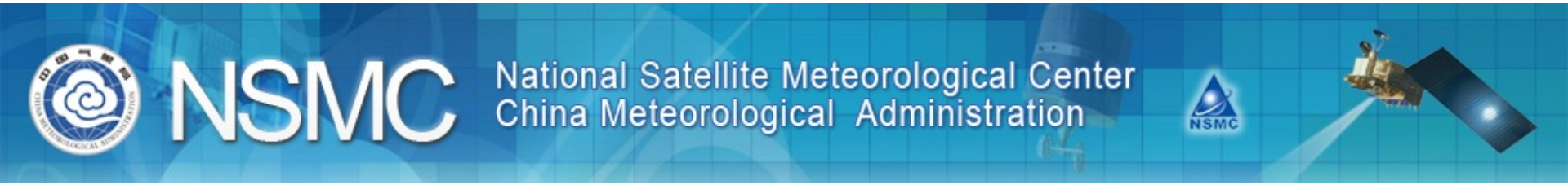
Report from CMA

Sujuan Wang , Peng Cui, Miao Zhang
Peng Zhang, Caiying Wei , Feng Lu, Jian Liu

National Satellite Meteorological Center, CMA

GHRSST XIX
4-8 June, 2018, Darmstadt

Introduction



- National Satellite Meteorological Center (NSMC)
  - is one of the operational centers of CMA
  - is tasked to support nation-wide weather forecasts, climate research, and natural disaster monitoring with space-based EO data and derived products (include SST).
- CMA Fengyun Constellation current status
  - GEO satellites:

    FY2E/F/G/H(op.), FY2H is ready to launch

    FY4A(R&D), new generation
  - LEO satellites:

    FY3A/B(R&D)

    FY3C(op.), AM

    FY3D(op.), PM, Post Launch Test

FY: Fengyun
'Feng' in Chinese means Wind
'Yun' means Cloud.

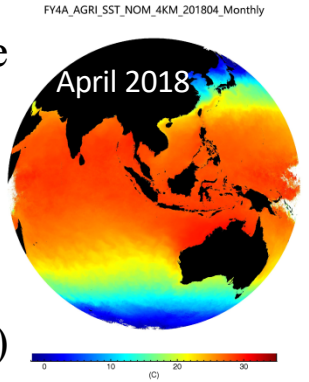
Even number series: GEO
Odd number series: LEO

