Space-time analysis of systematic errors and biases in SMAP SSS

Oleg Melnichenko[1], Peter Hacker[1], and Thomas Meissner[2]

[1] International Pacific Research Center, University of Hawaii
[2] Remote Sensing Systems, Santa Rosa, CA

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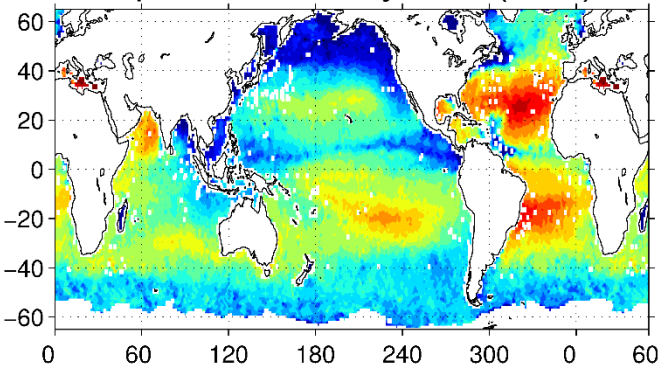
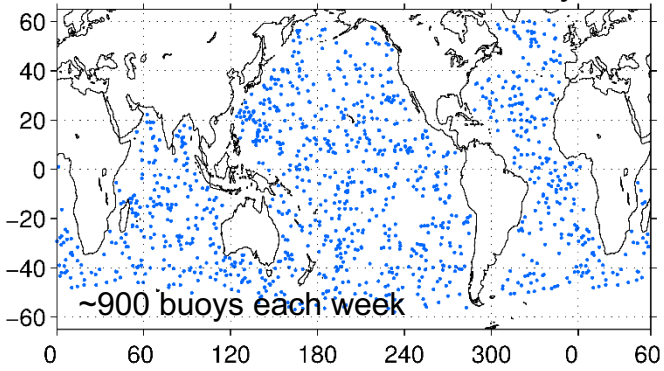
Bias analysis of L3 data

The error statistics are calculated by comparing Argo buoy measurements (z<6m) for a given week with SSS values at the same locations obtained by interpolating the corresponding L3 SSS maps.

Aquarius L3 7-day SSS (A+D)



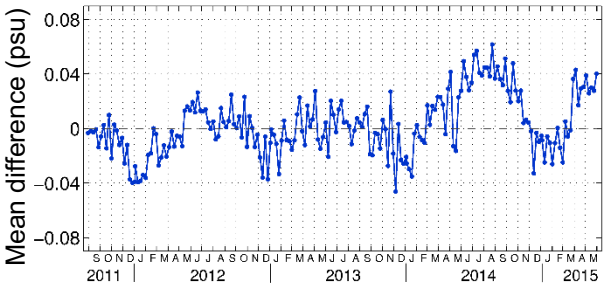
Middle of the week +/- 3 days



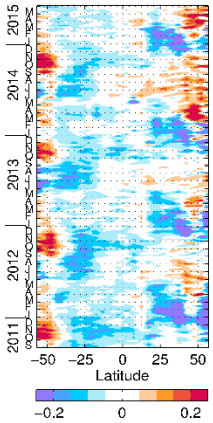
L3 weekly SSS minus Argo SSS at buoy locations

Average globally

Time-series of the global average bias

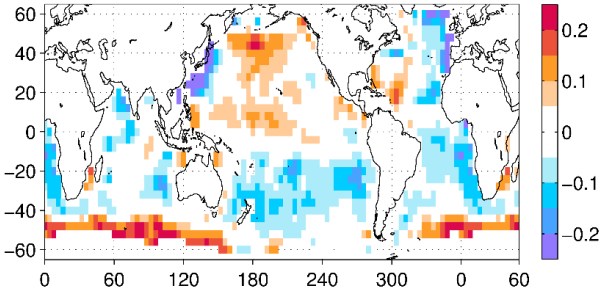


Average zonally (within 5°-lat bins)

