

Aquarius SSS

Dependence on Auxiliary SST
Evaluation

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SST Products Evaluated

1. NOAA OI (Reynolds)

- Daily. 0.25 deg.
- Uses: InSitu (buoys, ships), AVHRR.
- Used In Aquarius V4.0 processing.

2. WindSat

- Weekly running averages centered on each day.
- Created from RSS V7.0.1 L3 files.
- 0.25 deg.

3. CMC (Canada)

- Global GHRSSST L4 data product via PO.DAAC.
- Native resolution: 0.2-deg, daily.
- Resampled to 0.25-deg by Joel.
- Uses: AQUA / AMSR-E; ENVISAT / AATSR; InSitu / InSitu; MetOp-A / AVHRR-3; NOAA-16 / AVHRR-3; NOAA-17 / AVHRR-3; NOAA-18 / AVHRR-3; TRMM / TMI; ERS-1 / ATSR-2; ERS-2 / ATSR-2; NOAA-19 / AVHRR-3; Coriolis / WindSat.

4. MUR (JPL)

- Global GHRSSST L4 data product via PO.DAAC.
- Native resolution: 1-km, daily.
- Resampled to 0.25-deg by Joel.
- Resampled to 1-deg to compare to Reynold's.
- Uses: AQUA / AMSR-E; AQUA / MODIS; NOAA-18 / AVHRR-3; TERRA / MODIS; Coriolis / WindSat.

5. UKMet OSTIA (Operational Sea Surface Temperature and Sea Ice Analysis)

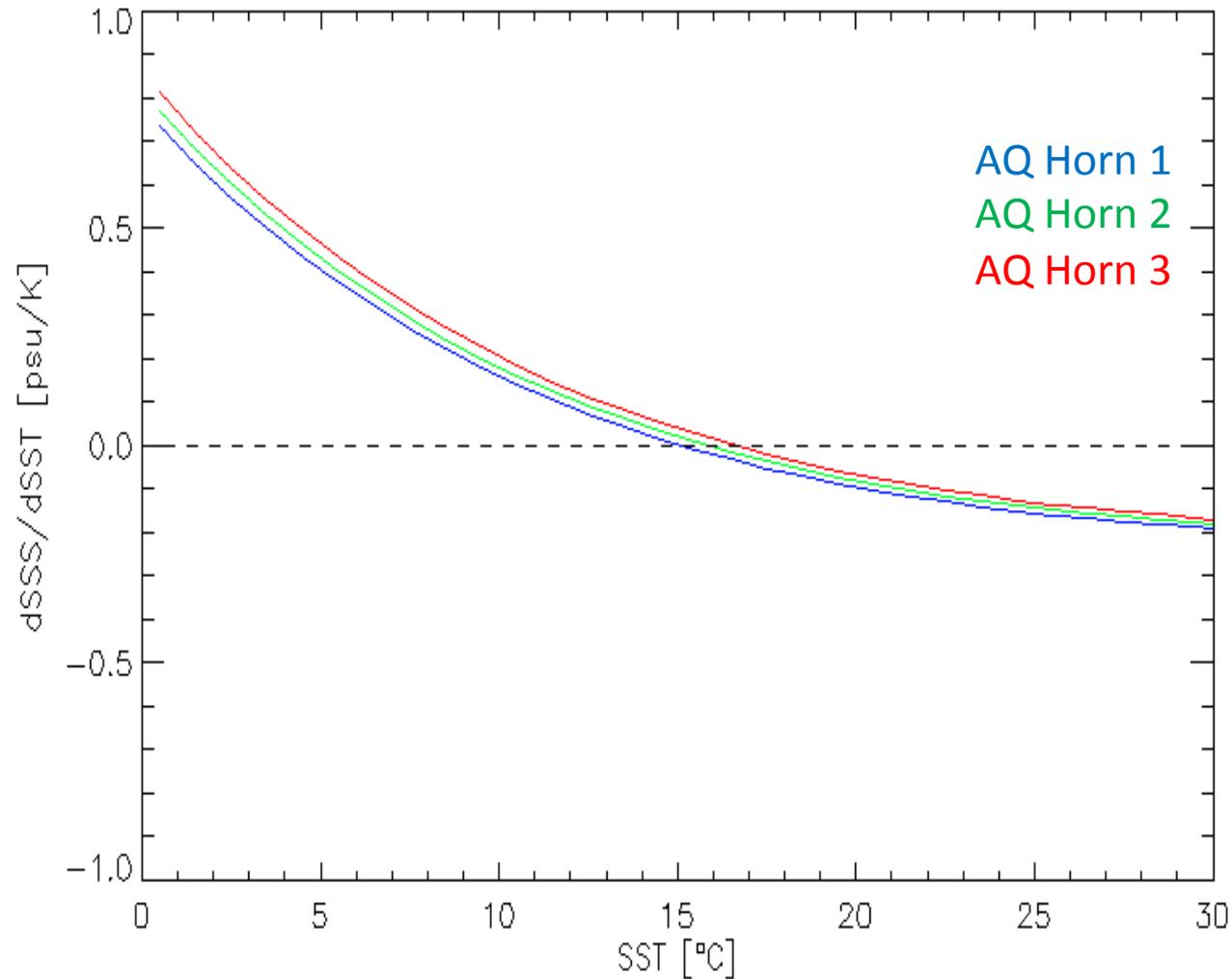
- Global GHRSSST L4 data product via PO.DAAC.
- Inputs: AVHRR, SEVIRI, GOES, IASI, TMI, in situ.
- Optimal interpolation, on a global 0.054-degree grid.
- Only available since 2013.115.
- We ended up NOT using this product in our evaluation as the SST shows large biases in cold water compared with all the other SST products. These biases seem to be spurious.