http://www.nsmc.org.cn/en/NSMC/Home/Index.html

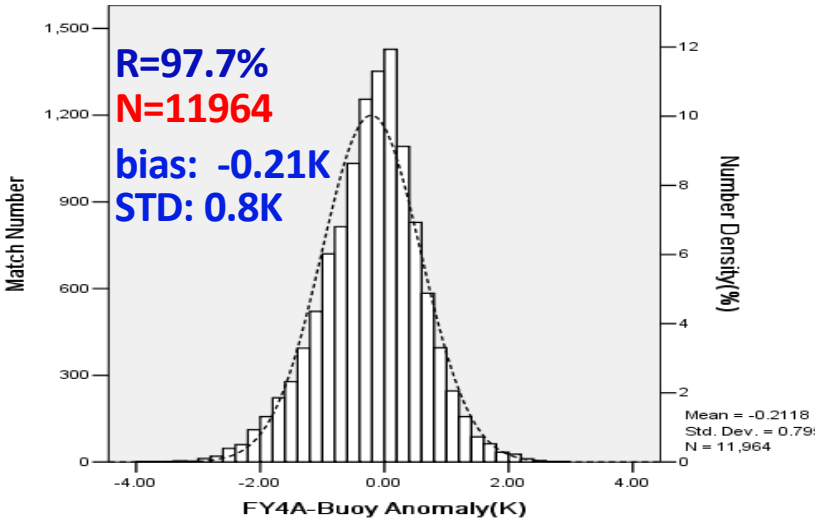
Main activities since GHRSST XVIII

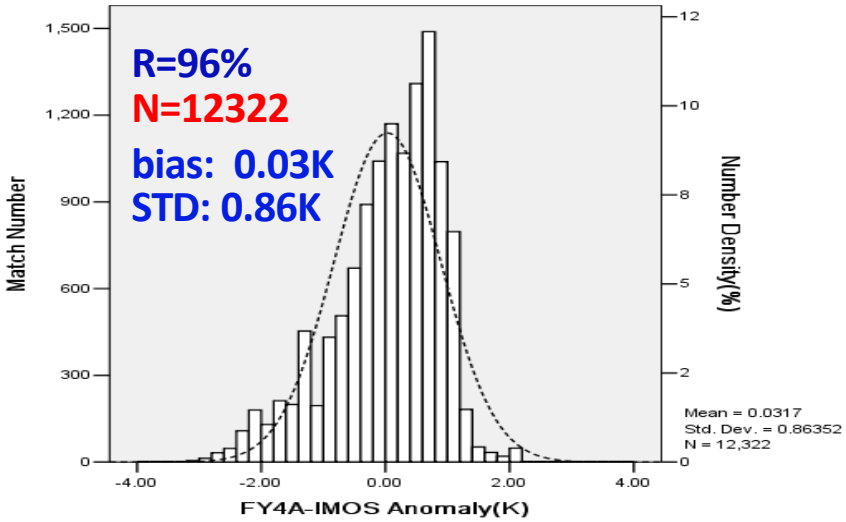
❑ Geo SST

- FY4A was launched on 11 Dec. 2016.It has been put into operation since 1 May 2018. SST will be available soon (autumn 2018?).



- ➢ NLSST(D/N) is chosen for the operational algorithm.
- ➢ Validation (1 April 2018 - 30 April 2018)
  - Compare SST against L4 CMC SST (by a bilinear interpolation approach)
    FY4 - CMC : -0.13K ± 0.86K
  - Validate SST against in situ(iQUAM) with Matchup window of (4km, 30min)
    FY4 - Buoy(Drifters&Tropical Moorings) : -0.21K± 0.8K
    FY4 - IMOS: 0.03K ± 0.86K

