



Assimilation of VIIRS SSTs and Radiances into Level 4 Analyses

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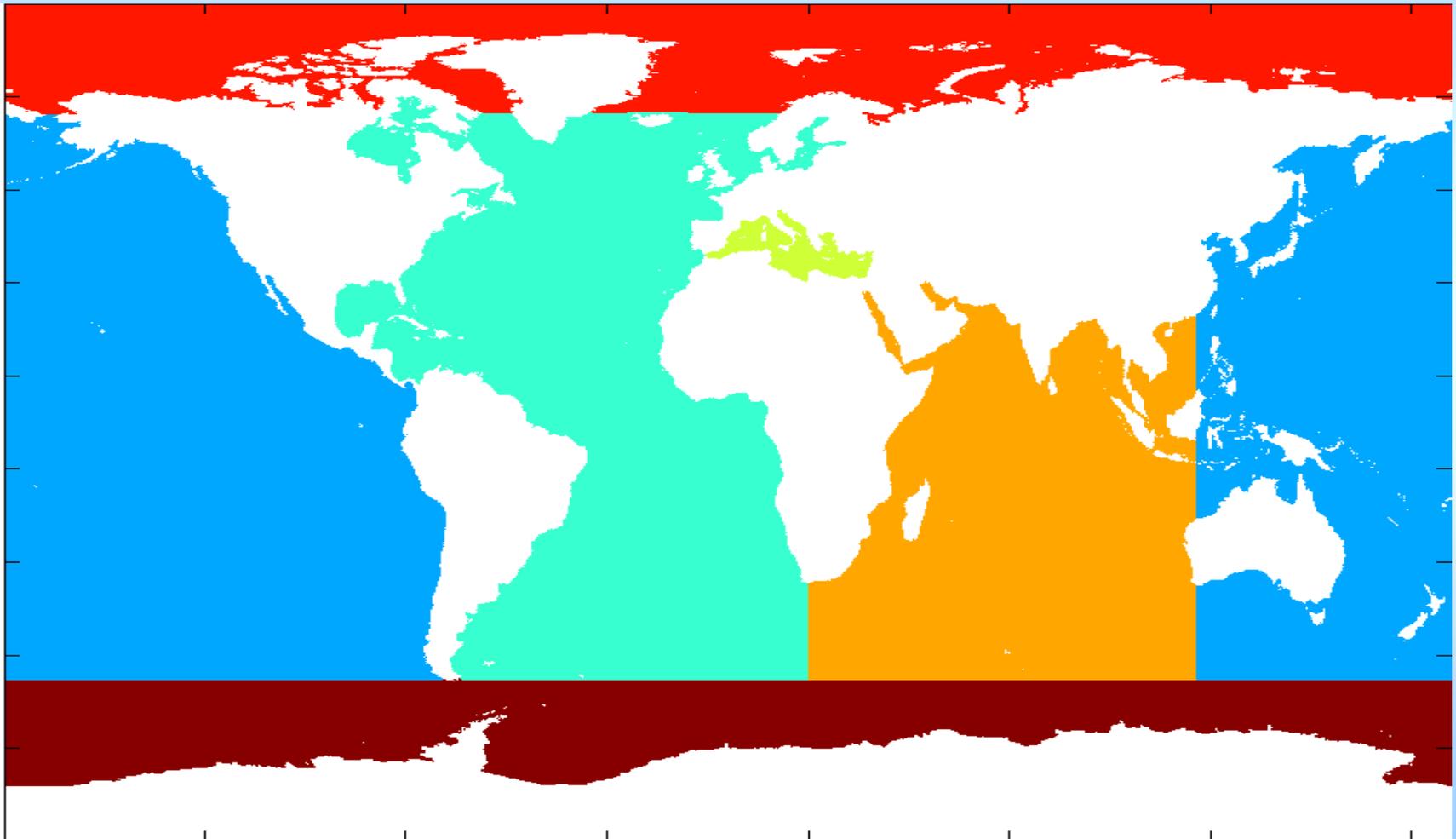
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Eileen Maturi (NESDIS/STAR)

5-km Blended SST Analysis

- **Produced daily from 24 hours of AVHRR & Geo-SST**
 - MetOp-B
 - GOES-E/W Imager
 - MTSAT-2 Imager
 - Meteosat-10 SEVIRI
 - VIIRS
 - [AMSR-2]
 - **Does not use buoy data**
- **Multi-scale OI**
 - Mimics Kalman Filter (*Khellah et. al., 2005*)
- **3 stationary priors**
 - Short, intermediate and long correlation lengths
 - Mimic non-stationary prior while preserving rigor
 - Interpolation of resultant analyses based data density
 - **Allows fine resolution where possible without introducing noise**