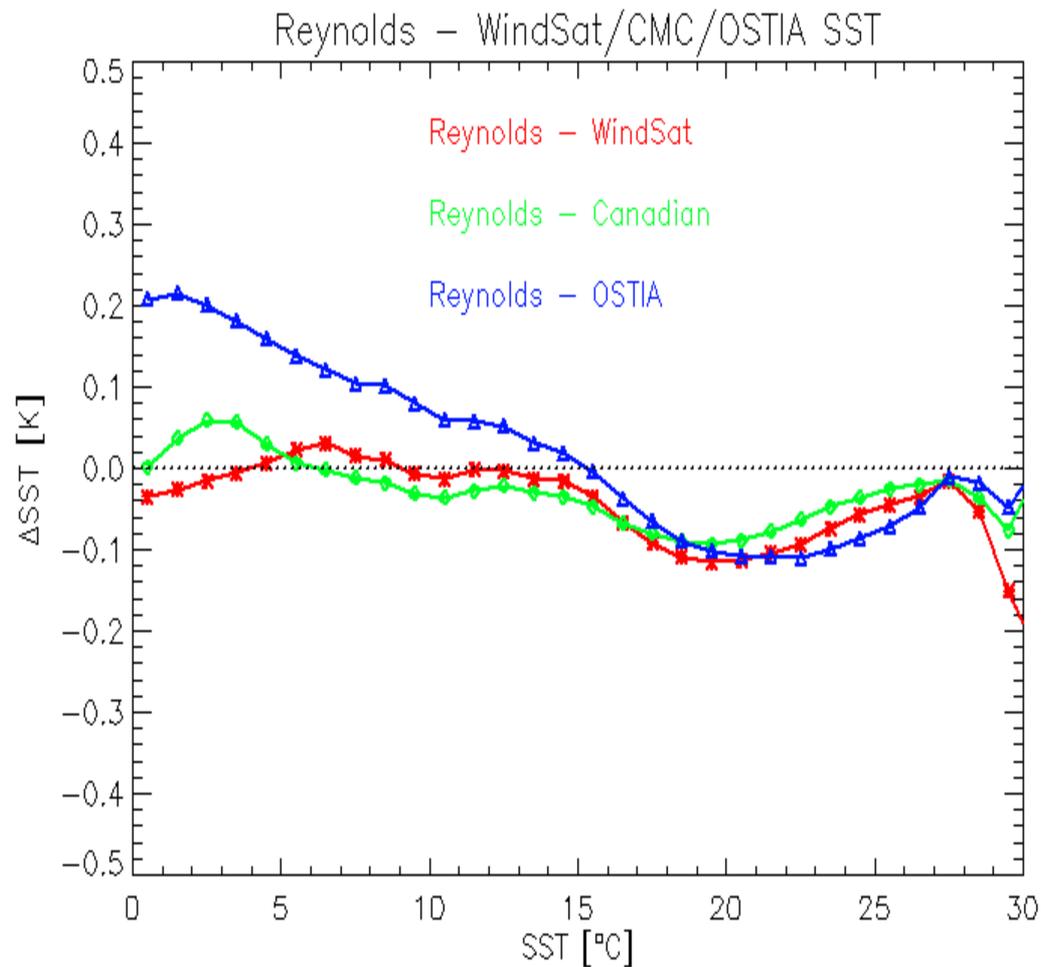
Summary/Conclusions

- All three products that use microwave SST (WindSat, CMC, MUR) perform slightly better than Reynolds.
 - That holds both for the Level 2 (1.44 sec) and the Level 3 (monthly maps) Aquarius SSS.
- There is very little difference between the SST products that use microwave SST: WindSat, CMC, MUR.
 - WindSat and CMC are very close.
 - MUR appears to slightly worse overall.
 - It is somewhat stunning that simply taking running weekly averages of our WindSat SST gives the same performance as all the daily MUR product. And that holds even for Level 2 (1.44 sec), where we do not do any averaging.
 - The CMC product performs best for L2 performance.
- As expected the difference between the SST products and in particular the performance enhancement of WindSat/CMC/MUR versus Reynolds shows up in cold water/high latitudes.
- It is still somewhat unclear to me why the SST differences in cold water arises between the different products. Looking at the examples I do not see any particular large cloud cover that would degrade the IR SST compared with microwave. Maybe we can try to discuss that more with Jorge Vazquez (JPL).
- I also made a test run taking the average between Reynolds and WindSat SST as input. As expected, the performance of the retrieved SSS comes right in between of using Reynolds or WindSat (slide 10). That is consistent with the fact that the errors in the SSS retrieval are predominantly of systematic nature. So I believe we are not gaining anything by averaging different input SST fields together.
- **For implementation in the upcoming Aquarius algorithm changes, my recommendation is to go with the Canadian SST product.**