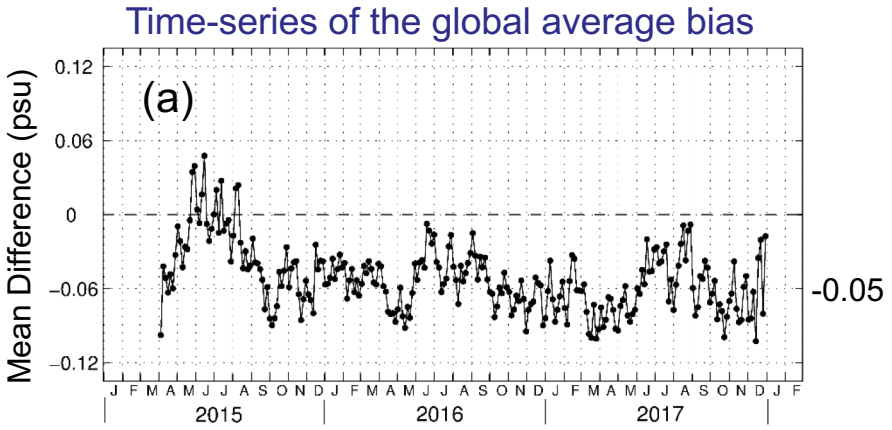


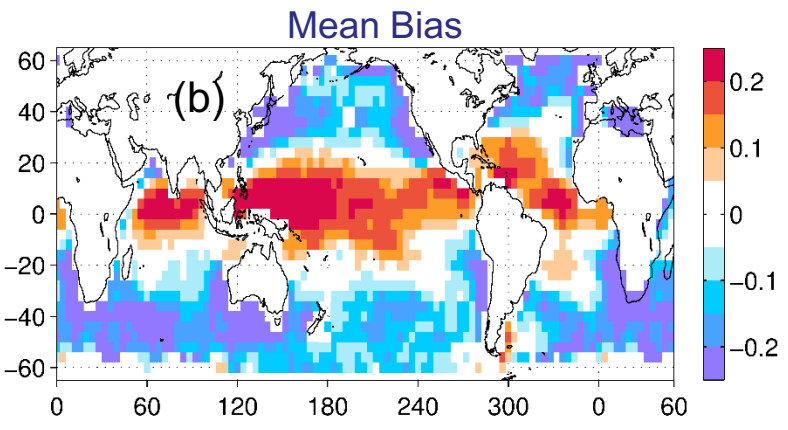
Average over time (within 8°x8° bins)

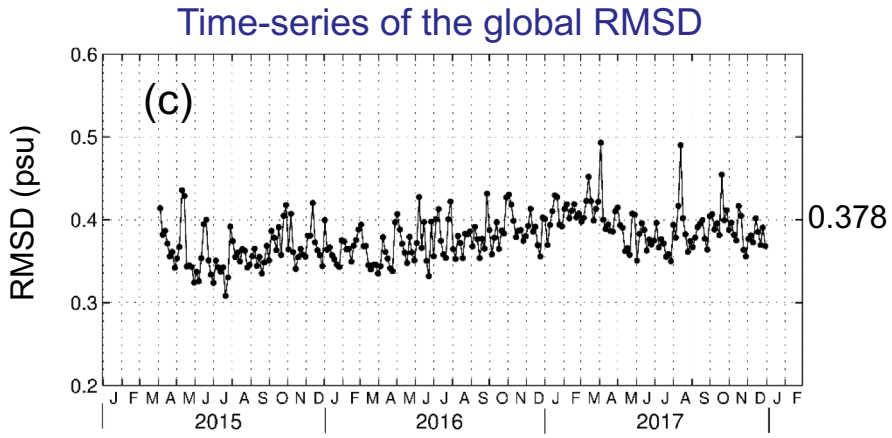
Map of the time average bias

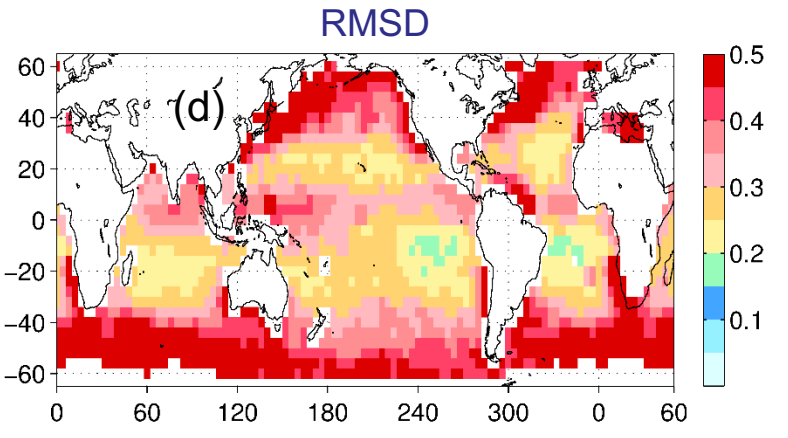


Mean differences and RMSD between Argo buoy observations and SMAP v2.0 40-km Level-3 SSS maps weekly