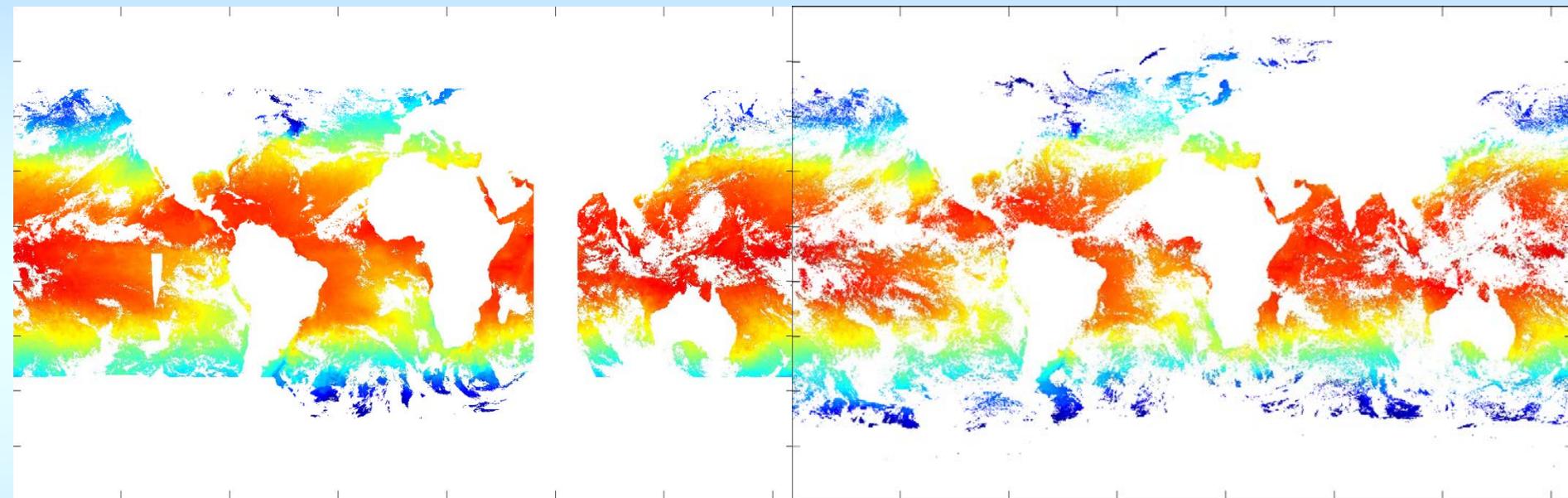
Separate Ocean Basins



Data Coverage

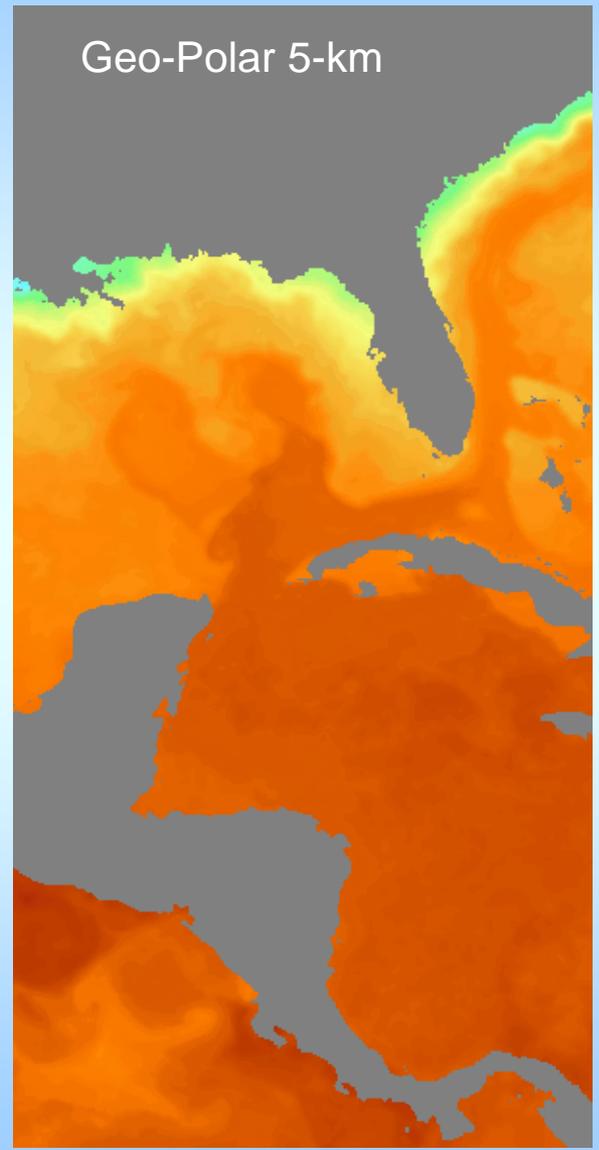
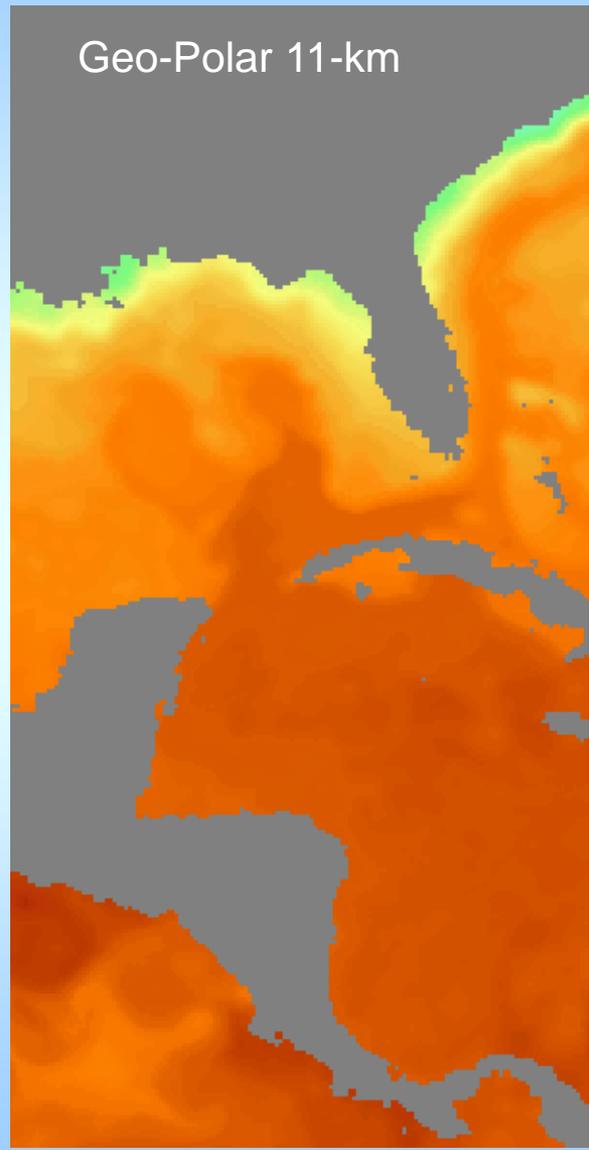
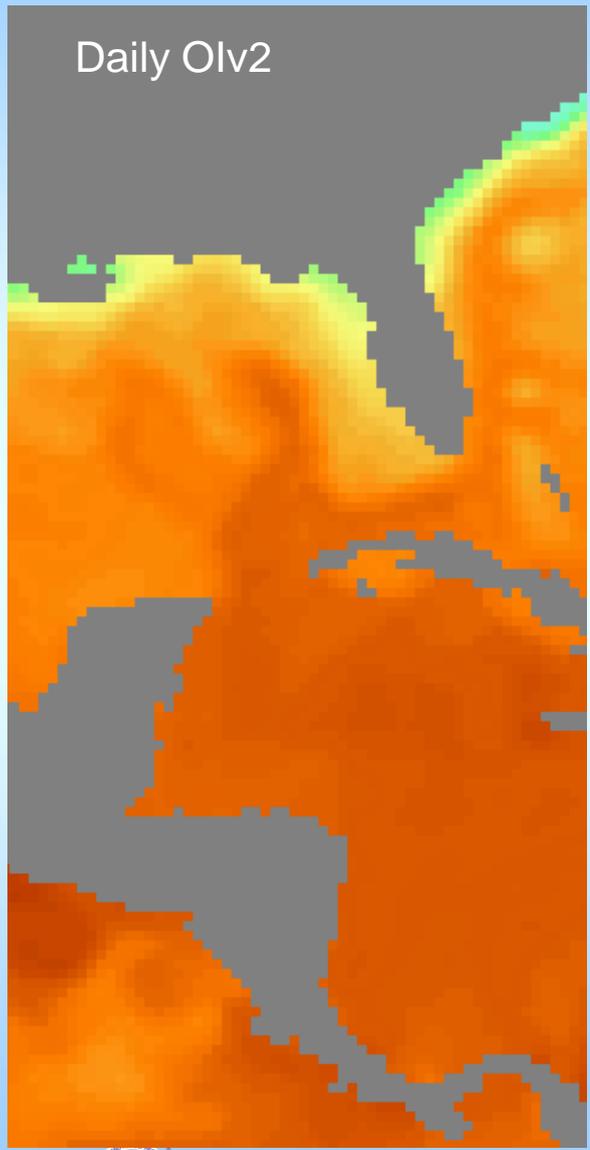
Geostationary SST

Polar-Orbiter SST



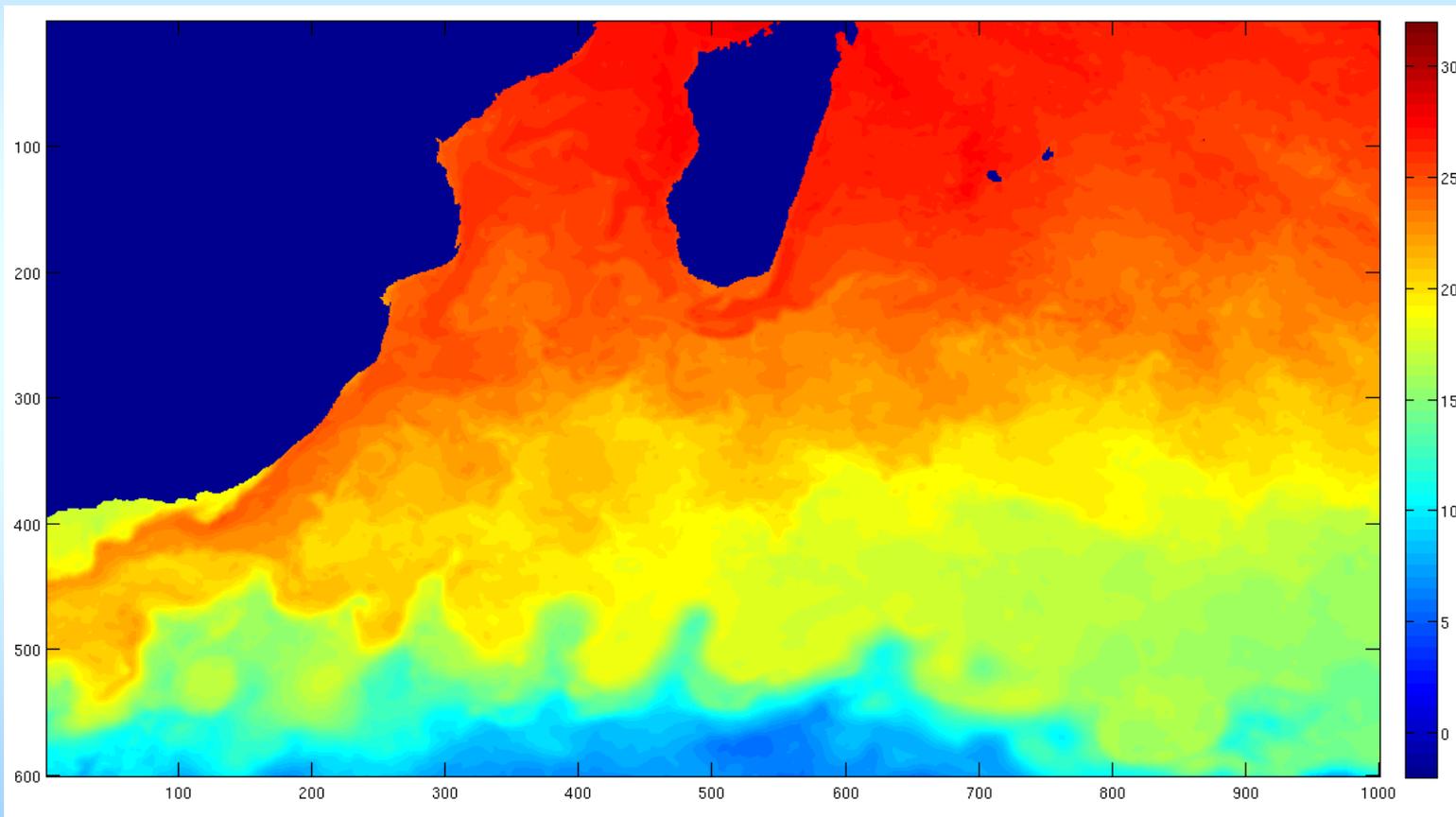
- **Geostationary data in particular provide lots of observations**
 - N.B. gap in coverage in Indian Ocean
- **Data-driven analysis**
 - Need to treat the input data “carefully”