SSS Sensitivity to SST

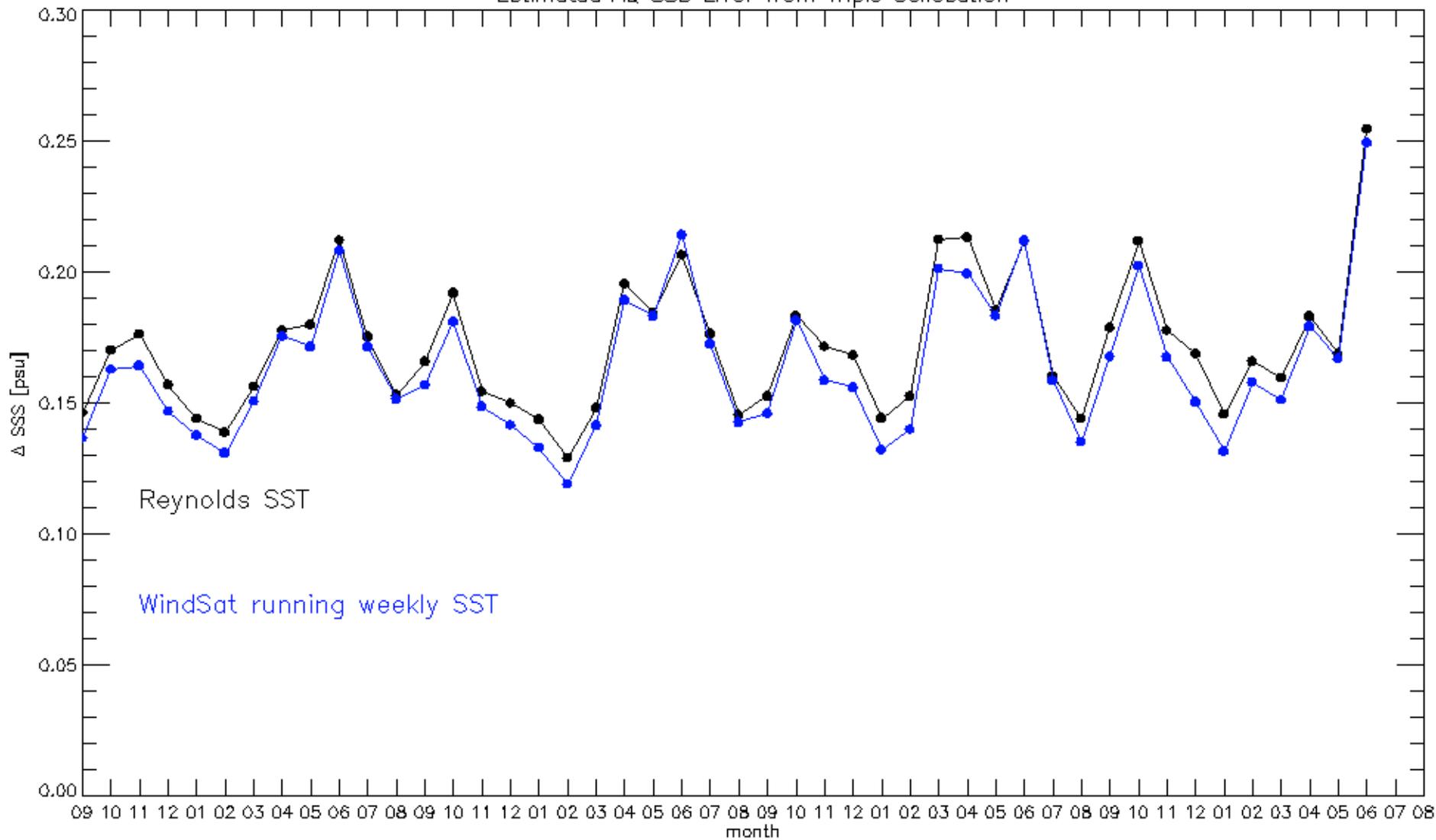
as a function of SST



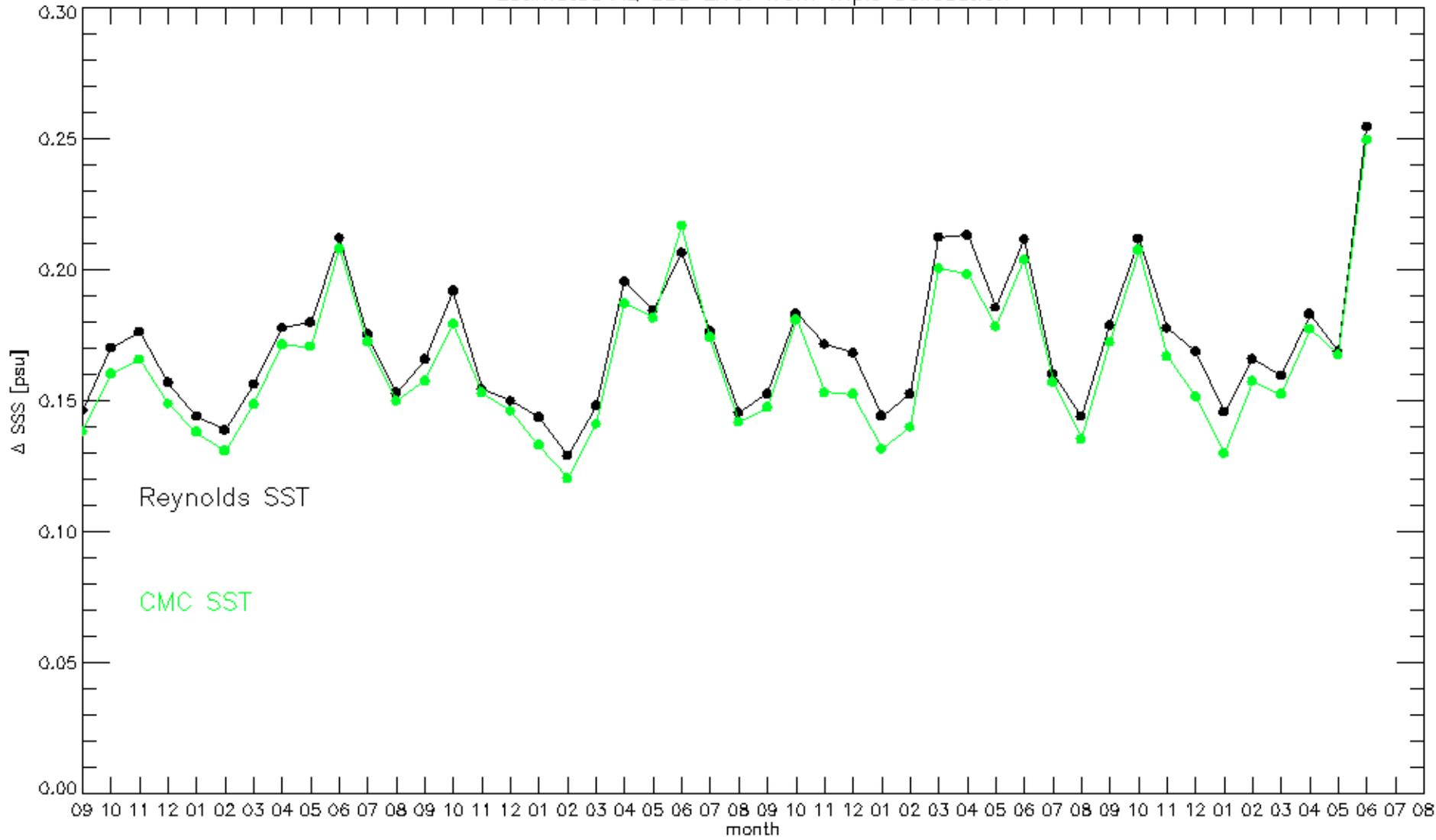


because of the obvious bias of the OSTIA SST in cold SST compared with all the other SST products we have stayed away from the OSTIA product.

