

# Use of ACSPO VIIRS L3U SST in MGDSST (delayed analysis)

Japan Meteorological Agency

#### Toshiyuki SAKURAI<sup>\*</sup>, Yukio KURIHARA, Akiko SHOJI, Hiromu KOBAYASHI, Ayako TAKEUCHI(Office of Marine Prediction)

\*e-mail: tsakurai@met.kishou.go.jp





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## Introduction

- MGDSST (Merged satellite and in-situ data Global Daily Sea Surface Temperature)
  - Global, 0.25 x 0.25 grid resolution, daily GPV
  - Biases of satellites' data are corrected using in situ SSTs
  - Scale decomposed space-time optimal interpolation

Prompt analysis: conducted within JMA's NWP System

Input: AVHRR (NOAA-18, 19, MetOp-A) [GAC and LAC around Japan],

AMSR2, WindSat, In-situ

Delayed analysis: conducted five-months later in principle

Input: AVHRR (NOAA-18, 19, MetOp-A) [GAC], AMSR2, In-situ

<u>Reanalysis</u>: reprocessed for 1982-2006 with Pathfinder SST v5.0/5.1 and other



We conducted an impact test for delayed analysis.

## ACSPO VIIRS L3U SST

- 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.



## Method of impact test

- Impact of assimilation of VIIRS SSTs for the delayed-mode MGDSST analysis was tested against a control run (i.e. routine analysis) for the period from 02 Feb. 2016 to 30 Jun. 2016.
- The configuration of test run was the same as the control, except that VIIRS SSTs are used in place of NOAA18/AVHRR data. The SSES bias was removed from the VIIRS L3U SSTs.
- The observational error of VIIRS SSTs in optimal interpolation was set equal to 0.57 times of that of NOAA18/AVHRR SSTs by calculating the ratio of the both RMSEs against buoy SSTs.





## Method of validation

- Validation was conducted against (1) in-situ observation and (2) daily VIIRS SSTs.
- (1) Comparison against In-situ observation
  Moored/drifting buoy and Argo data were used. Those were not

independent to analysis because they were also used for bias correction of satellites' data.

- (2) Comparison against daily VIIRS SSTs To confirm VIIRS SST were ingested into analysis, we also compare with daily VIIRS SSTs.
- Both data were daily-averaged and converted into 0.25 deg. X 0.25 deg. grids for comparison.
- Validation Period : from 02 Feb. 2016 to 30 Jun. 2016.



### Results (1): Validation by in-situ data

- RMSE for Test run is improved by 0.016 K in global region.
- Improvement of RMSE is relatively large in the southern midand high- latitude.
- Bias for Test run is generally comparable with that of Control.

Area	BIAS (K)		RSME(K)		Number of Observations
	Control	Test	Control	Test	
Global	0.021	0.020	0.409	0.393	381420
60N-90N	0.001	0.008	0.364	0.355	8886
30N-60N	0.035	0.034	0.575	0.554	80554
30S-30N	0.020	0.021	0.271	0.265	175876
60S-30S	0.013	0.009	0.450	0.427	113138
905-605	-0.002	-0.020	0.254	0.225	2966



### RMSE map against In-situ data



#### RMSE difference between Control and Test



[Left figure]

- 0.20 Warm color indicates 0.15
- RMSE(Test) is smaller than 0.10

RMSE(Control). 0.05

- -0.05RMSE for Test is generally -0.10 improved in almost all areas.
  - Improvement is relatively large in the mid- and high-latitude.

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0.00

-0.20

### Bias map against In-situ data



[Above figures] Bias for 10x10 degree grids

Difference in absolute value of bias (abs (bias)) between Control and Test



[Left figure]

0.05

Warm color indicates abs (bias) (Test) is smaller than abs (bias) (Control).

- Both Test and Control have a positive bias in almost all areas.
- Abs (bias) for Test is comparable with that of Control.

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### Results (2) : Validation by daily VIIRS SSTs RMSD map against daily VIIRS SSTs

#### RMSD for Test (+ VIIRS) [K]



#### RMSD for Control [K]



#### RMSD difference between Control and Test

SST diff. rmsd(tn)-rmsd(exp) 2017/02/10-06/30



[Left figure]

Warm color indicates RMSD (Test) is smaller than RMSD (Control).

- RMSD for Test is smaller in the mid- and highlatitude and around sea ice area.
- RMSD for Test is degraded along west coast of the North America, in seas off Alaska and the Red sea.
  - => It might be caused by some unknown issues with our analysis system.

### Bias map against daily VIIRS SSTs

Bias for Test (+ VIIRS) [K]



Bias for Control [K]



Difference in absolute value of bias (abs (bias)) between Control and Test



[Left figure] Warm color indicates abs(bias) (Test) is smaller than abs(bias) (Control).

Abs(bias) is generally improved, however, not so large except around the Antarctic.



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## Summary & Future Work

- Impact of assimilation of VIIRS SSTs for the delayedmode MGDSST analysis was tested.
- From the validation results against in-situ data, RMSE for Test run was improved by 0.016 K in global region.
- The improvement is relatively large in the southern mid- and high- latitude. This might be caused by better coverage of VIIRS SSTs in these areas, and by better accuracy of VIIRS SSTs.
- We will make an impact test for prompt analysis of MGDSST and HIMSST in current year.