Resolution difference



Key Results/Accomplishments

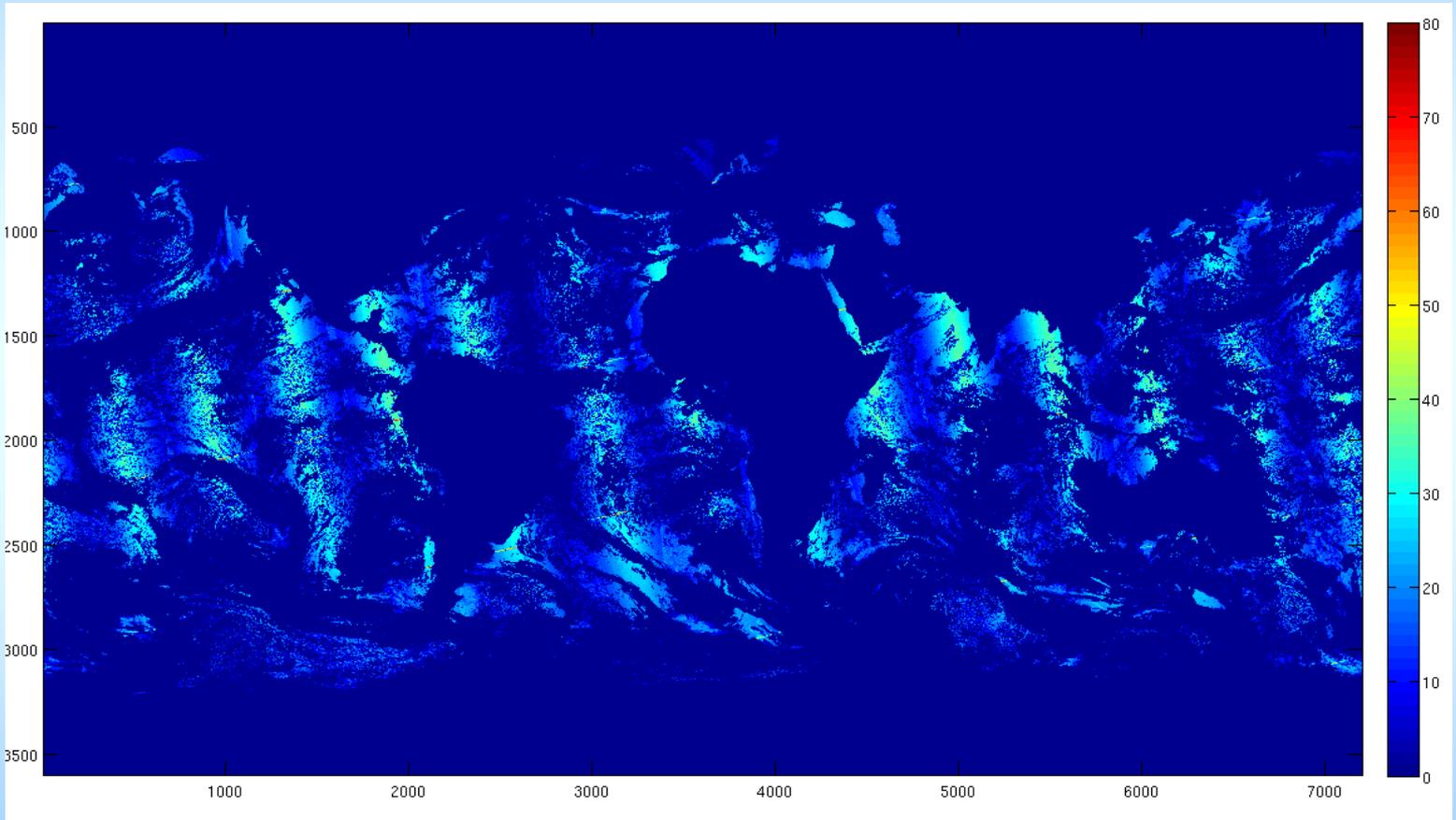
- VIIRS successfully incorporated into Geo-Polar Blended 5-km global SST analysis



Superior SST Analysis data

Key Results/Accomplishments

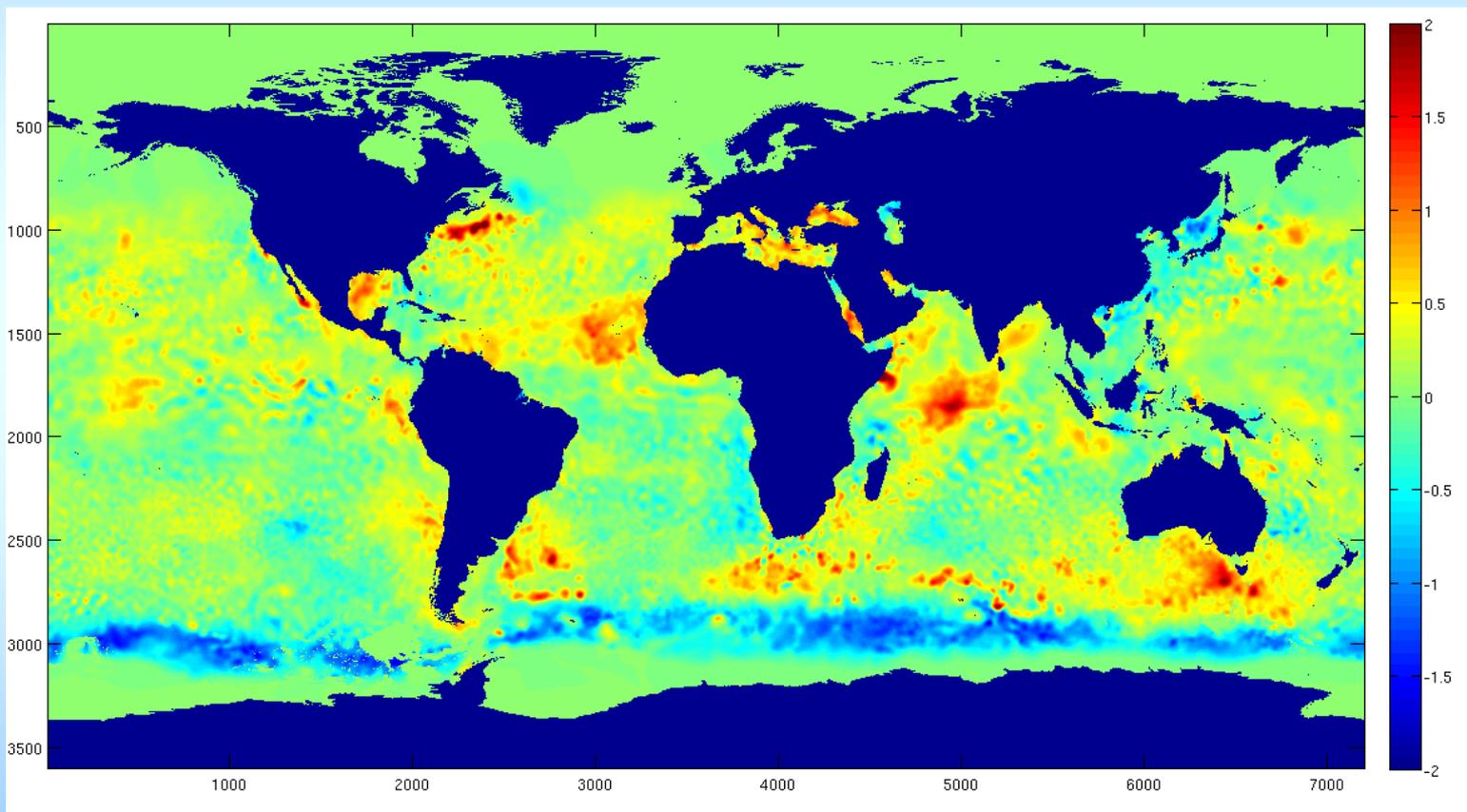
- Coverage is improved w.r.t. MetOp AVHRR