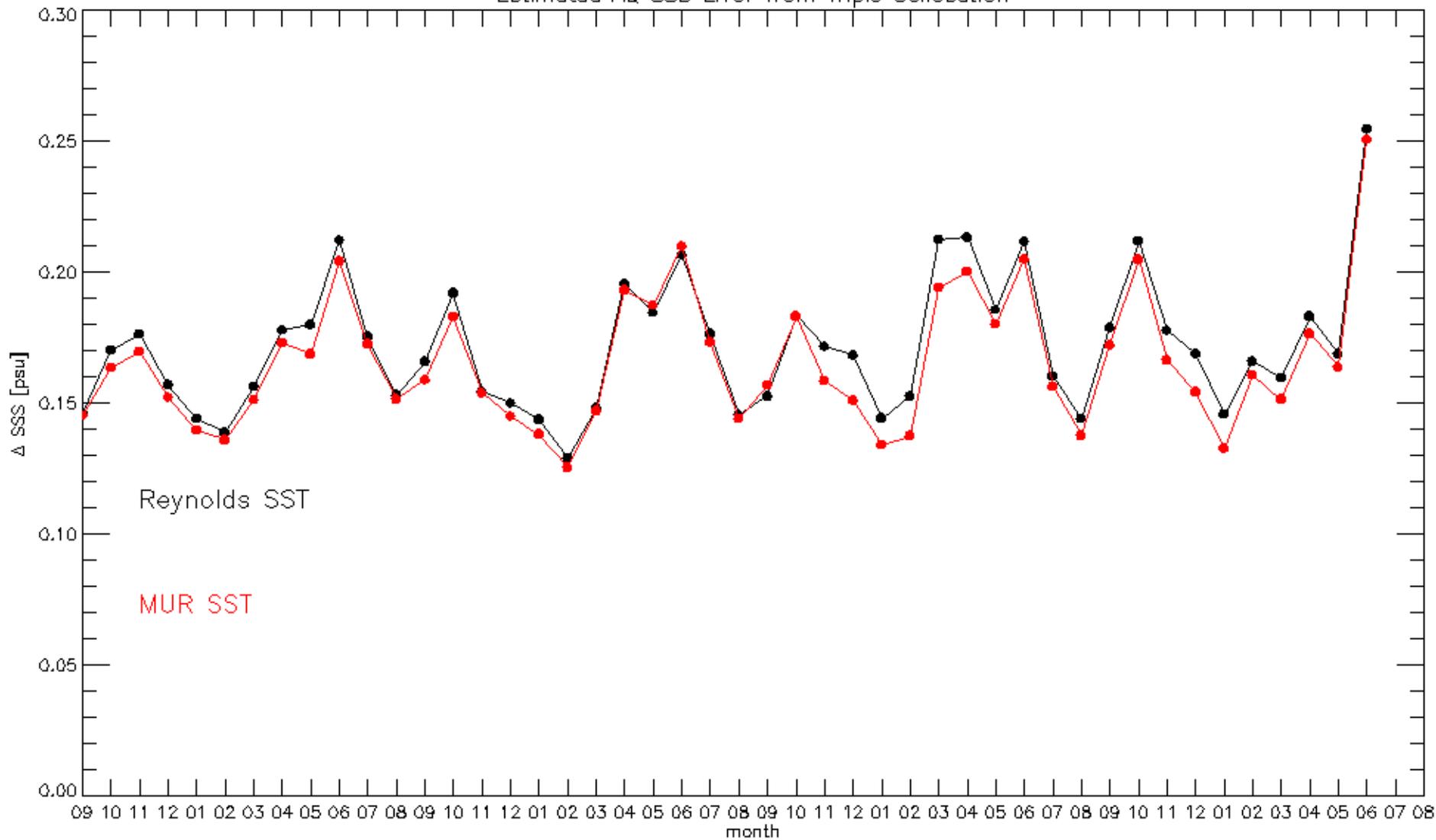
Estimated AQ SSS Error from Triple Collocation



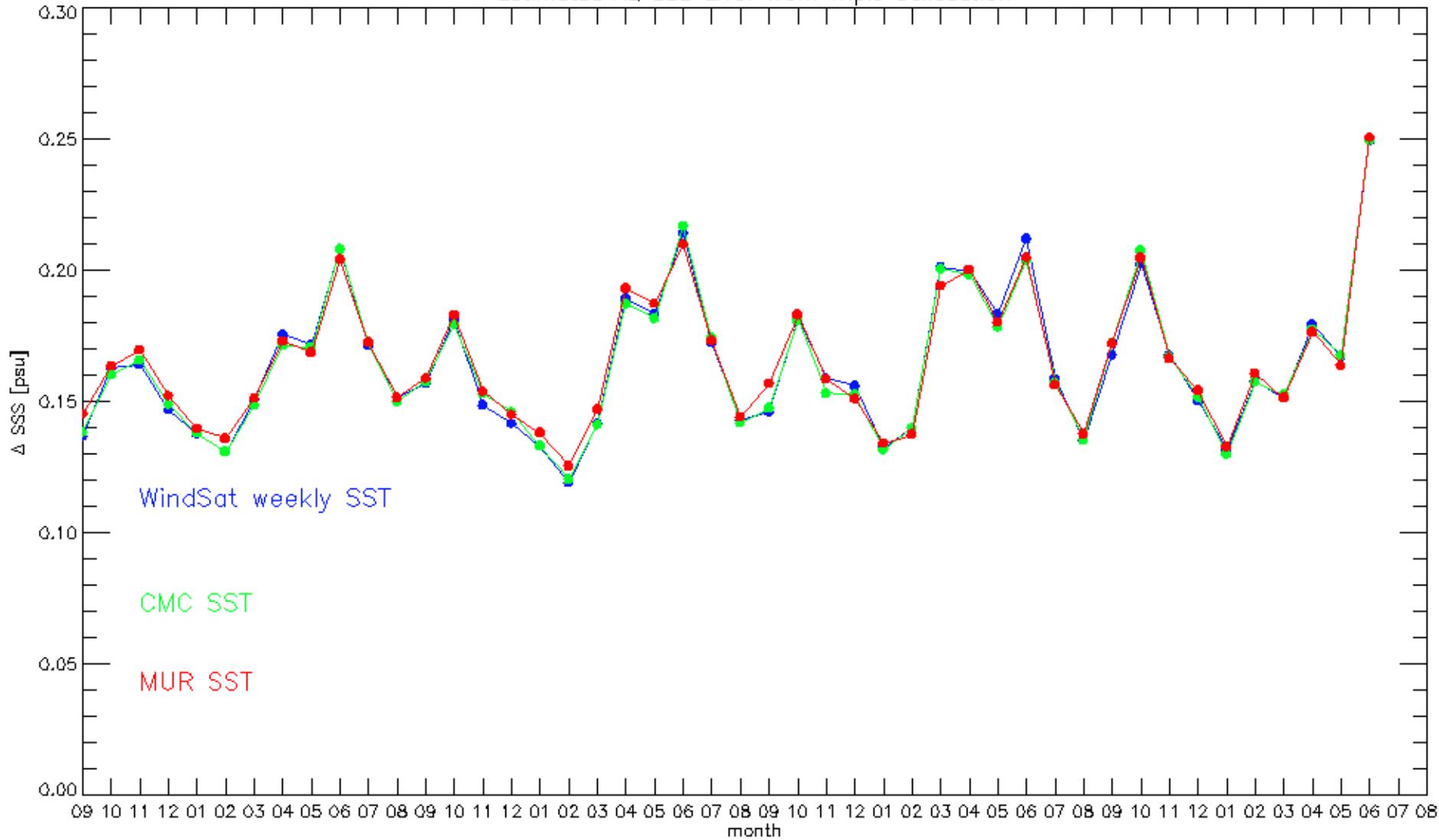
Estimated AQ SSS Error from Triple Collocation



