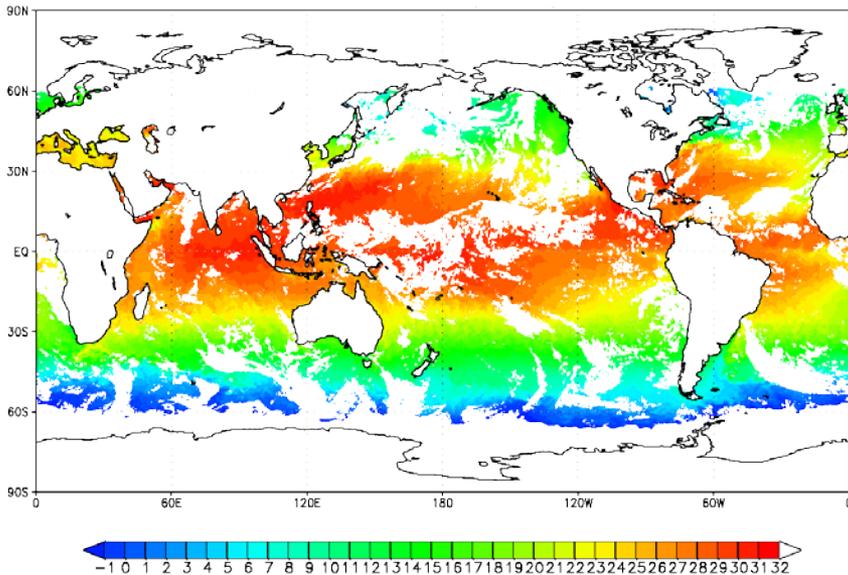
NOAA18/AVHRR SSTs 2015/07/01

Daytime and nighttime data are combined on a 0.25 ° grid

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ACSPO VIIRS L3U SST (2)

- JMA has a plan to incorporate ACSPO VIIRS L3U SST into MGDSST analysis.

- ACSPO VIIRS SST includes Single Sensor Error Statistics (SSES) biases. ACSPO SSES bias correction is considered to reduce the effects of diurnal warming, cloud leakages and satellite view zenith angle, and to make VIIRS SSTs close to 'SST depth' (i.e. representative of in situ SSTs)

- We conducted a primary investigation whether we should apply the SSES bias correction to VIIRS SSTs before experimentally assimilating them into MGDSST analysis.

Validation Method

- In MGDSST analysis, daytime and nighttime satellites' data are binned into 0.25° x 0.25° grid and converted into daily composite.

- We validated the following 4 cases of VIIRS daily 0.25 ° binned data and 1 case of AVHRR data against in situ SSTs (buoys and Argo floats) for the period from June to August 2015. The Case 3. to 5. were calculated as a reference.

1. composite daytime and nighttime SSTs [day + night]
2. same as 1. but <u>with</u> SSES bias correction [day + night w/ SSES]
3. nighttime SSTs [night only]
4. same as 3. but <u>with</u> SSES bias correction [night only w/ SSES]
5. same as 1. but for AVHRR/NOAA18 (based on MCSSTs by JMA)
   [NOAA18]

* In situ SSTs for the validation are also binned into 0.25 ° x 0.25° grid and daily averaged.