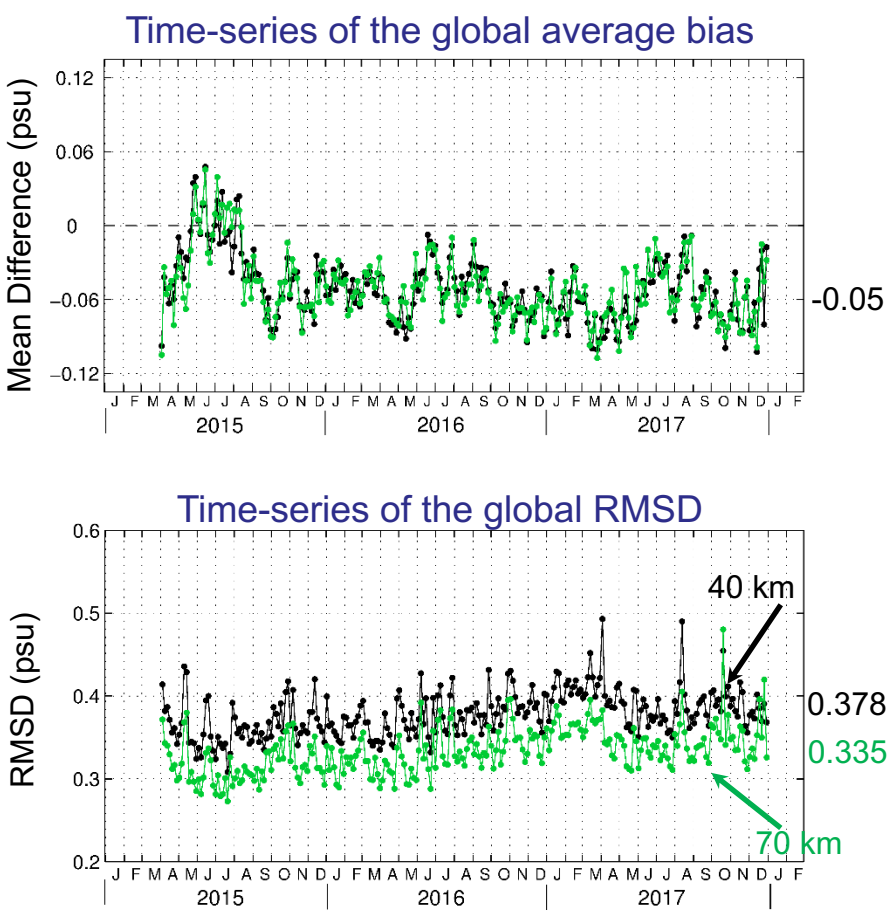


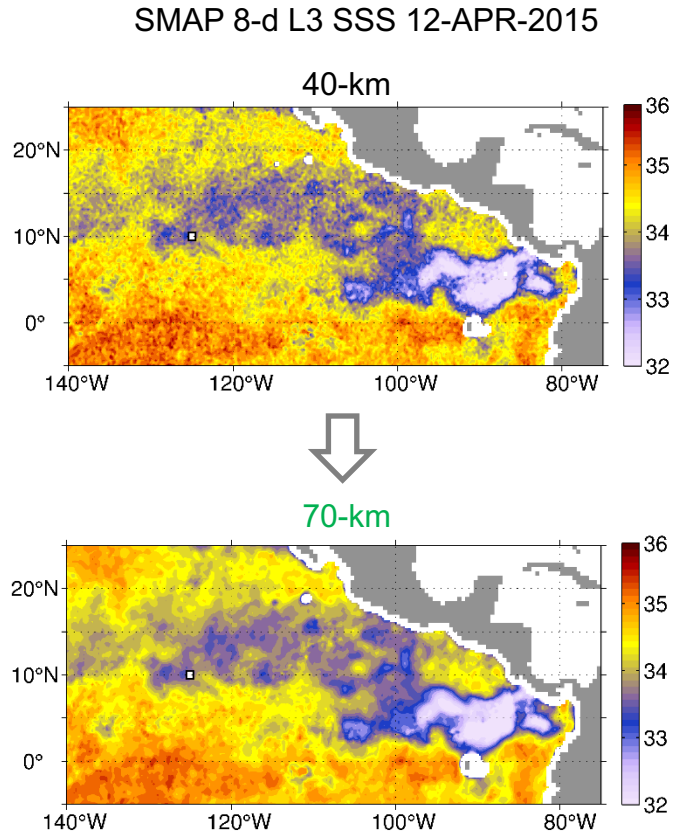




The error statistics are computed by comparing Argo buoy measurements for a given week with SSS values at the same locations obtained by interpolation of the corresponding L3 SSS maps