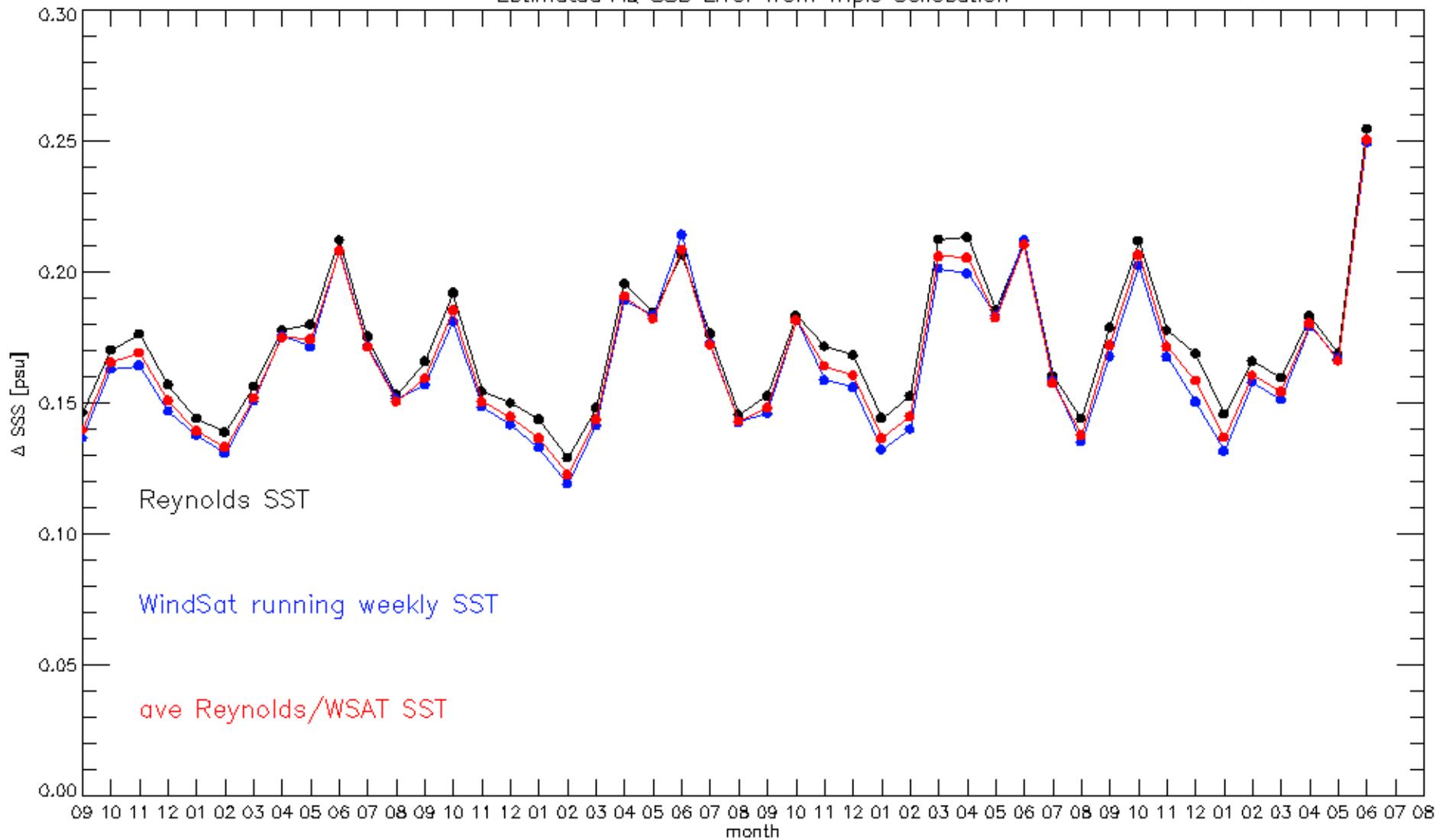
Estimated AQ SSS Error from Triple Collocation