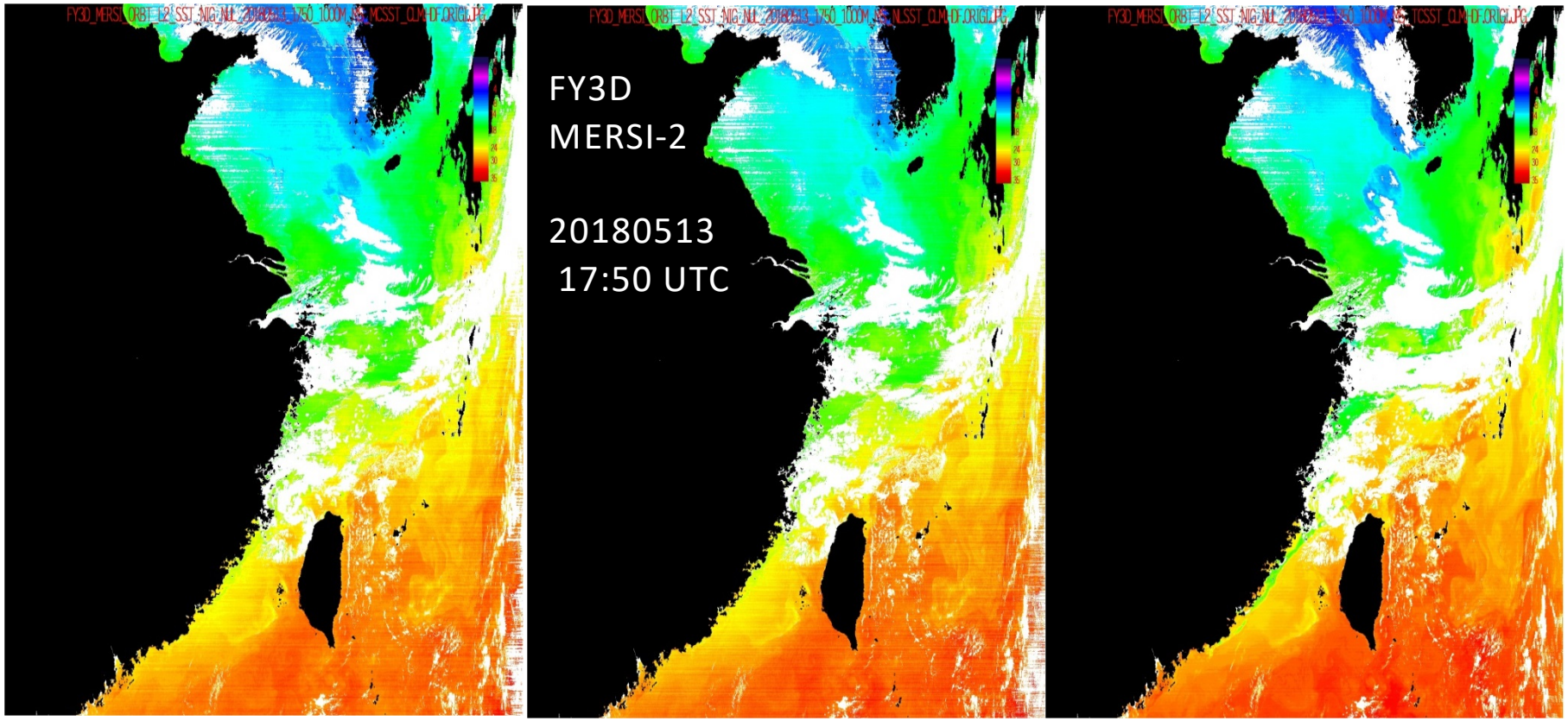




Main activities since GHRSST XVIII

❑ Leo SST

- FY3D was launched on 15 Nov. 2017. It's still in Post Launch Test phase.
  - ➢ Multichannel regression , Validation against iQUAM & OISST
  - ➢ The 3.8μm band of FY3D MERSI-2 is better than the counterpart of FY3 VIRR.



MCSST(split channel) **NLSST(split channel)** **TCSST(split channel + 3.8 μm)**

30-year daily OISST

Main activities since GHRSST XVIII

– Operational

❑ in situ data update

- The in situ data used for FY3B/C matchup routine was updated from iQUAM V1 to V2.

❑ Algorithm update

- FY3B VIRR SST algorithm was updated from MCSST(D) to NLSST(D/N). And the L3U specification was updated from 1km, 648 files per day to 5km, 2 files per day.
- FY3C MWRI SST's quality control was updated.

❑ FY3C VIRR SST Validation against OISST and OSTIA

- Nov.2017-Feb.2018, statistics of quality flag with optimal(0) and overall are shown as following

	optimal	ALL
FY3-OISST:	**-0.16±0.75K (D) -0.15±0.78K (N)**	**-0.33±1.25K (D) -0.38±1.30K (N)**
FY3-OSTIA:	-0.17±0.66K (D) -0.17±0.66K (N)	-0.34±1.21K (D) -0.41±1.26K (N)

SST Quality Flag
0: Optimal
1: Sub_Optimal
2: Poor

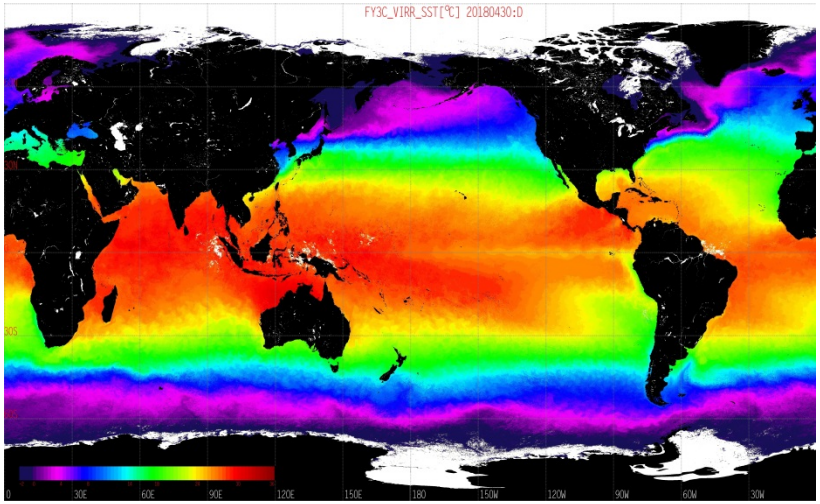
❑ FY3C Orbit maintained

- Since 1 April 2018, after the orbit maintained, the cold bias of FY3C VIRR nighttime SST (from -0.15K to -0.05K, Vs OISST) is improved , the regression coefficients' update is underway.