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Results (1)：Global Mean
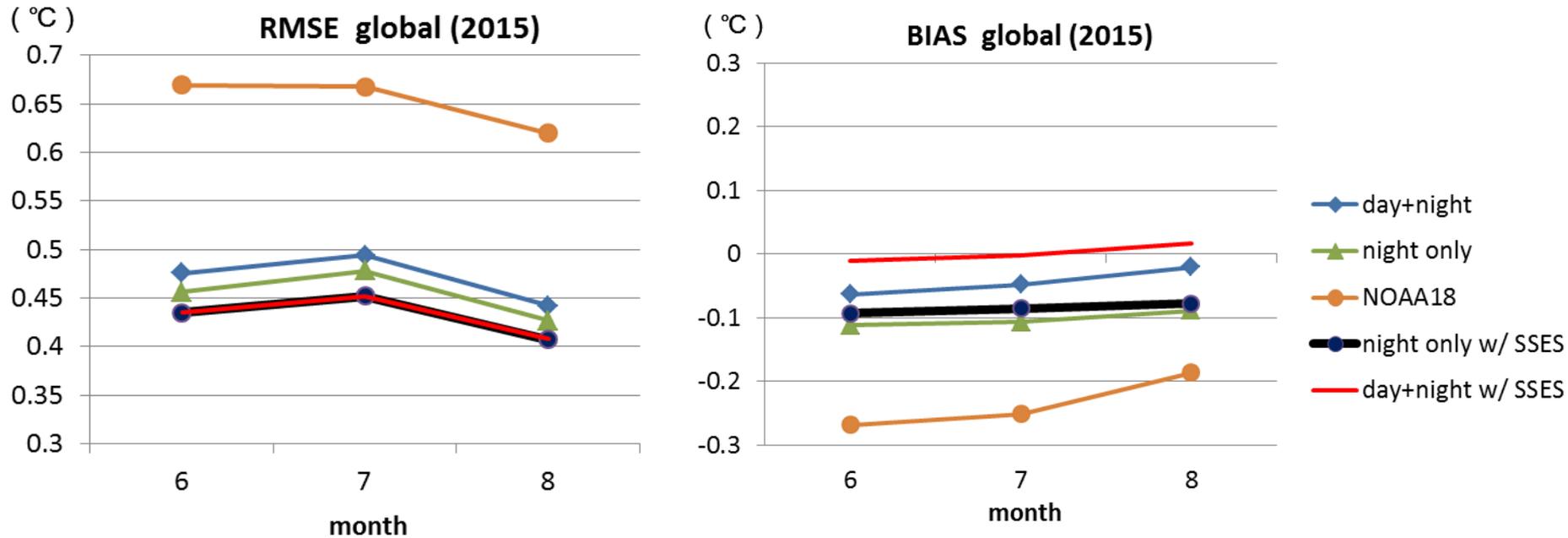
- RMSE and BIAS values of VIIRS SSTs are superior to those of AVHRR/NOAA18.
- Daytime and nighttime SSTs with SSES bias correction show the best results.

Result (2)：Tropical region (30S-30N)
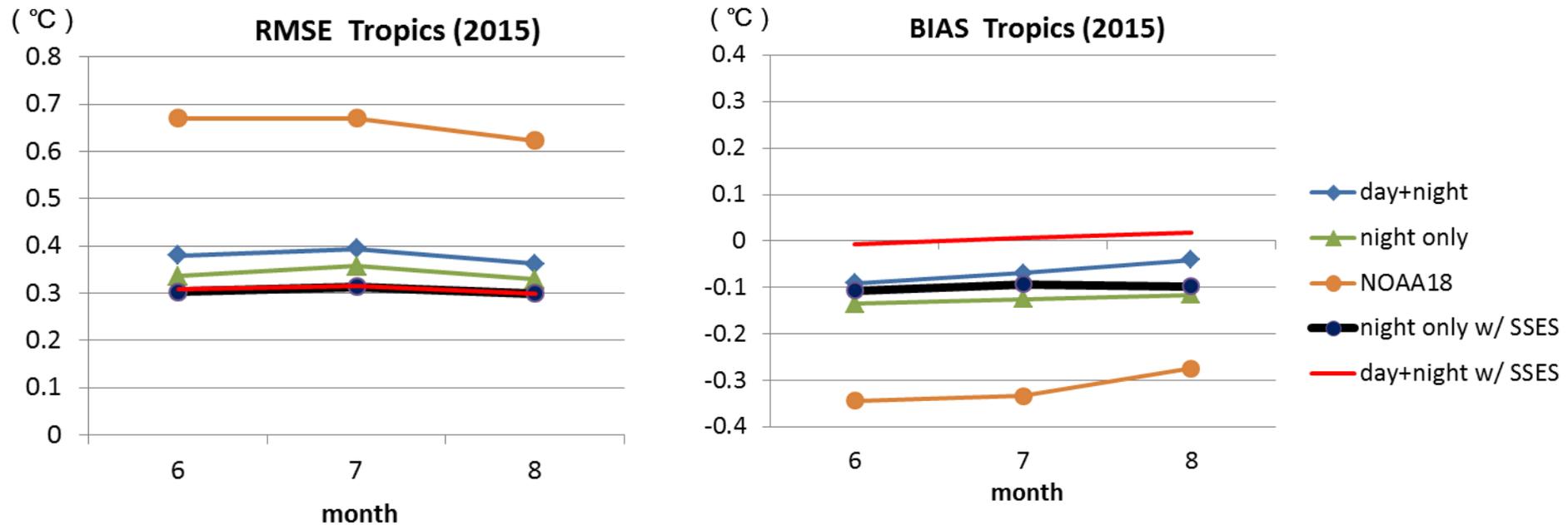
- Nearly the same result as that of global mean.
- SSES bias correction reduced RMSE and BIAS values for 'day + night' by 0.07 ℃, respectively.