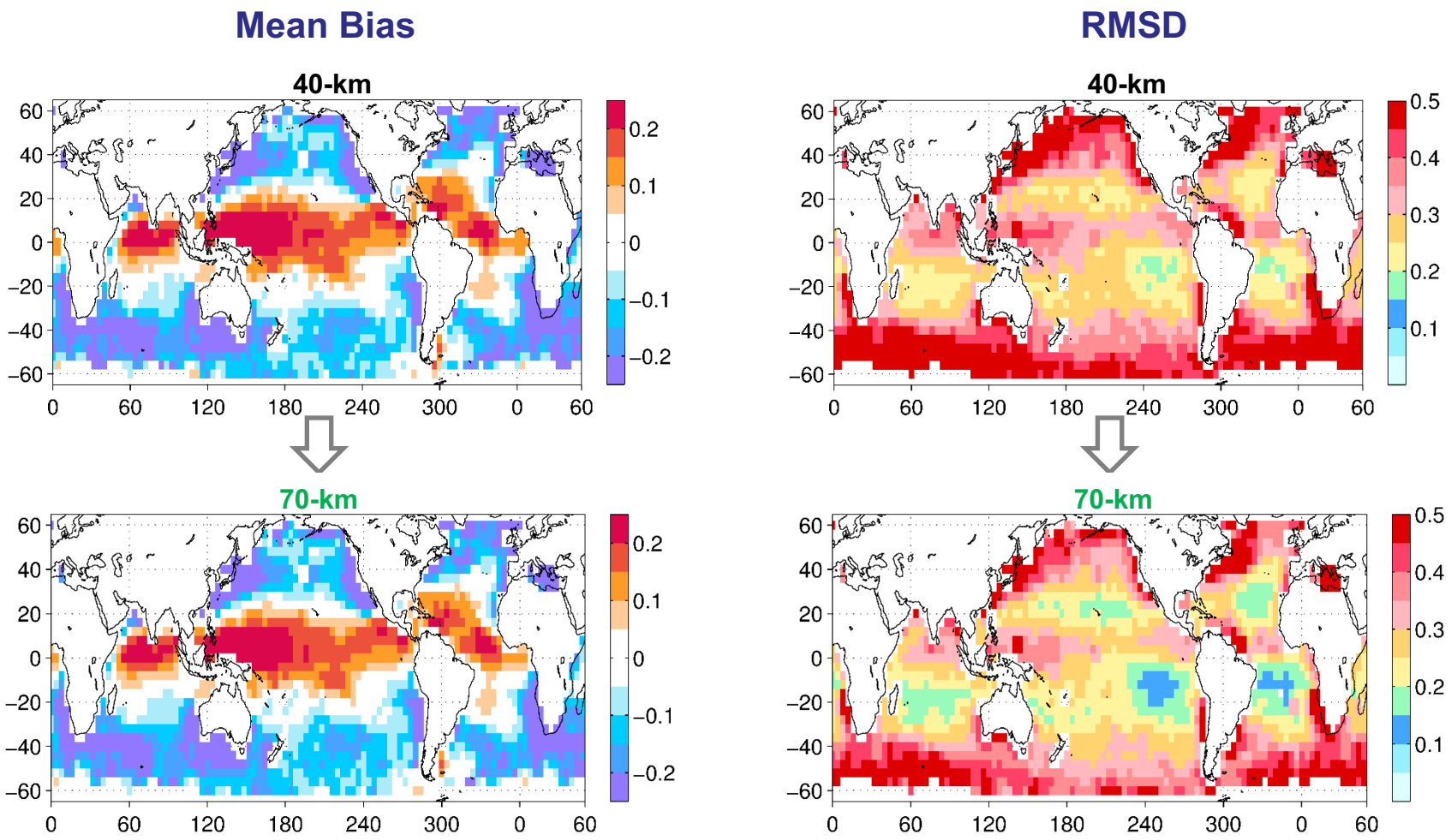
Effect of smoothing: 40-km vs 70-km





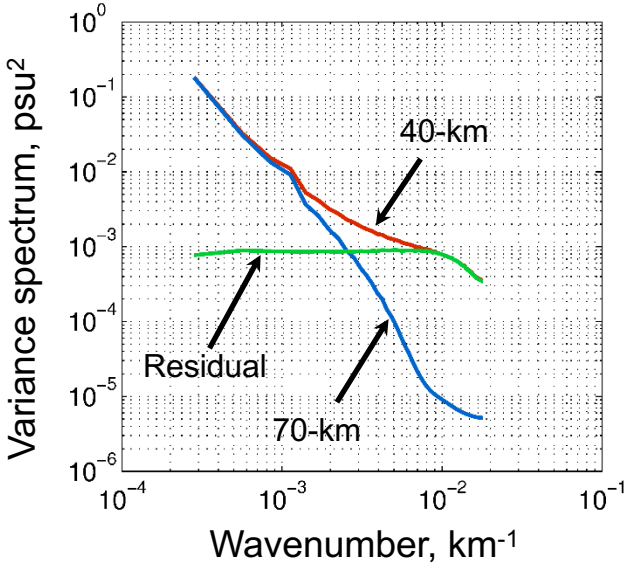
The error statistics are computed by comparing Argo buoy measurements for a given week with SSS values at the same locations obtained by interpolation of the corresponding SSS maps.

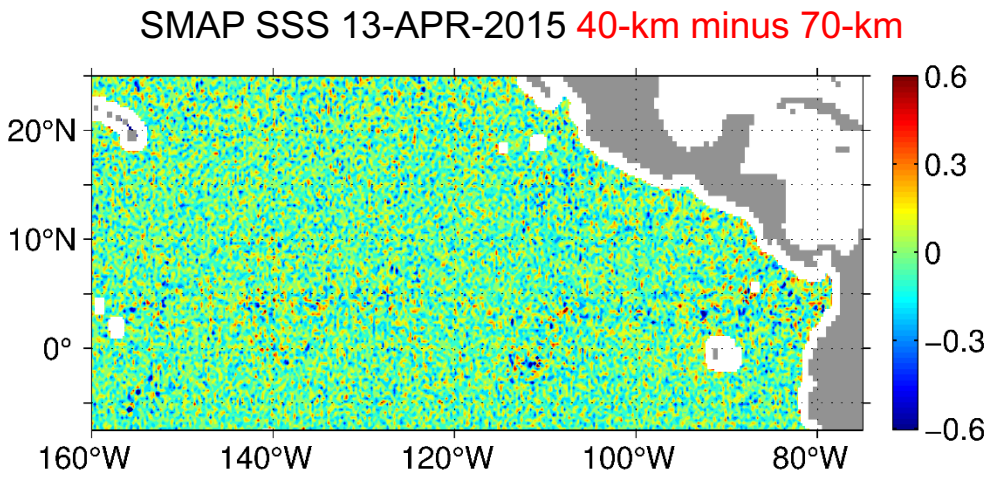
Effect of smoothing: 40-km vs 70-km

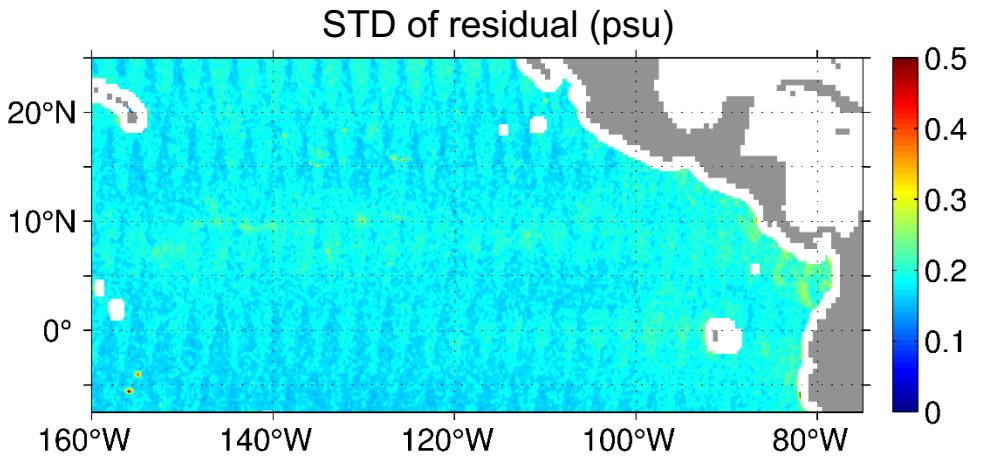


The error statistics are computed by comparing Argo buoy measurements for a given week with SSS values at the same locations obtained by interpolation of the corresponding L3 SSS maps