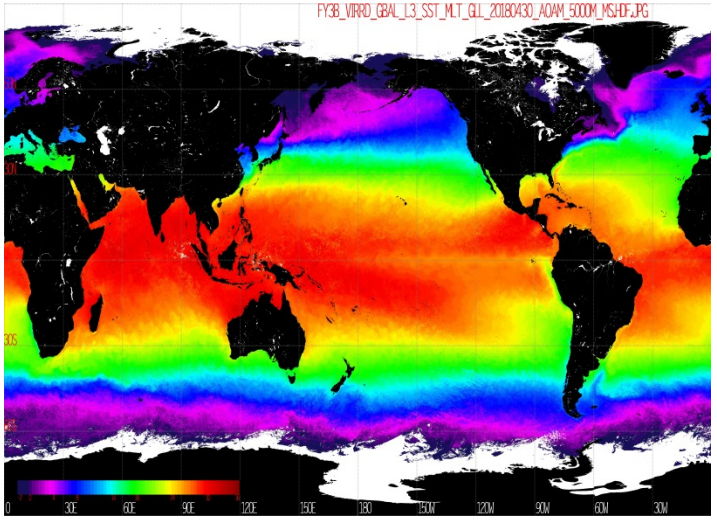
FY3/VIRR monthly SST(FY-3 AM+PM)