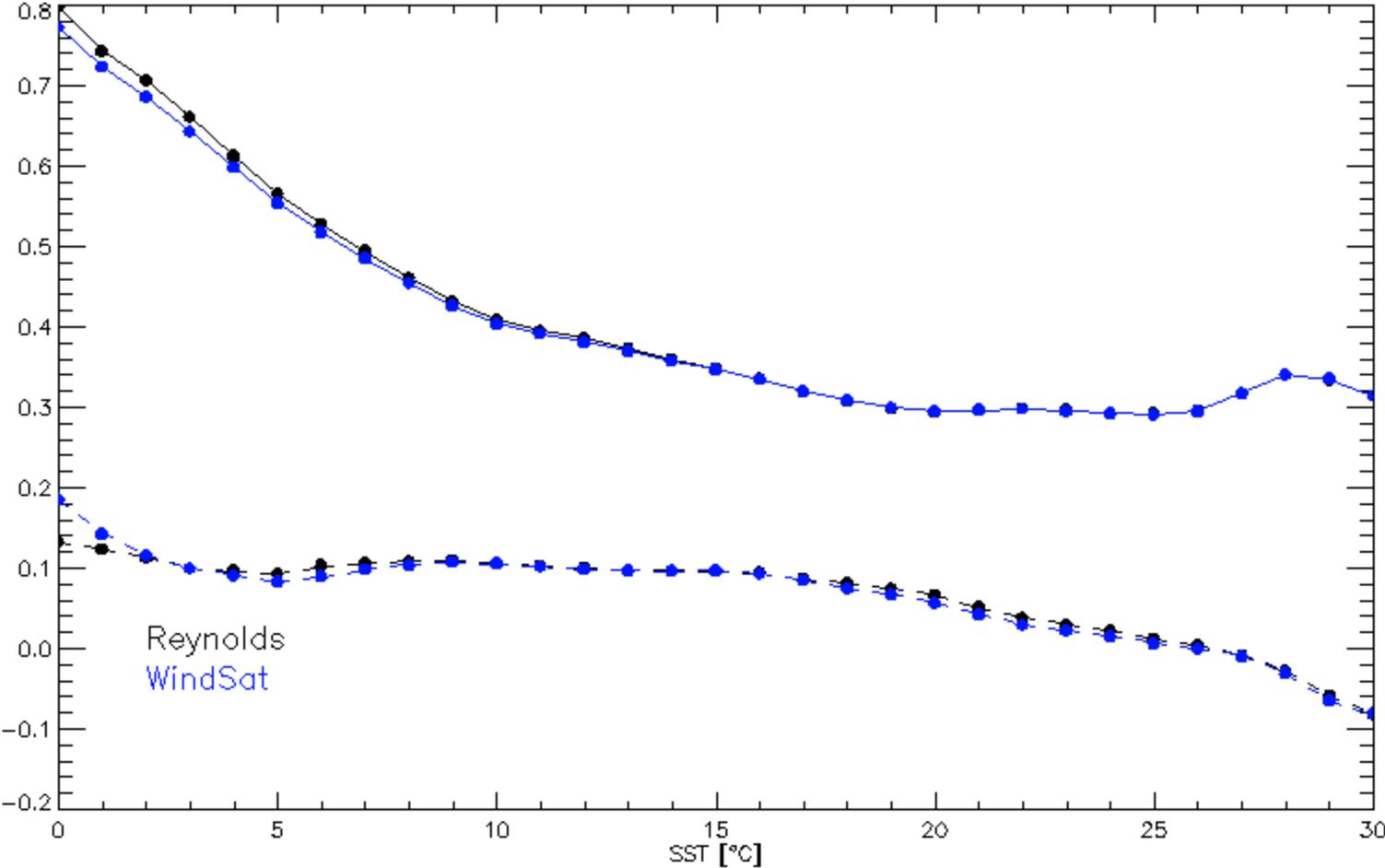
Estimated AQ SSS Error from Triple Collocation

