Improvements of the Daily OISST Version 2.1

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Introduction

Since 2016, the quality of NOAA/NCEI 0.25°x0.25° Daily Optimum Interpolation Sea Surface Temperature (DOISST) v2.0 degraded and exhibited cold biases in the averaged SST in the global oceans, particularly the Indian Ocean. Several factors may attribute to the degradation: (a) Loss of drifting buoy SSTs in BUFR format, (b) Inaccurate correction to ship SSTs, (c) Degradation of NOAA-19 SSTs, and (d) Warm bias in SST proxy of ice-SST regression. DOISST v2.1 has now been updated upon those factors.

Progressive Experiments from v2.0 to v2.1

Experiments	Descriptions
(a) MA+N19	Using MetOp-A (MA) and NOAA-19 (N19), the same as DOISST **v2.0**
(b) MA+MB	Same as (a) except for using MetOp-A (MA) and MetOp-B (MB)
(c) FrzPnt	Same as (b) except for using freezing-point (FrzPnt) over the regions of sea-ice
(d) Ship01	Same as (c) except for replacing ship bias of 0.14°C by 0.01°C
(e) R3.0.2	Same as (d) except for replacing ship and buoy SSTs from NCEP by ICOADS R3.0.2
(f) ALL	Same as (e) except for including Argo temperatures at 5 m depth, the same as DOISST **v2.1**

Summary

The cold biases in DOISST v2.0 can effectively be reduced from -0.14C to -0.04C by adjusting ship SST from 0.14C to 0.01C, using ICOADS R3.0.2 derived from BUFR and TAC, and including Argo SSTs above 5 m depth.

The impact of using MetOp-B instead of NOAA-19 is trivial because both MetOp-B and NOAA-19 SSTs are adjusted by the same in situ SST observations.

The warm bias in the Arctic can be improved by applying freezing-point SST proxy, but its contribution to the globally averaged SST is small due to its small area weight.

References

Banzon, V., T. M. Smith, M. Steele, B. Huang, and H.-M. Zhang, 2020: Improved Estimation of Proxy Sea Surface Temperature in the Arctic. J. Atmos. Oceanic Technol., 37, 341-349, doi: 10.1175/JTECH-D-19-0177.1.