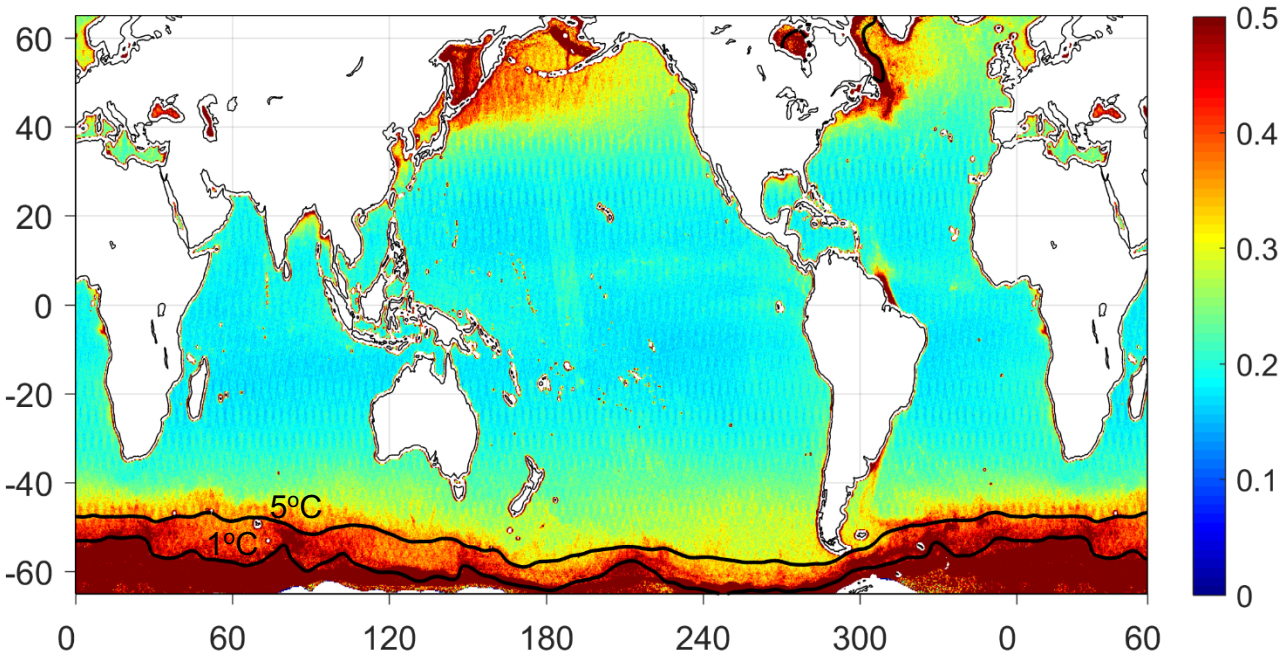
The residual



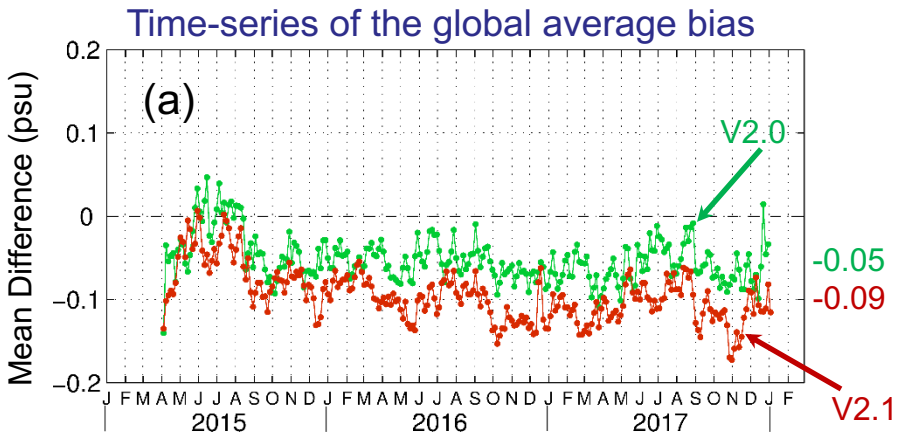


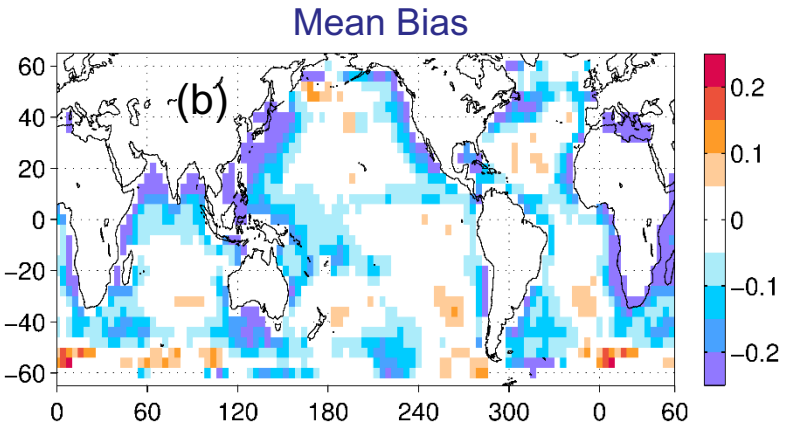


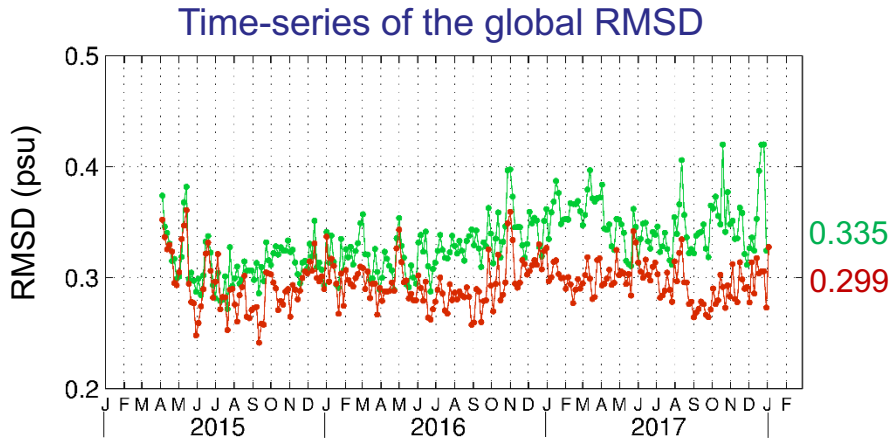
STD of the residual 40-km minus 70-km

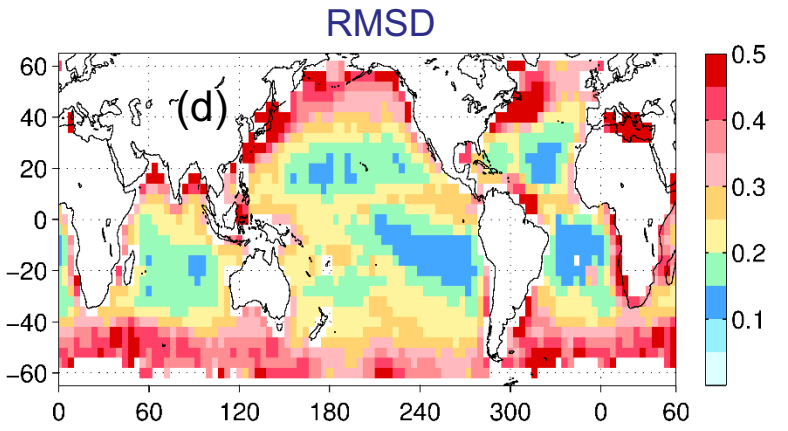


Mean differences and RMSD between Argo buoy observations and SMAP v2.1 (evaluation) 70-km Level-3 SSS maps weekly