ACSPO AVHRR coverage

Key Results/Accomplishments

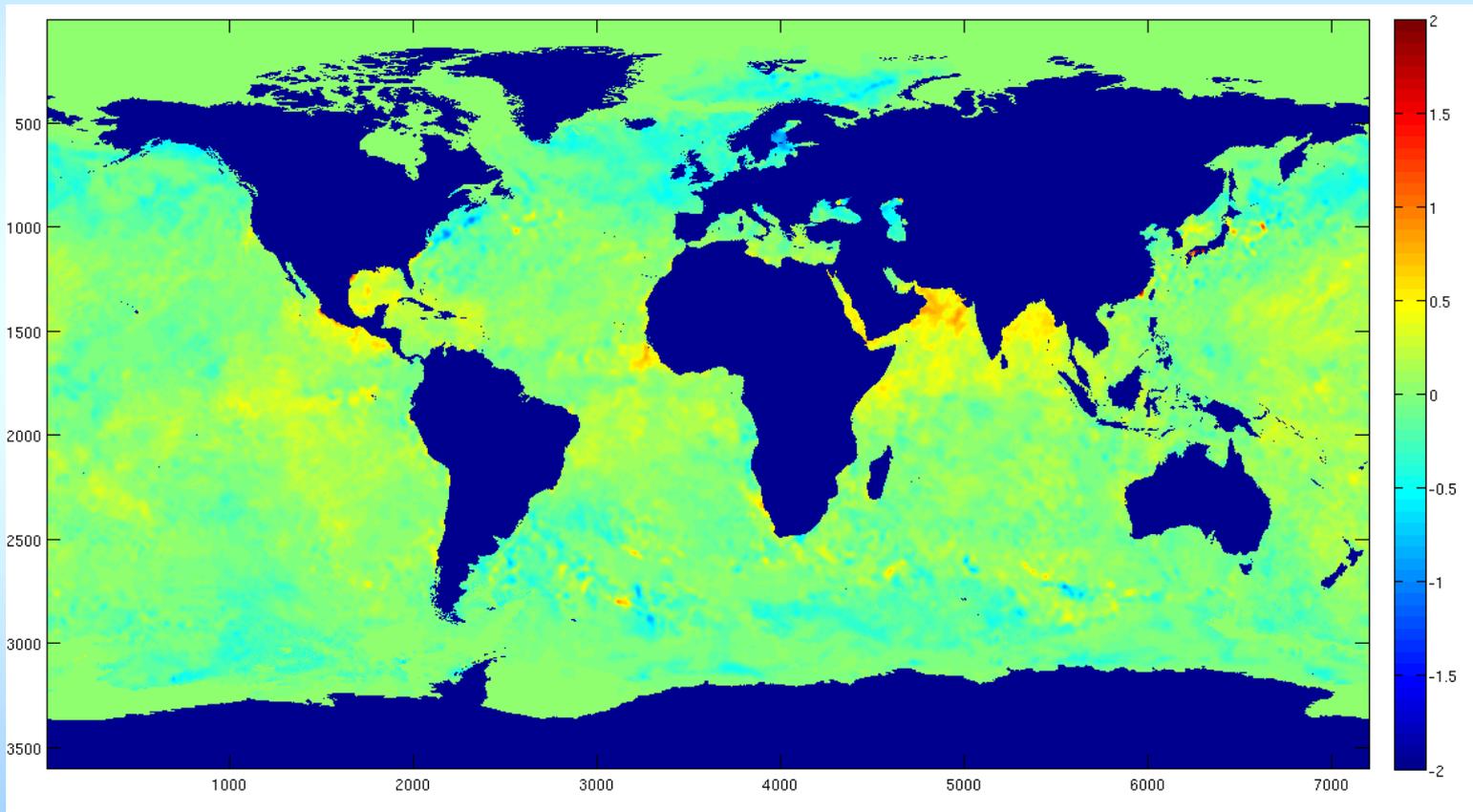
- Biases w.r.t. NCEP RTG_HR_SST indicate problem with the latter



ACSP0 VIIRS SST bias correction field

Key Results/Accomplishments

- Biases seems to be somewhat reduced w.r.t. RTG recently, but less *cf.* OSTIA SST analysis



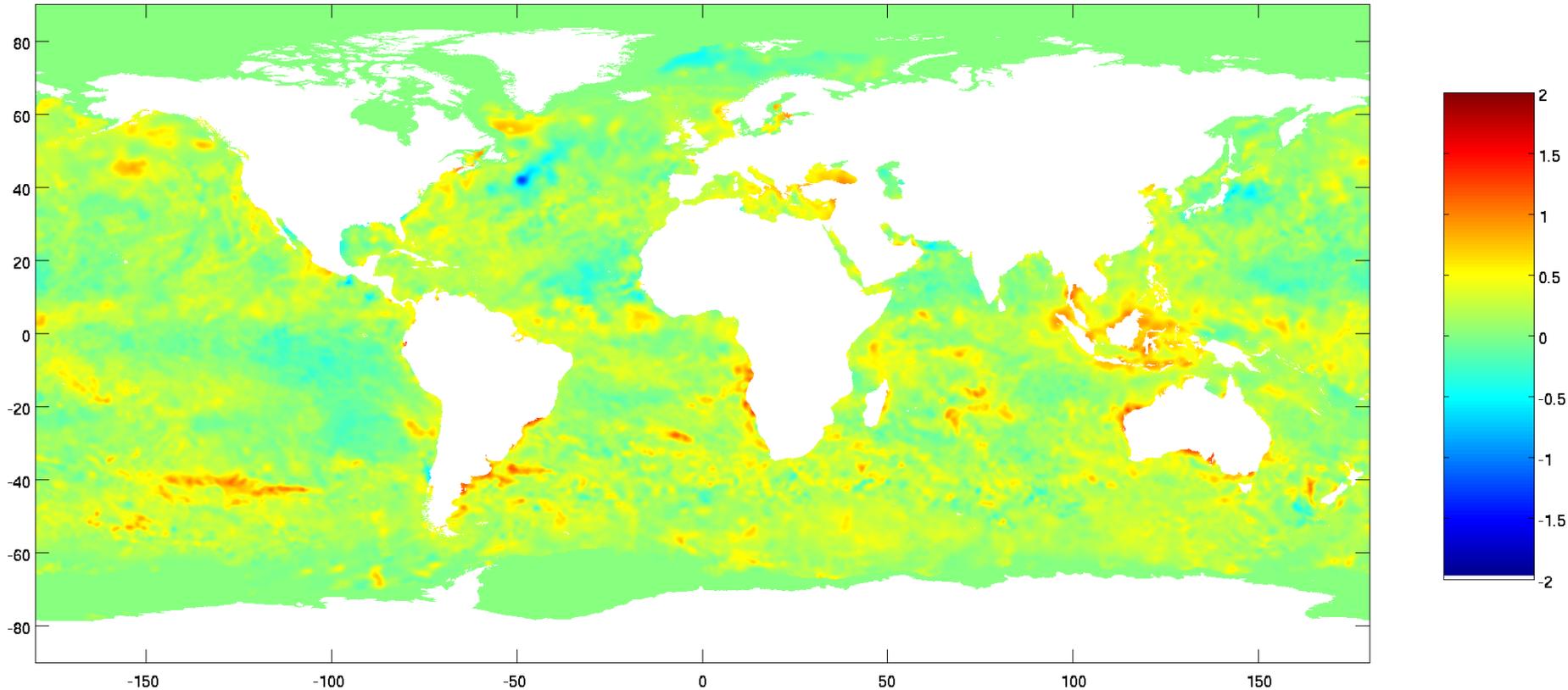
ACSP0 VIIRS SST bias correction field w.r.t. OSTIA

Use of GHRSSST ancillary info

- **Switching to GHRSSST L2P format**
 - More compact & contains useful ancillary data
 - *N.B.* QL supplied in ACSPO GHRSSST not particularly useful at present – likely to change
 - Sensor-Specific Error Statistics
 - Estimated bias & uncertainty (Std. Dev.)
 - Using these should improve product accuracy
 - Reduced biases
 - Reduced random error
 - Analysis performs statistical bias correction against a reference (currently OSTIA → Sentinel-3 SLSTR)
 - Does use of SSES information reduce magnitude of bias correction?