Huang, B., C. Liu, V. Banzon, E. Freeman, G. Graham, B. Hankins, T. Smith, and H.-M. Zhang, 2020: Improvements of the Daily Optimum Interpolation Sea Surface Temperature (DOISST) Version 2.1, Journal of Climate, in review.
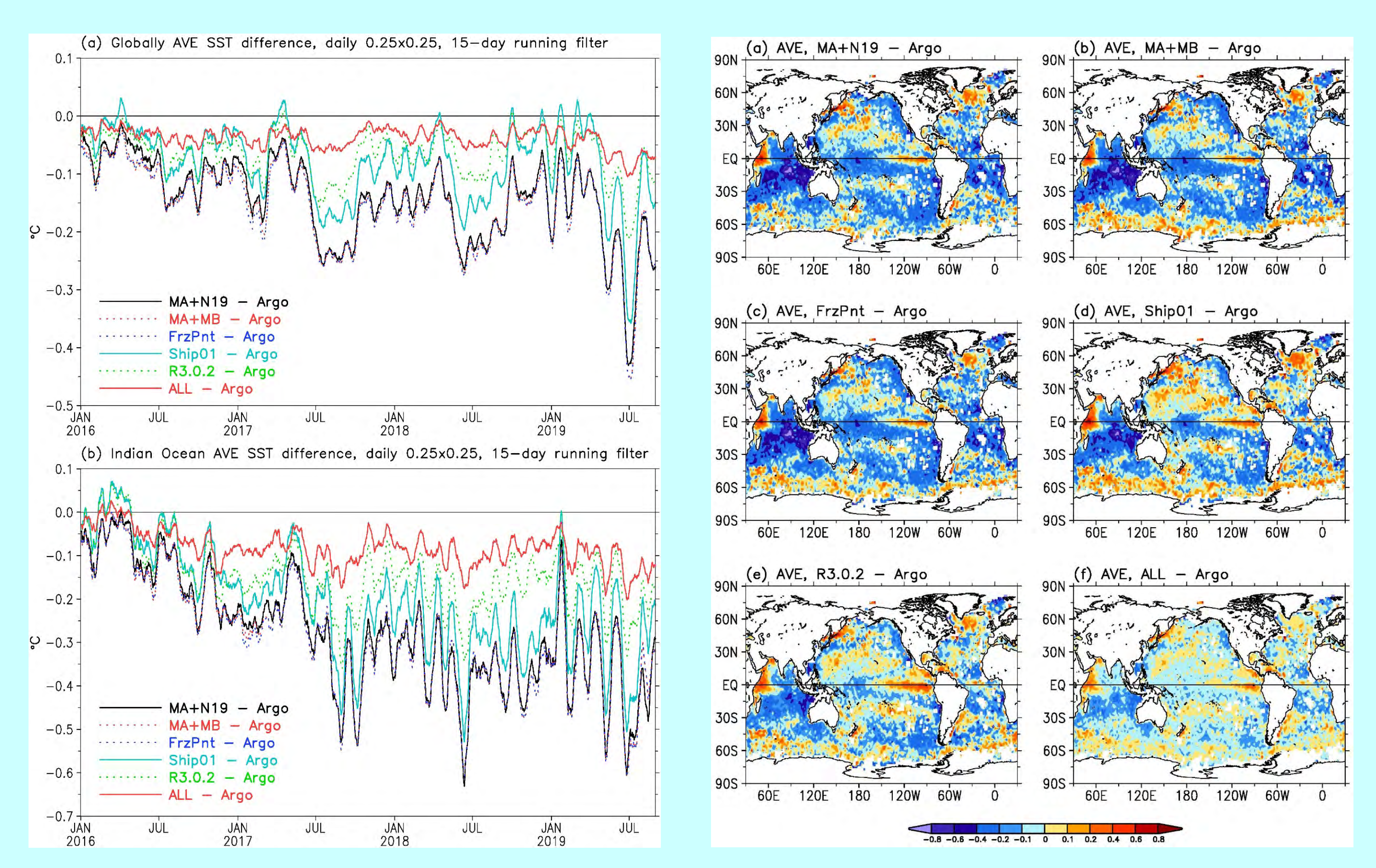
Left: (a) globally and (b) Indian Ocean averaged SST difference against Argo observations in experiments (a)-(f).