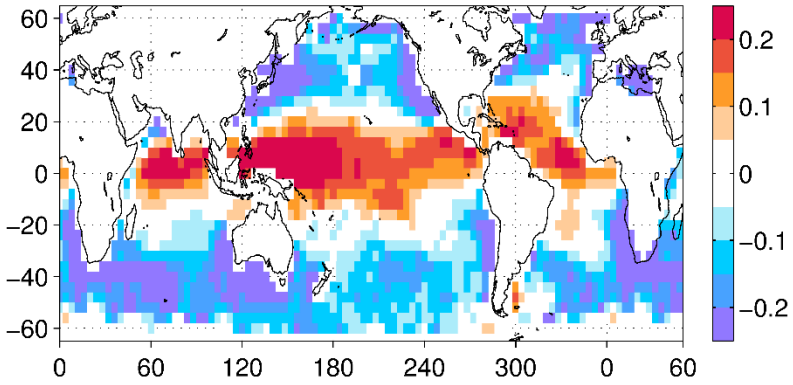


The error statistics are computed by comparing Argo buoy measurements for a given week with SSS values at the same locations obtained by interpolation of the corresponding L3 SSS maps

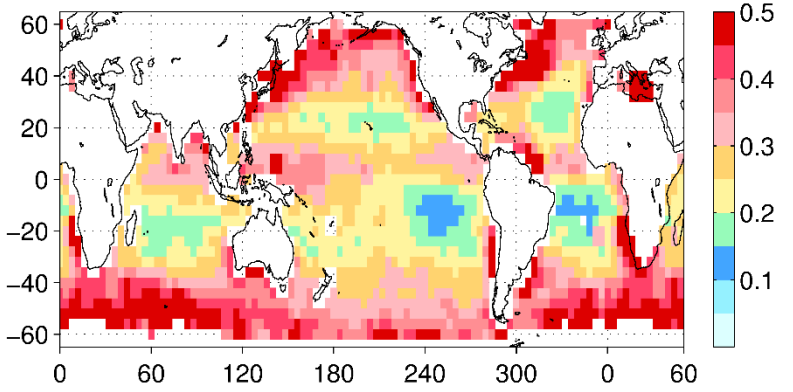
Mean differences and RMSD between Argo buoy observations and Level-3 SSS maps weekly