201804

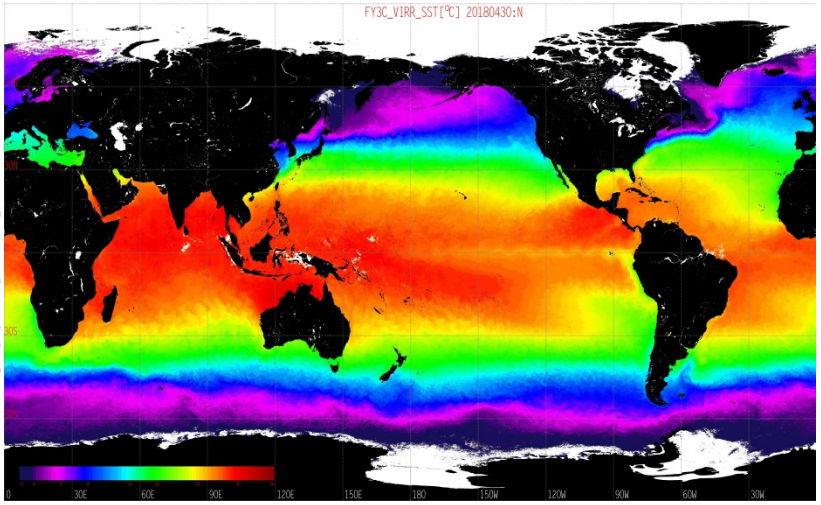
Local time 10



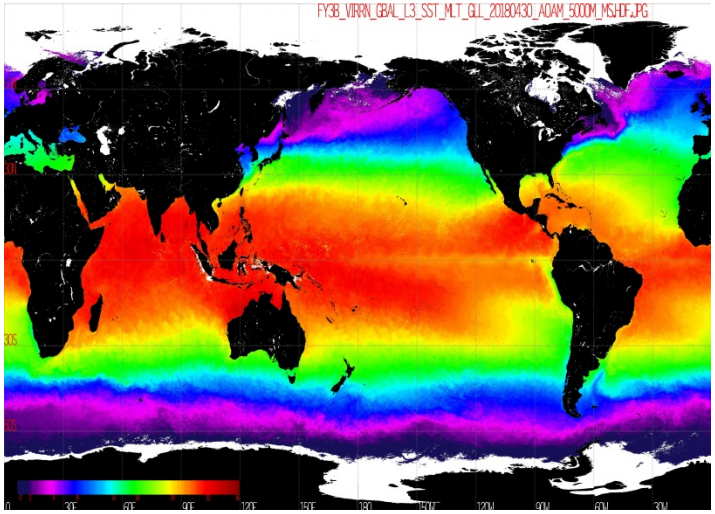
Local time 14



Local time 22



Local time 2



daytime

nighttime

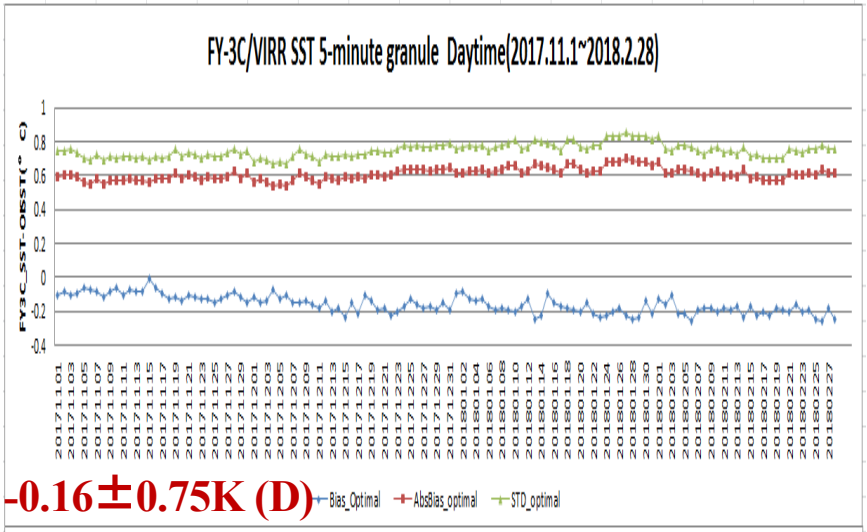
FY3C PGS(MCSST)

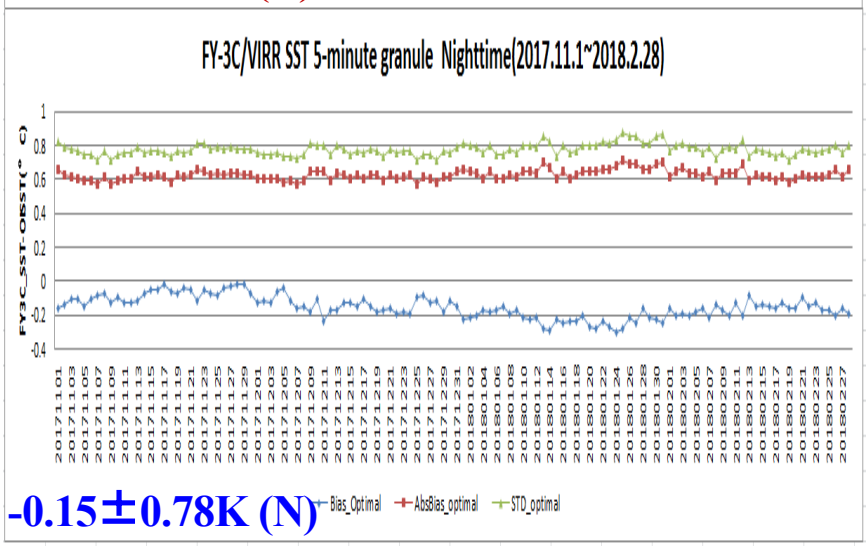
FY3B PGS(NLSST)

PGS: Products Generation System

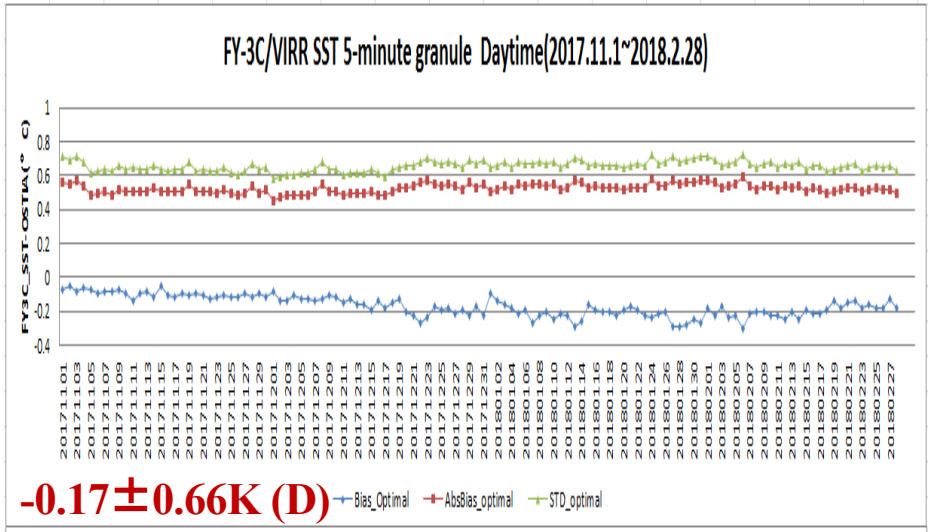
FY3C VIRR SST Validation against OISST and OSTIA