Result (3)：Northern mid and high latitudes (30N-90N)
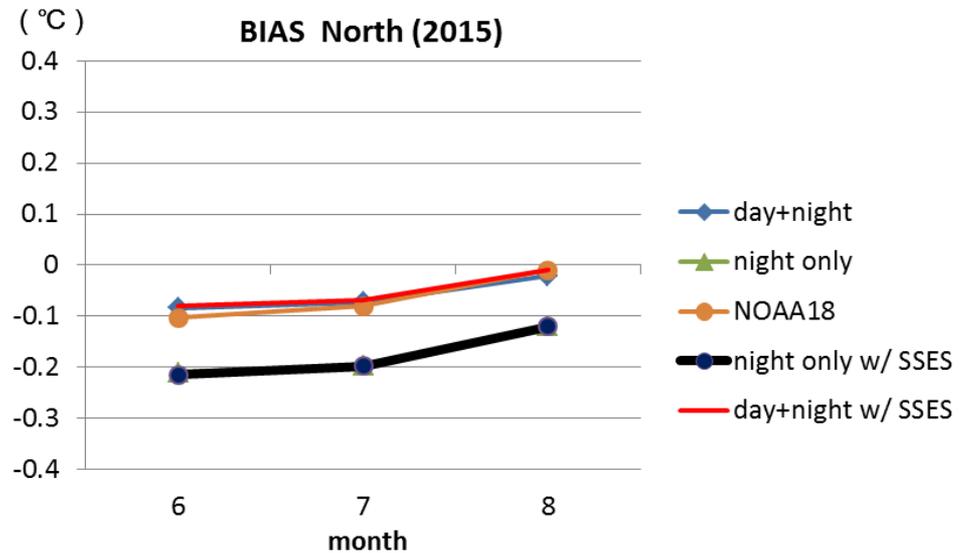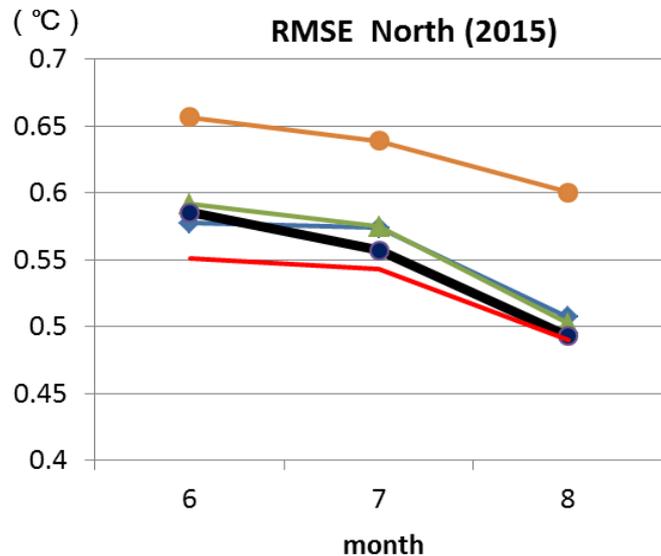
- Composite of daytime and nighttime SSTs with SSES bias correction (day+night w/ SSES) show the best results. However, SSES bias correction did not improved BIAS values.