SMAP V2.0 70-km

Mean Bias

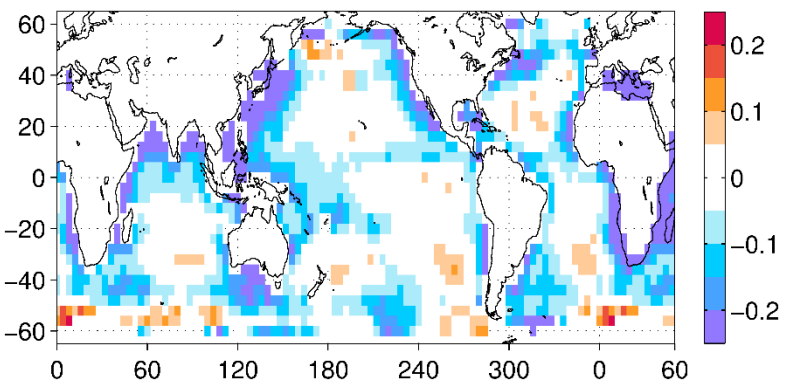


RMSD

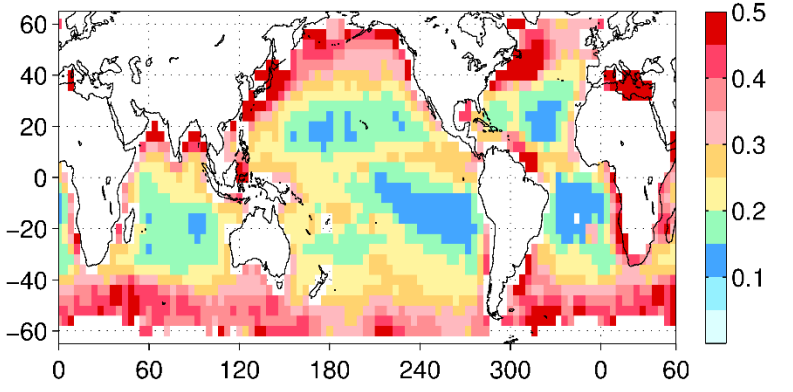


SMAP V2.1 70-km

Mean Bias



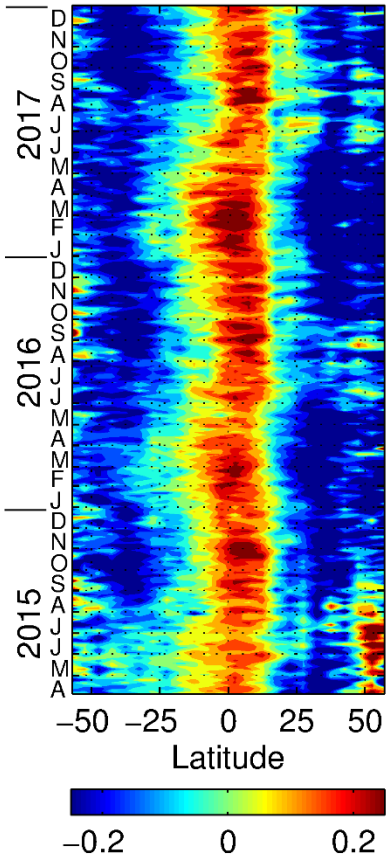
RMSD



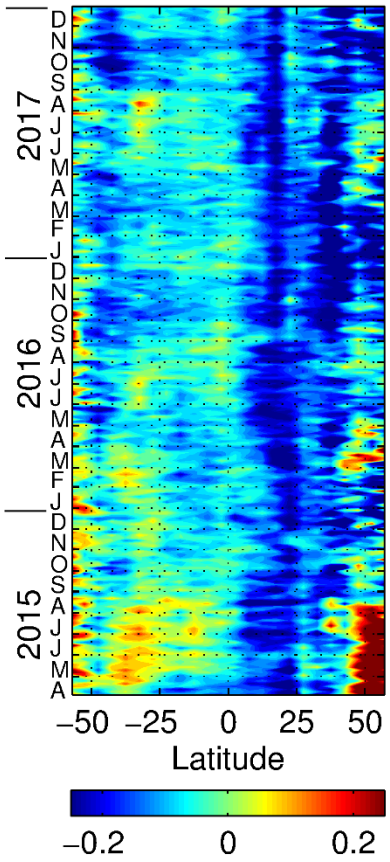
The error statistics are computed by comparing Argo buoy measurements for a given week with SSS values at the same locations obtained by interpolation of the corresponding L3 SSS maps

Latitude-time distribution of the zonally averaged differences between weekly L3 SSS maps and the corresponding Argo buoy data

SMAP V2.0



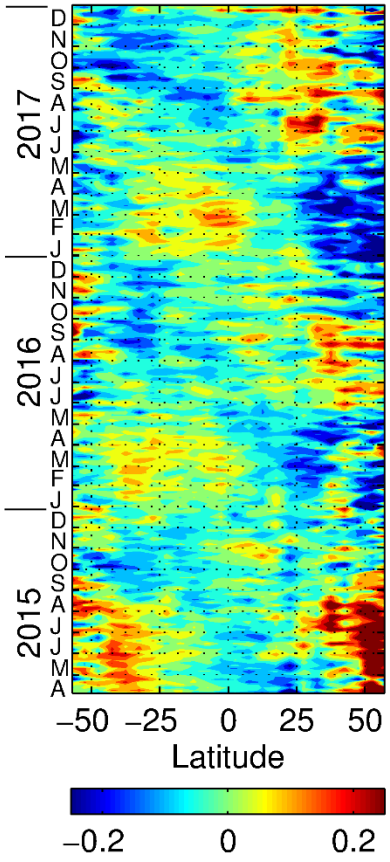
SMAP V2.1



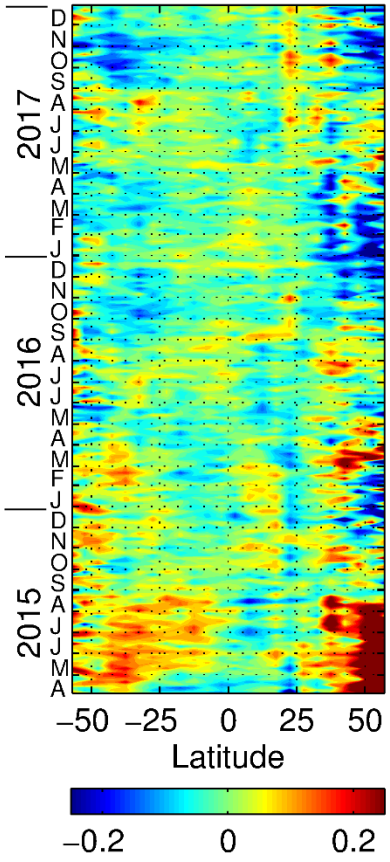
The error statistics are computed by comparing Argo buoy measurements for a given week with SSS values at the same locations obtained by interpolation of the corresponding L3 SSS maps