Key Results/Accomplishments

- Compare use of Bias & S.D., Bias-only, and no SSES

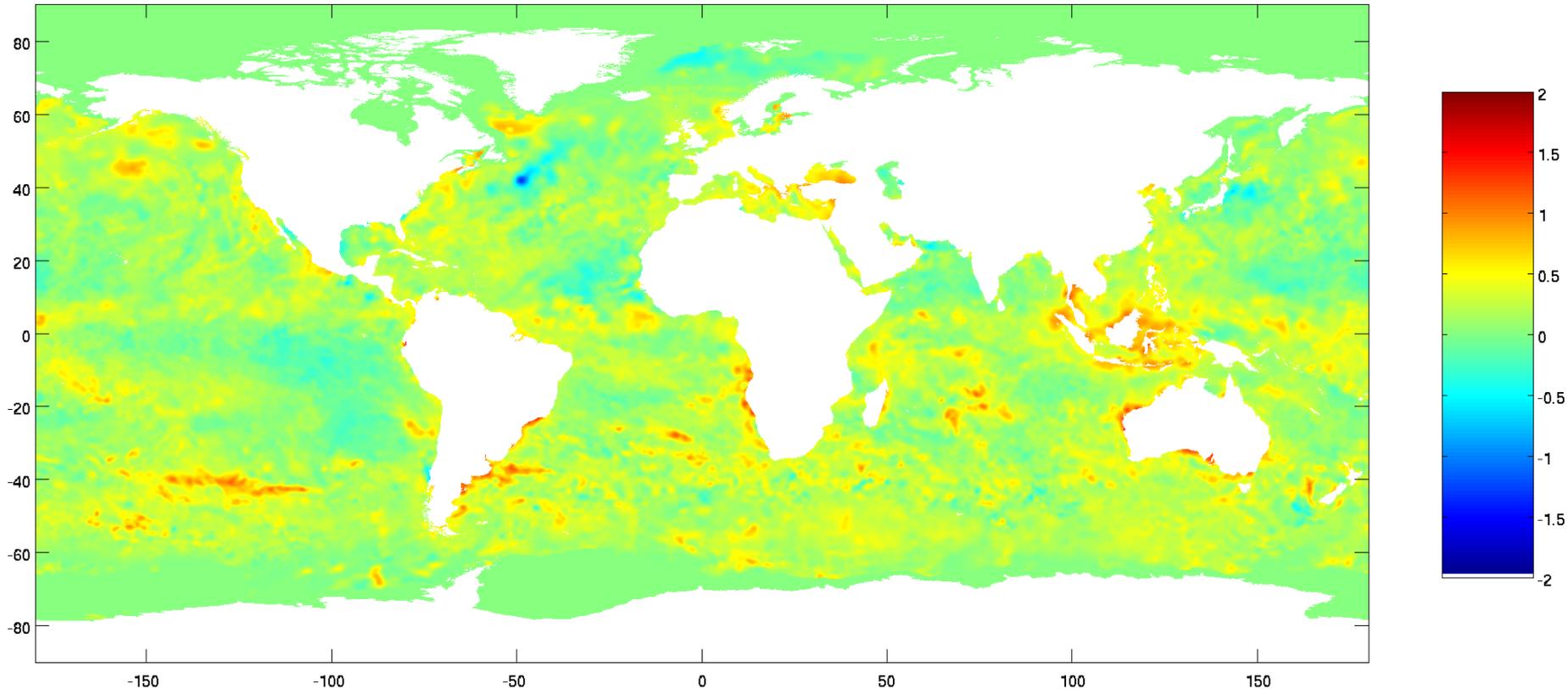


Bias for ACSPO VIIRS Day SSES Bias+SD

N.B. reversed sign *cf.* previous bias correction plots

Key Results/Accomplishments

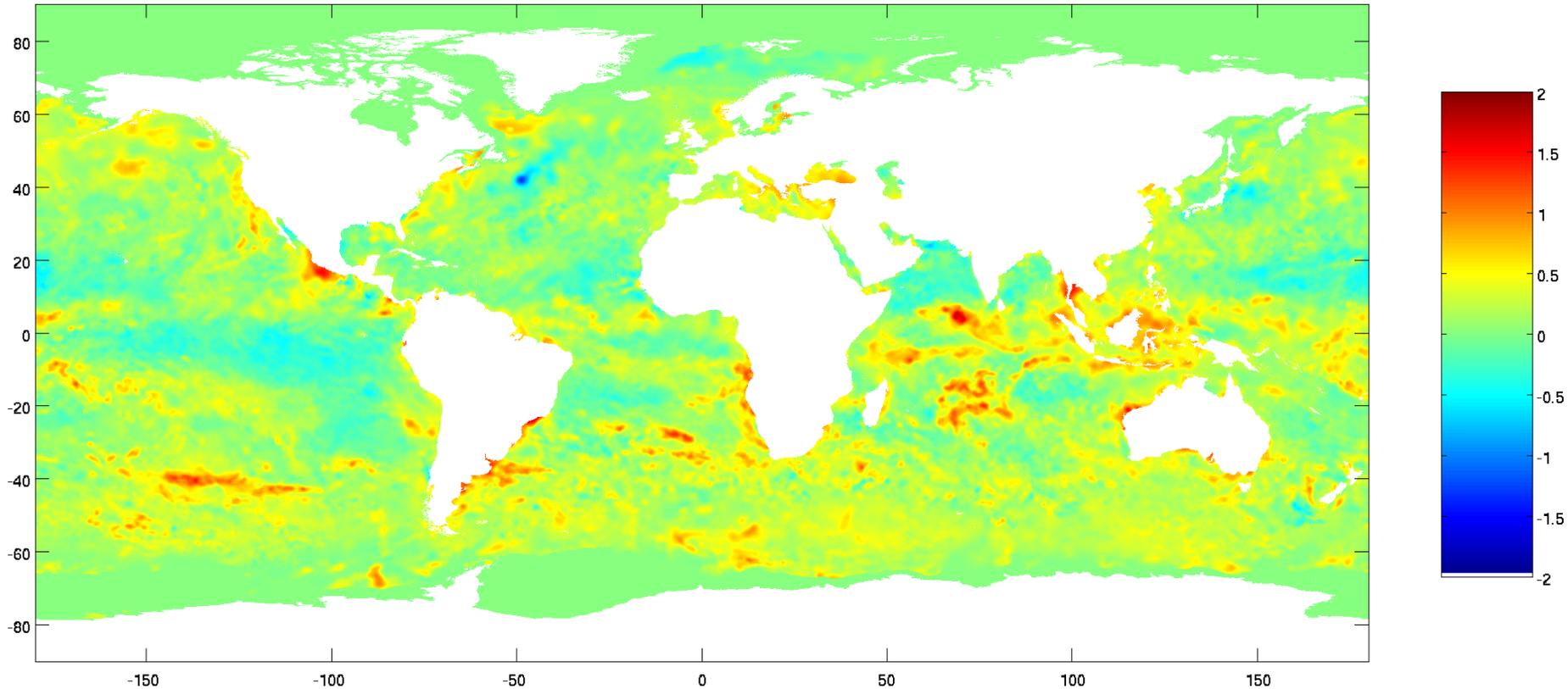
- Compare use of Bias & S.D., Bias-only, and no SSES