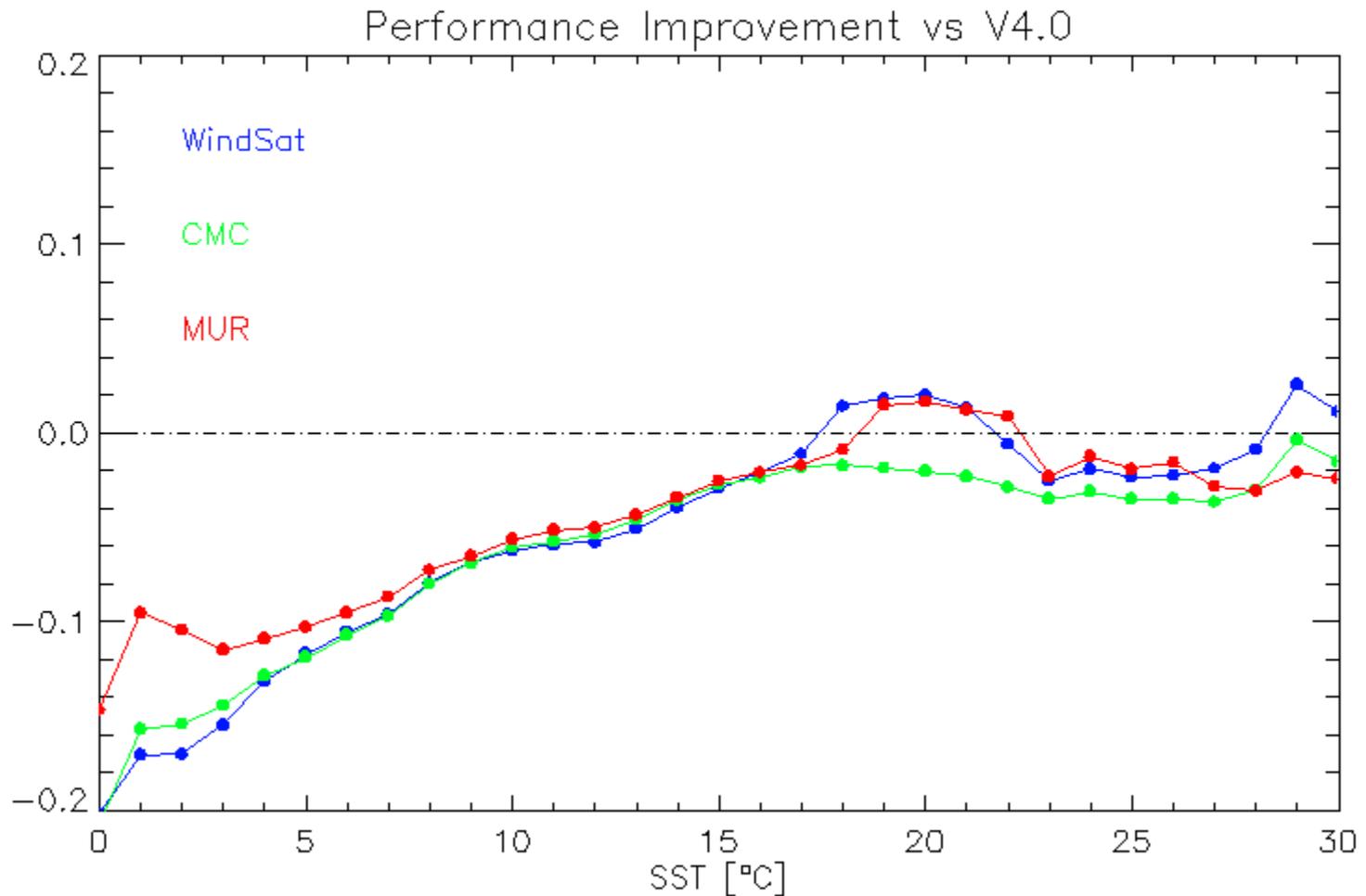


Estimated AQ SSS Error from Triple Collocation

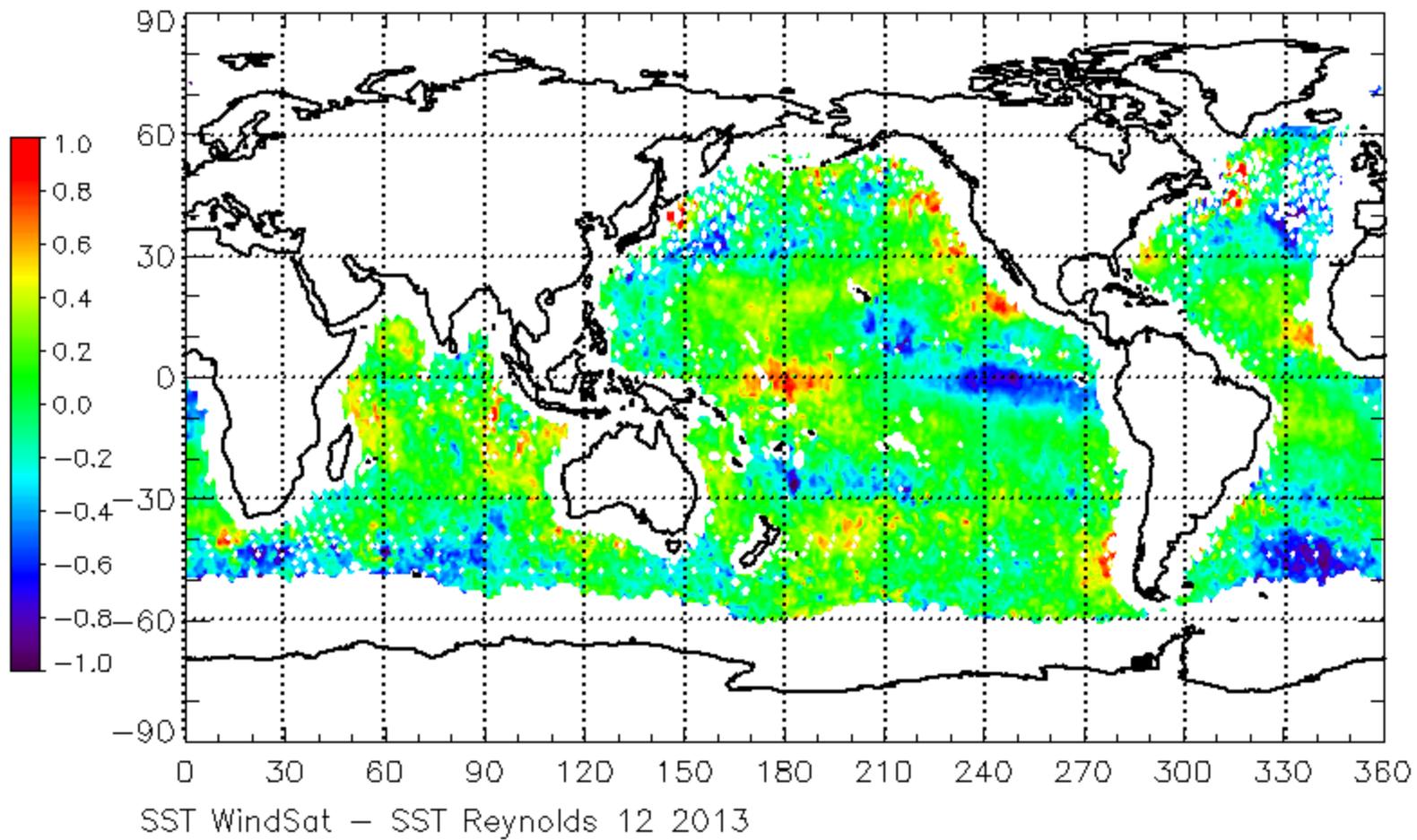


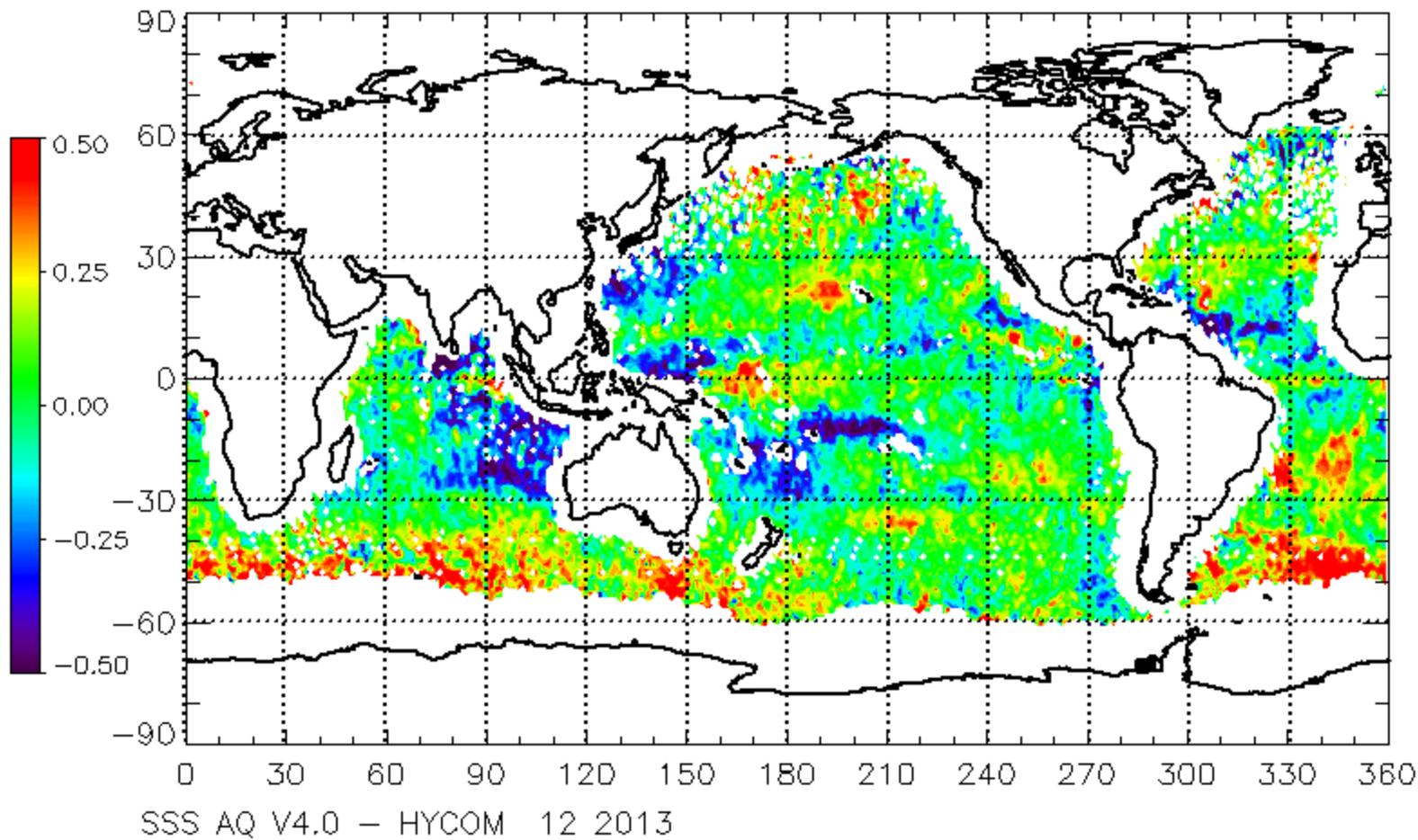
Error statistics for Level 2 as function of SST.
Lower: Bias. Upper: Standard Deviation.

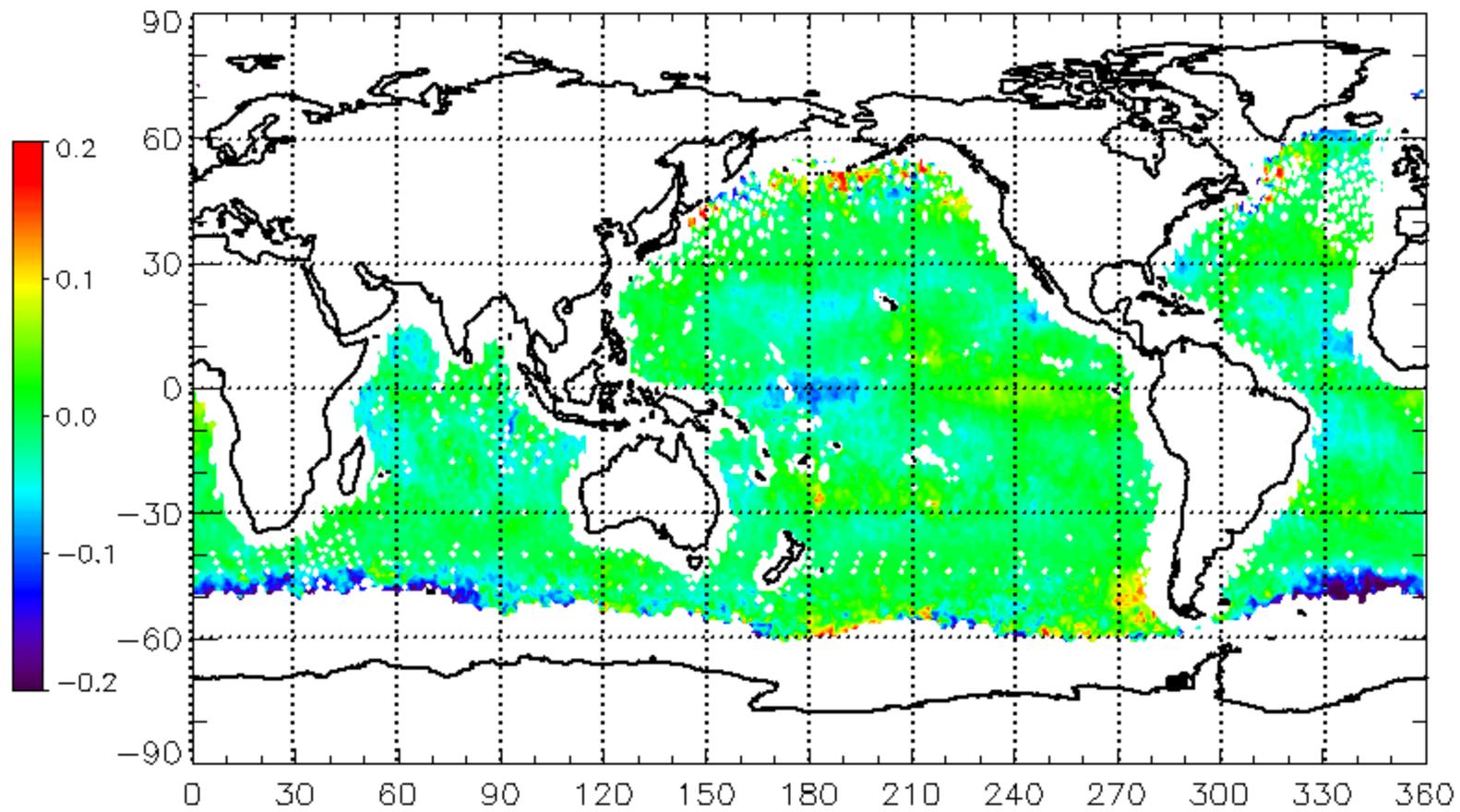




This figure shows the root square difference of the standard deviation of Aquarius – HYCOM L2 SSS between the 3 SST product minus V4.0 (Reynolds): A positive value means that the standard deviation has increased from V4.0. A negative value means that the standard deviation has decreased from V4.0.







SSS AQ - V4.0. Use SST:WindSat 12 2013