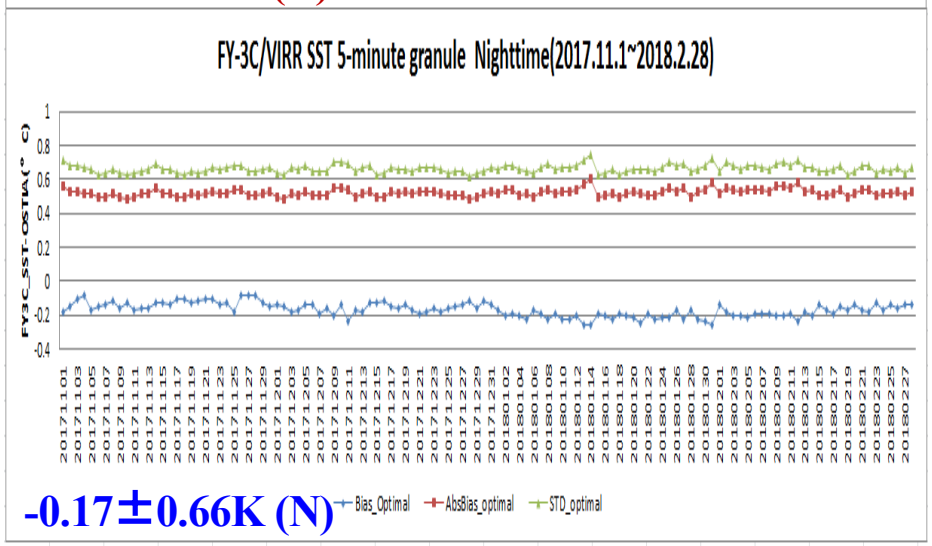
FY3C VS OISST





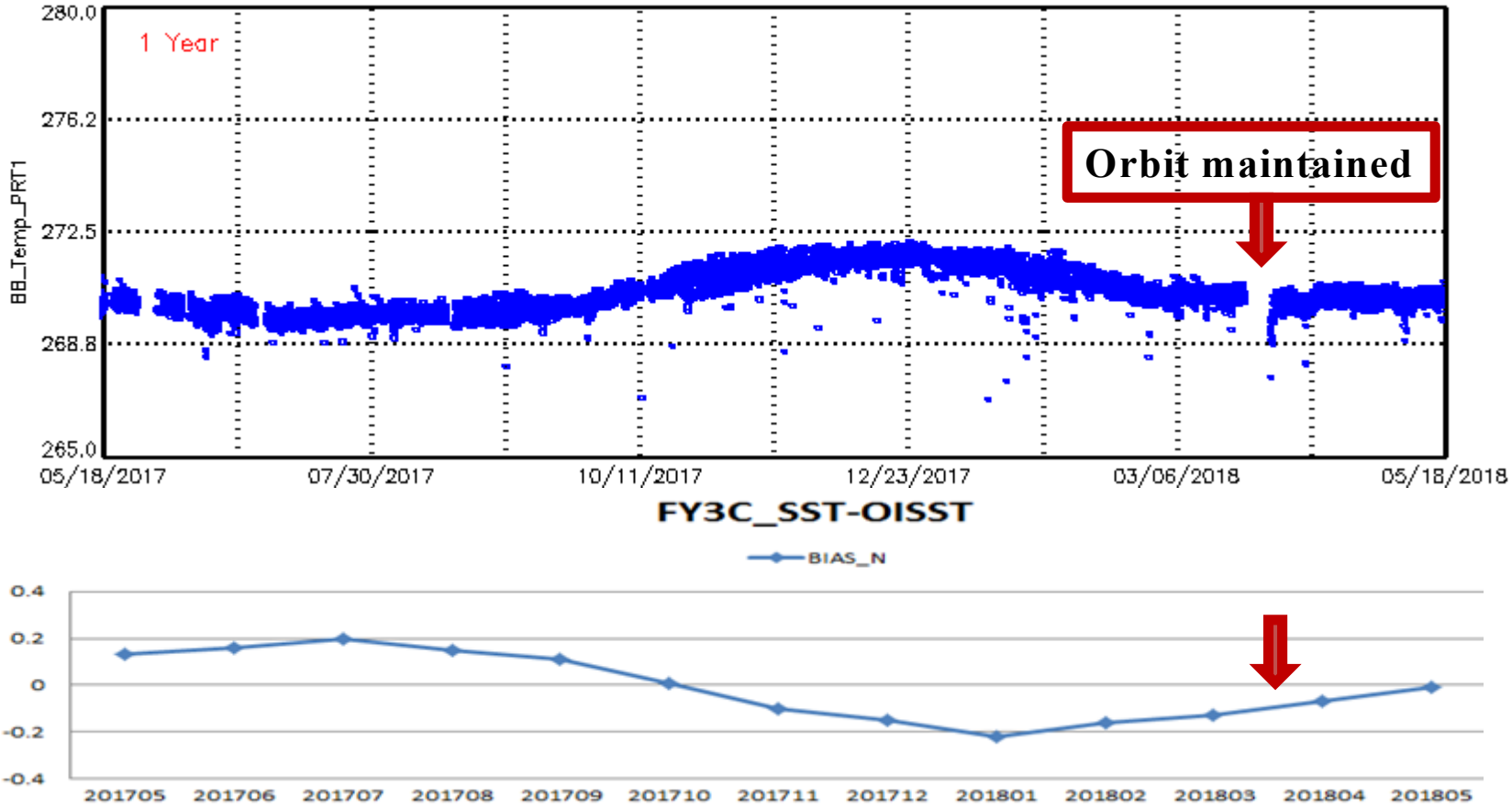
FY3C VS OSTIA





The daily time series of anomaly statistics of FY-3C/VIRR operational SST from November 2017 to February 2018 for the quality flag with optimal(0)。

Main activities since GHRSST XVIII



The bias of FY3C VIRR nighttime SST has high correlation with the temperature of Block Body(BB_Temp_PRT1). Since 1 April 2018, after the orbit maintained, the cold bias of nighttime SST is improved. It has been fed back to the calibration team.

Main activities since GHRSST XVIII