Bias for ACSP0 VIIRS Day SSES Bias

Key Results/Accomplishments

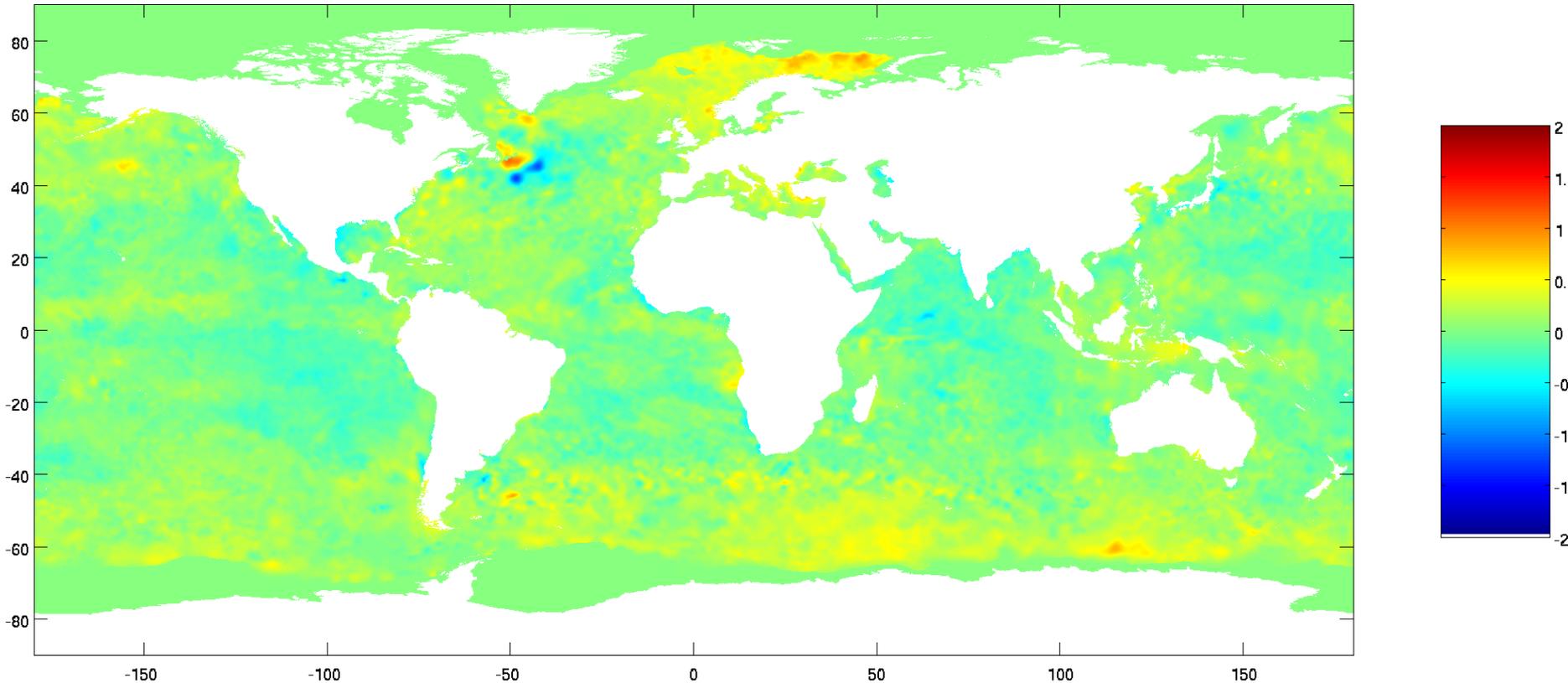
- Compare use of Bias & S.D., Bias-only, and no SSES



Bias for ACSPO VIIRS Day No SSES

Key Results/Accomplishments

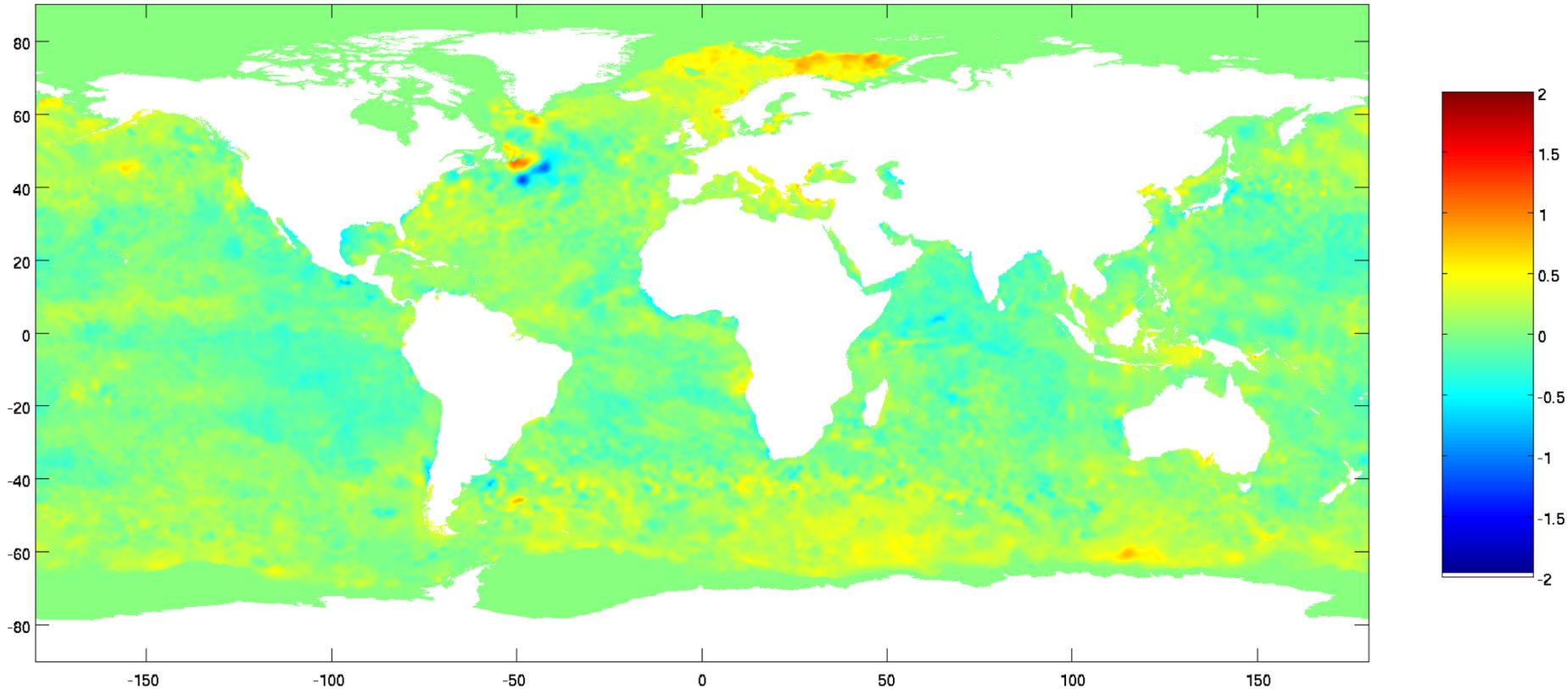
- Compare use of Bias & S.D., Bias-only, and no SSES



Bias for ACSP0 VIIRS Night SSES Bias+SD

Key Results/Accomplishments

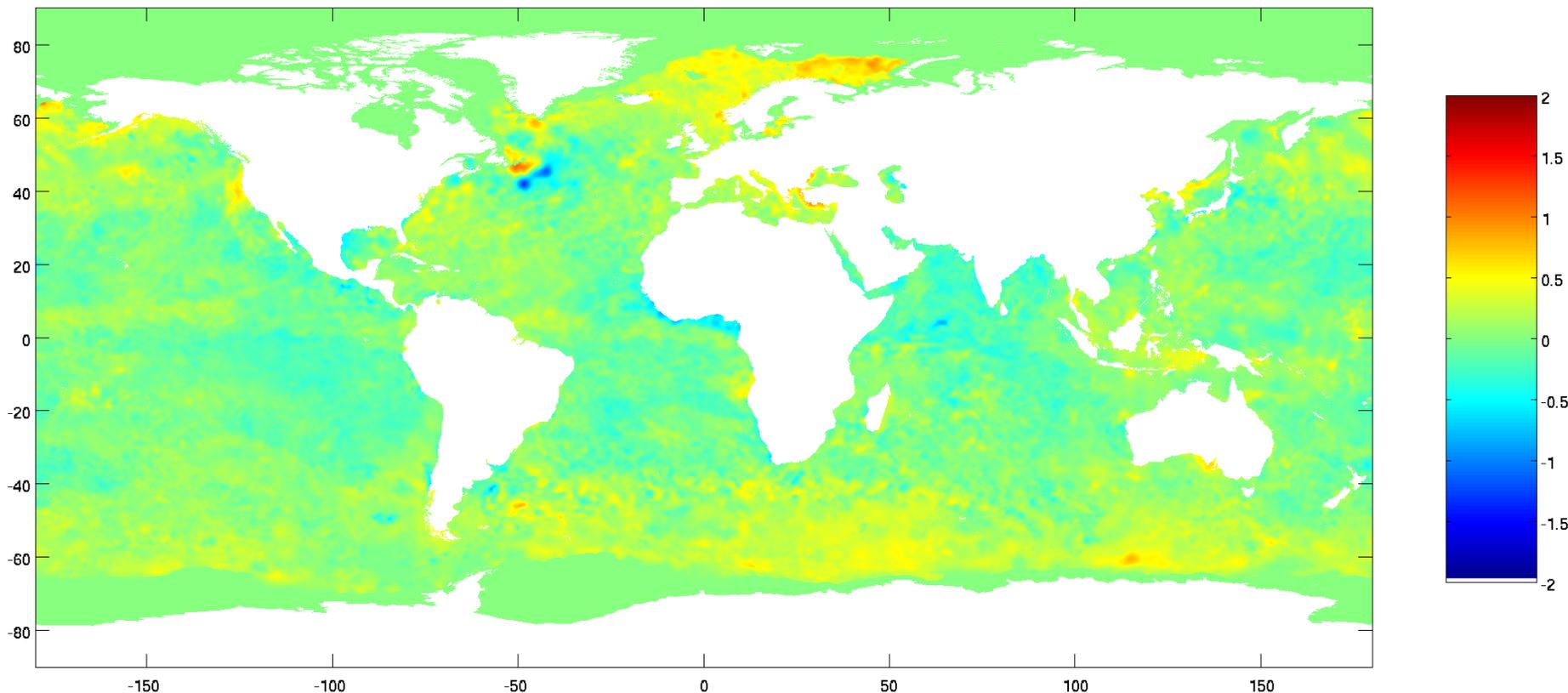
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Bias for ACSPO VIIRS Night SSES Bias