Right: (a)-(f) Averaged (from January 2016 to August 2019) SST difference against Argo in experiments (a)-(f), respectively.
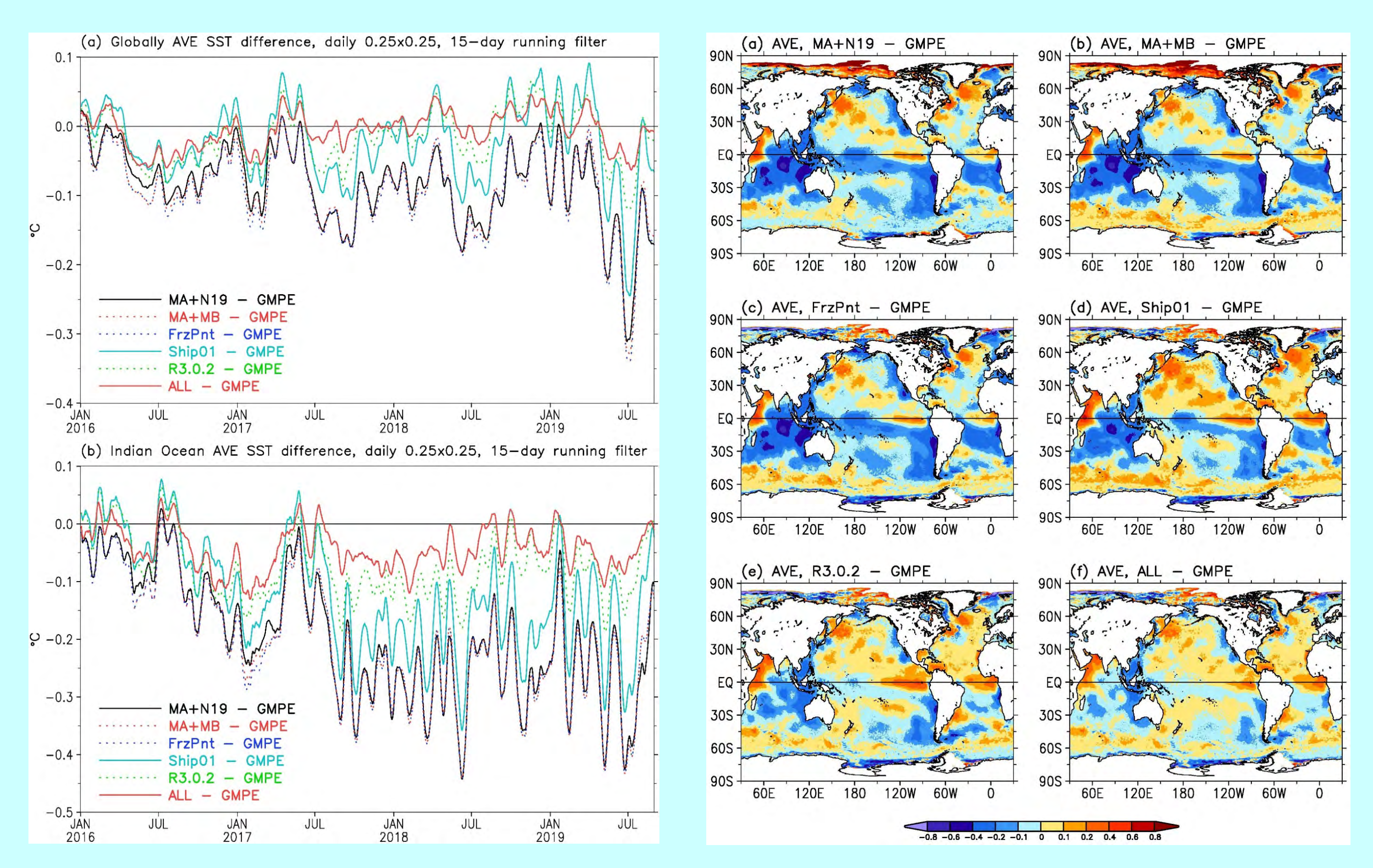
Left: (a) globally and (b) Indian Ocean averaged SST difference against GRHSST GMPE in experiments (a)-(f).

Right: (a)-(f) Averaged (from January 2016 to August 2019) SST difference against GRHSST GMPE in experiments (a)-(f), respectively.

Experiments	Global Bias	Global RMSD	Indian Ocean Bias	Indian Ocean RMSD
(a) MA+N19	**-0.14°C**	0.43°C	**-0.28°C**	0.50°C
(b) MA+MB	**-0.15°C**	0.43°C	**-0.28°C**	0.50°C
(c) FrzPnt	**-0.15°C**	0.42°C	**-0.29°C**	0.50°C
(d) Ship01	**-0.08°C**	0.14°C	**-0.20°C**	0.50°C
(e) R3.0.2	**-0.07°C**	0.38°C	**-0.14°C**	0.46°C
(f) ALL	**-0.04°C**	0.24°C	**-0.08°C**	0.26°C

Table 1. Biases and RMSDs in the global and Indian Oceans in experiments (a) – (f).