Result (4)：Southern mid and high latitudes (90S-30S)
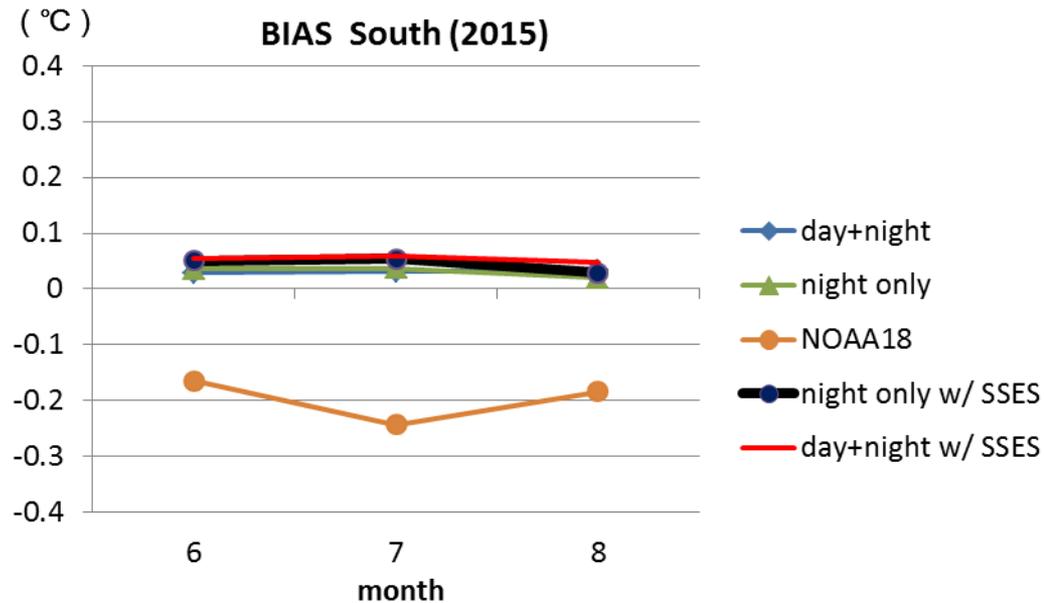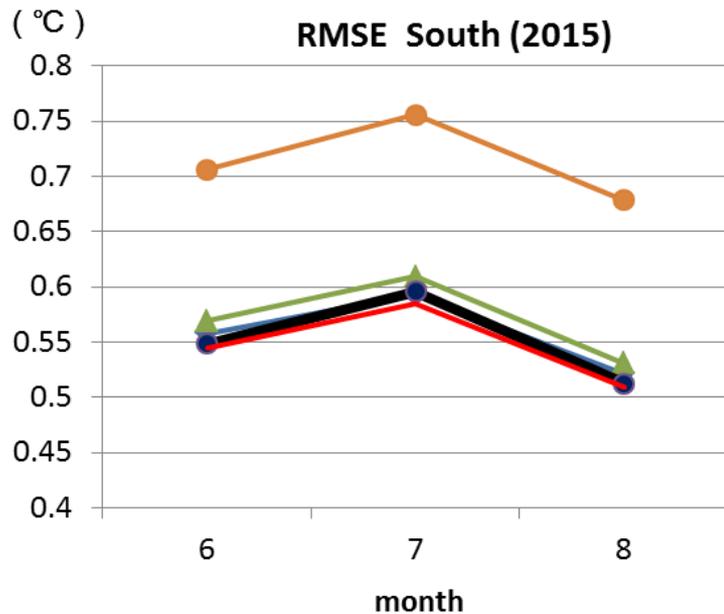
RMSE and BIAS values are almost the same level among 4 cases of VIIRS data.

Summary & Future Work

- We validated daily 0.25° binned data of VIIRS SST against in situ SSTs for 3 months whether SSES bias correction improve precision of daily SSTs.
- In the tropical region, SSES bias correction reduced both RMSE and BIAS values for composite of daytime and nighttime SSTs by 0.07℃. However, in other regions, it has little impact.

- If improvements are confirmed for other period, we will experimentally assimilate VIIRS SSTs with SSES bias correction in MGDSST analysis in the current year.

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