Key Results/Accomplishments

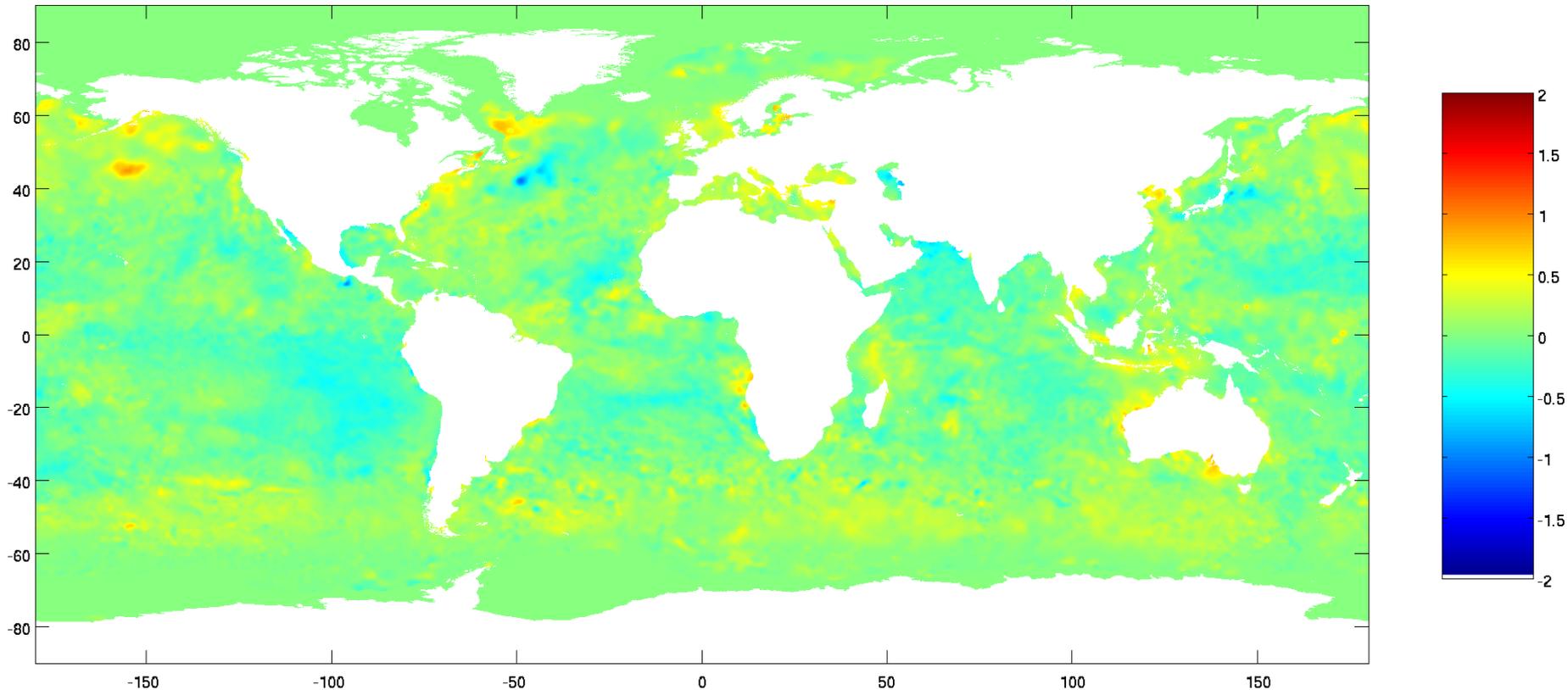
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Bias for ACSP0 VIIRS Night No SSES

Key Results/Accomplishments

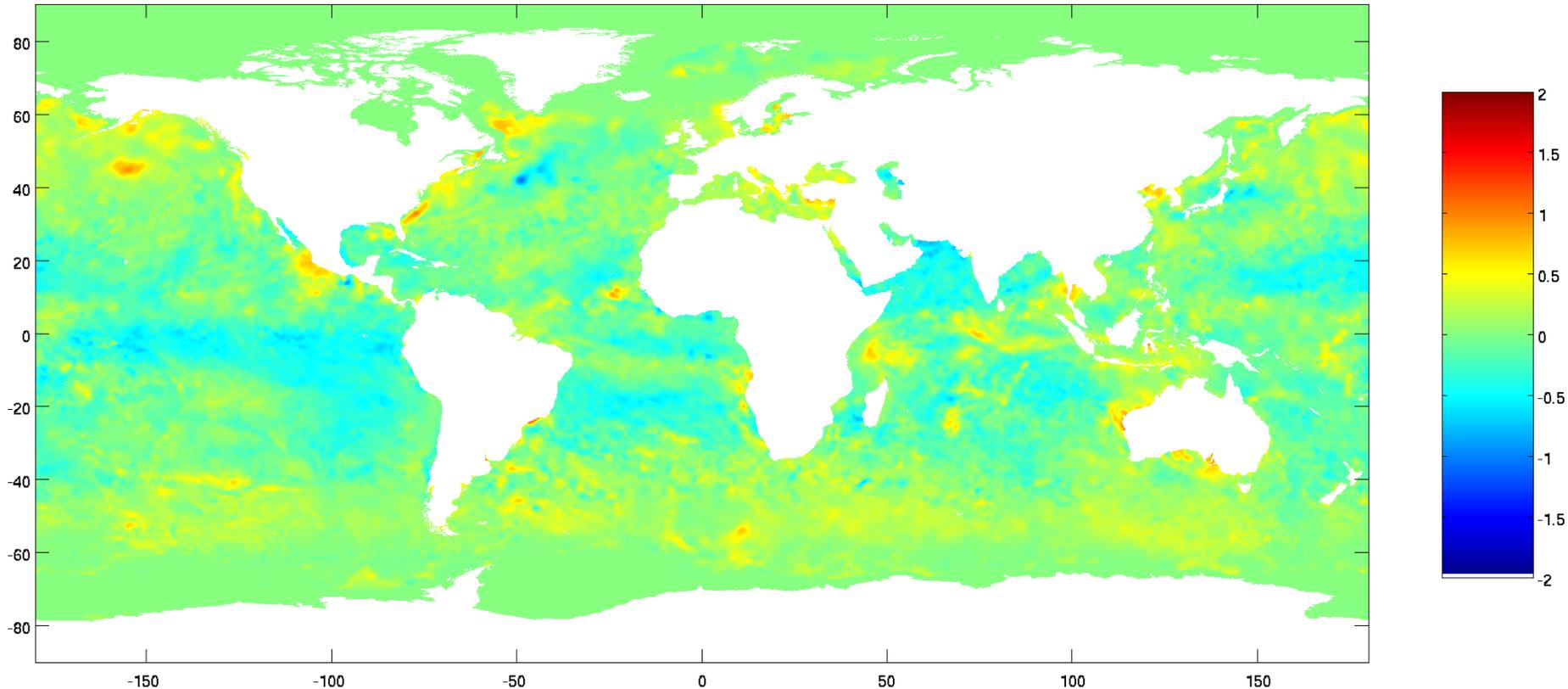
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Bias for ACSPO METOP-B Day SSES Bias