– **Experimental**

❑ FY3C VIRR

- Reprocessing of SST from August 2016 to December 2017 based on operational L1 data with monthly coefficients. NL and MC retrieval against OISST were compared .
  - MCSST-OISST: 0.04±0.83K (D) 0.15±0.85K (N) | -0.14±1.23K (D) -0.09±1.3K (N)
  - **NLSST-OISST: 0.10 ±0.76K (D) 0.06±0.76K (N) | -0.15±1.14K (D) -0.31±1.2K (N)**

optimal **ALL**

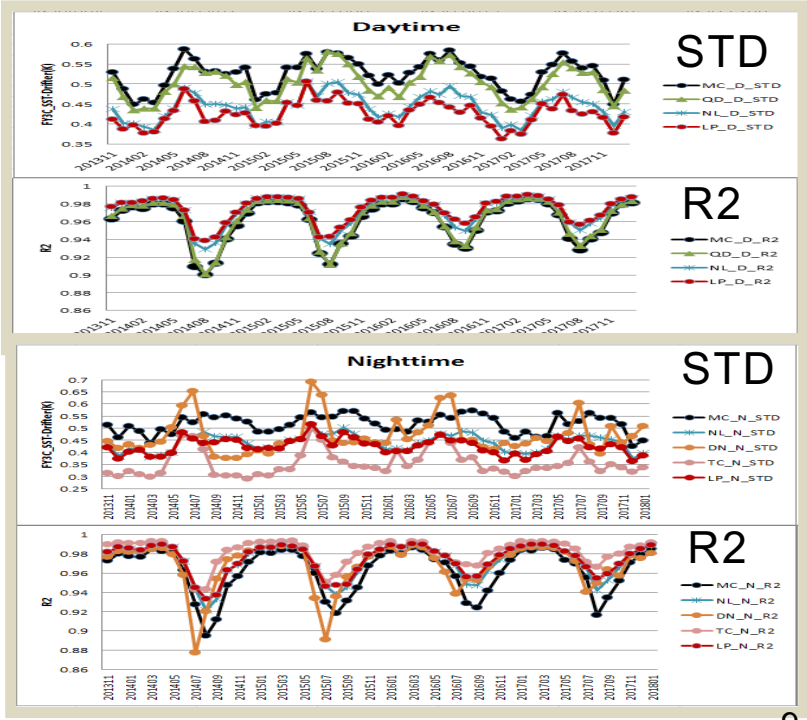
- Regional regression: Nov.2013-Feb.2018, monthly
  - The best algorithm is **LP(D/N)** *
- Regional retrieval: [10S-50N,80-180E] NL, monthly Coefs.
  - **FY3C vs OISST:**