Key Results/Accomplishments

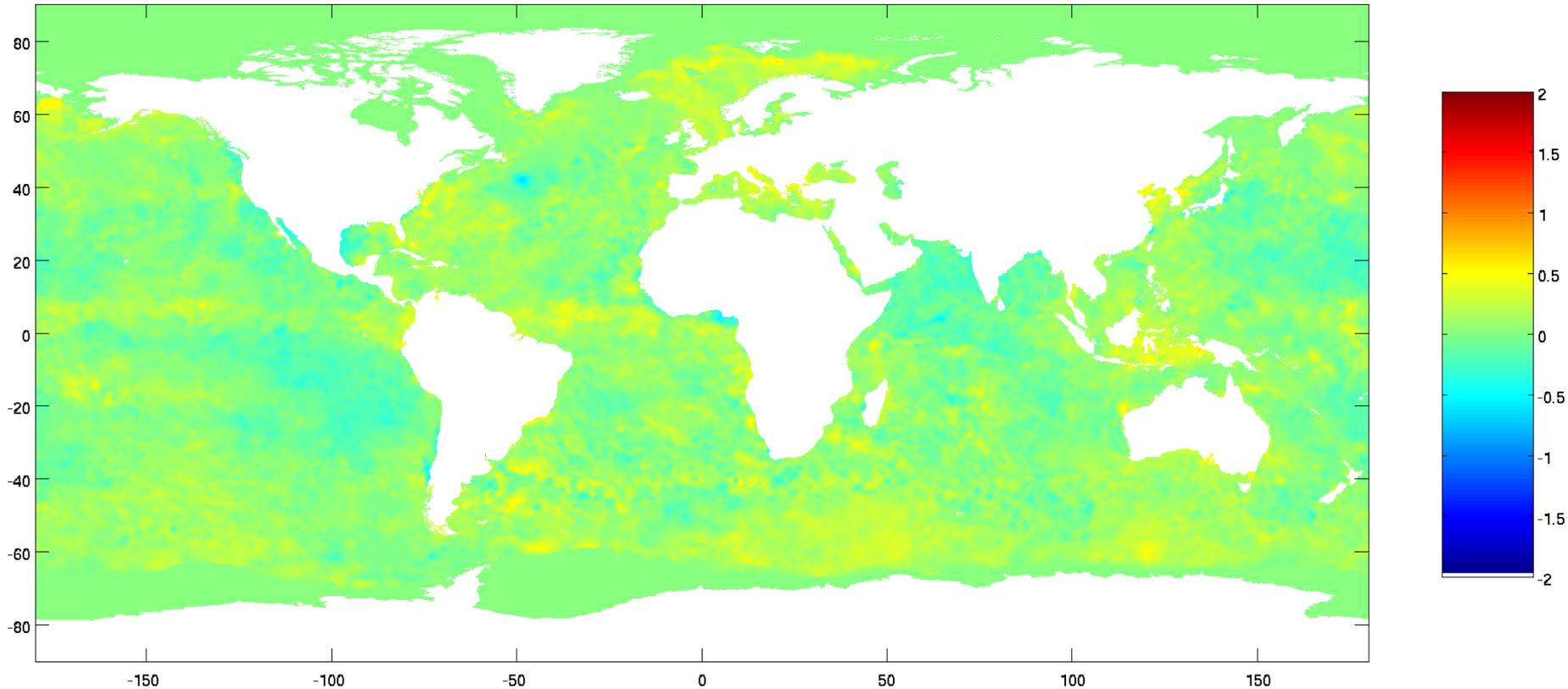
- Compare use of Bias & S.D., Bias-only, and no SSES



Bias for ACSP0 METOP-B Day No SSES

Key Results/Accomplishments

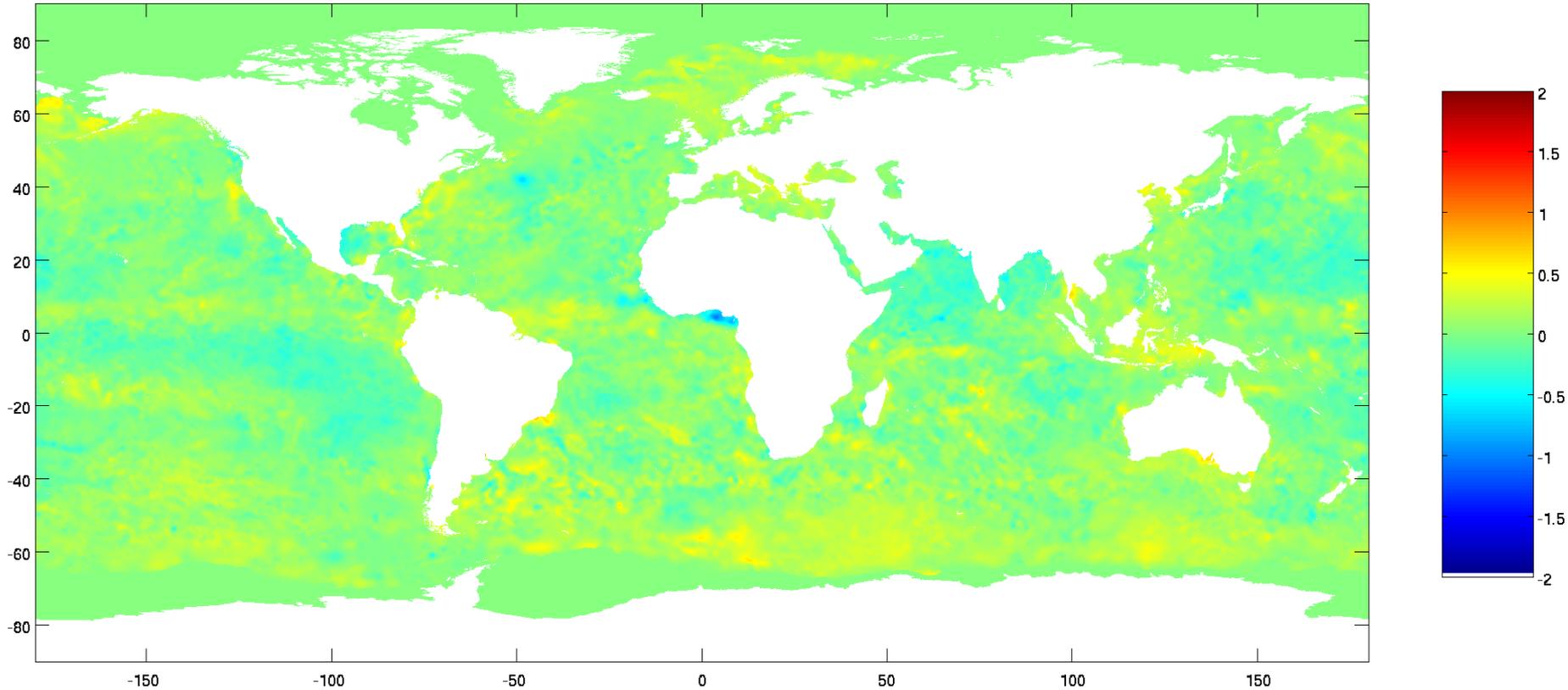
- Compare use of Bias & S.D., Bias-only, and no SSES



Bias for ACSP0 METOP-B Night SSES Bias

Key Results/Accomplishments

- Compare use of Bias & S.D., Bias-only, and no SSES



Bias for ACSP0 METOP-B Night SSES Bias

Points to note

- Using S.D. makes very little difference to bias
 - Not too surprising
- Biases w.r.t. reference (OSTIA) may not reduce
 - OSTIA uses OSI-SAF METOP-A nighttime GHRSSST QL5 restricted swath data and *in situ* as its bias-correction reference
 - Explain reduced biases for METOP-B night *cf.* VIIRS?
- ACSPO SSES bias is adjustment to PWR SST
 - Appears to suppresses diurnal warming
 - Makes correction for residual DW difficult
 - Since PWR does not make use of wind speed, implies there are signals (at least distinct statistical groupings) in BTs due to DW
 - Interesting physics
 - Investigate nighttime VIIRS PWR SST as reference?
 - Question – is SSES S.D. effectively that for PWR SST?