    optimal: -0.02±0.79K (D) 0.17±0.80K (N)

    All: -0.28±1.22K (D) -0.09±1.23K (N)
  - **FY3C vs iQUAM: (by Lei Guan etc.)**

    optimal: 0.02±0.66K(D) 0.15±0.64K(N)

    All: -0.21±0.92(D) -0.15±1.07K(N)



Courtesy to Prof. Lei Guan

* **LP: NLSST adapt from Petrenko's Algorithm (the RED line)**

Main activities since GHRSST XVIII

❑Preparation of FY_SST in GDS 2.0 format

- Determine to register parameters(e.g. center name, product name etc.) to GDS2.0 Specification
- L2Pcore : Is our SSES suitable for L2Pcore?
  - sses_bias
  - sses_standard_deviation
- L2Paux: To Be Determined
  - dt_analysis:
  - wind_speed:
  - sea_ice_fraction:
  - aerosol_dynamic_indicator:

Summary and Future Work

- Ongoing development to improve FY_SST.
- Development of regional SST using FY3D/MERSI data.
- Discussion with Calibration Team to improve the input sensor data quality
- CMA would like to increase collaboration with GHRSST Advisory Council in working towards GHRSST specifications.

Acknowledgements

Thanks to NOAA/NESDIS/STAR for providing iQUAM in situ SST.

Thanks to NOAA/NCEI for providing Reynolds OI v2. daily SST.

Thanks to NOAA/ESRL for providing the long term monthly and daily means OISST.

Thanks to JAXA for providing AHI SST.

Thanks to OSI-SAF for providing METOP SST.

Thanks to CMC for providing CMC daily SST.

Thanks to UKMO&CMEMS for providing OSTIA daily SST.

Thanks to ABOM for providing IMOS in situ SST.

Thank you!

Comparison of MIR's Contribution to SST retrieval

TCSST(N) $$T_s = a_0 + a_1 T_{11} + a_2 T_4 + a_3 T_{12} + a_4 (T_4 - T_{12})(\sec\theta - 1) + a_5 (\sec\theta - 1)$$

T_4, T_{11}, T_{12}: brightness temperature in ~3.8μm、11μm、12μm bands

Sat/Sensor	a0	a1	a2	a3	a4	a5	RMS (K)	R^2	NOBS	Month
NOAA-19/ AVHRR(NP)	-276.860	0.2700	1.1790	-0.4315	0.1462	1.1327	0.2441	0.999	9007	201005
FY-3B/VIRR	-281.806	3.1317	0.4158	-2.5214	-0.067	1.4118	0.5463	0.992	2105	201705
FY-3C/VIRR	-288.130	1.6741	0.8803	-1.6174	0.3035	1.2907	0.5895	0.990	3315	201705
FY-3D/MERSI	-276.844	0.2577	1.2235	-0.4658	-0.154	2.2701	0.2485	0.994	3631	201805

Comparison of nighttime TCSST Algorithm between FY3B /C and NOAA19

- **NOAA19:** $|a_2|$ is **bigger** than $|a_1|$ and $|a_3|$
- **FY3B/C:** $|a_2|$ is **smaller** than $|a_1|$ and $|a_3|$
- **FY3D:** $|a_2|$ is **bigger** than $|a_1|$ and $|a_3|$

The performance of 3.8μm band of FY3D MERSI-2 is better than the counterpart of FY3 VIRR.