Latitude-time distribution of the **time-varying part** of the differences between weekly L3 SSS maps and the corresponding Argo buoy data

SMAP V2.0



SMAP V2.1

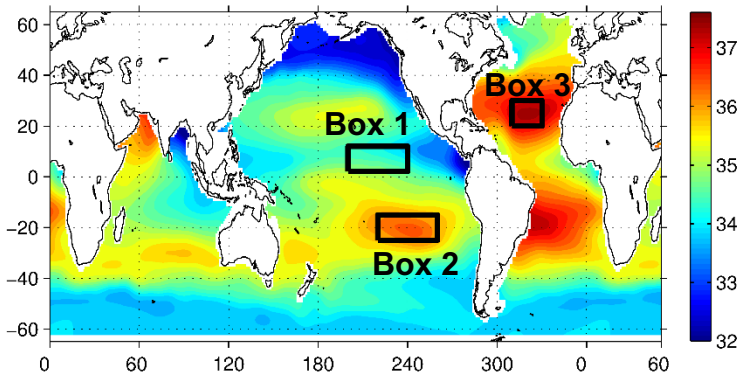


The error statistics are calculated by comparing Argo buoy measurements (z<6m) for a given week with SSS values at the same locations obtained by interpolating the corresponding L3 SSS maps. **The time-mean biases are subtracted.**

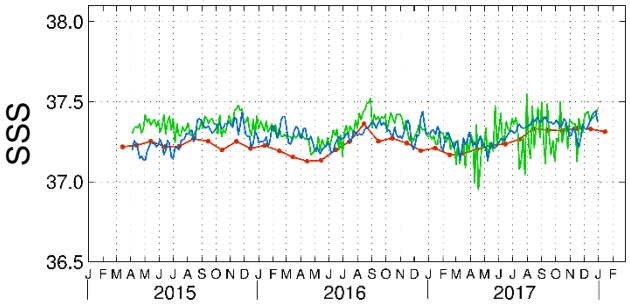
Box analysis

SSS L3 weekly averaged over a box area:

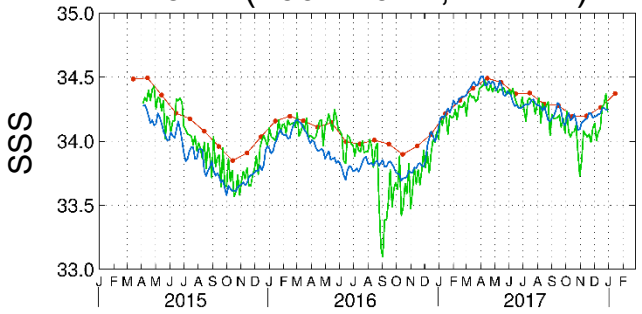
- SMAP RSS V2.1
- Argo-SIO
- Argo buoys (z<6m)



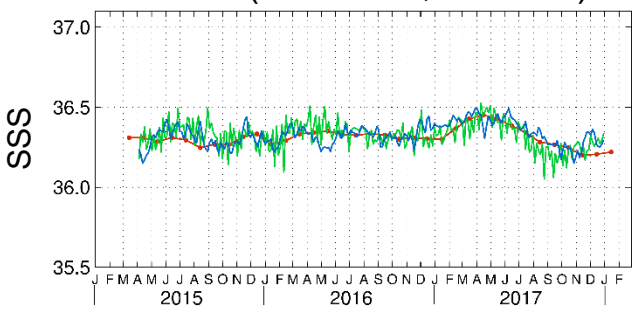
Box 3 (50-30°W, 20-30°N)



Box 1 (160-120°W, 2-12°N)



Box 2 (140-90°W, 25-15°S)



Comments

- RSS SMAP SSS: significant improvements from v2.0 to v2.1 (future v3.0). Virtually no biases in the open ocean between 40^{o}S- 40^{o}N.

- Significant fresh biases remain along the continental boundaries and in the Southern Ocean.

- Surprisingly, very small time-varying biases. This is in sharp contrast to Aquarius, where the time-varying biases (with the annual period, in particular) are significant.

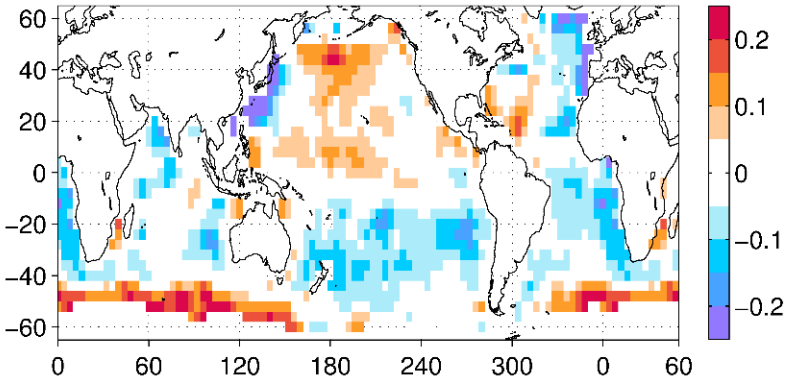
- Transition from 40-km to 70-km smoothing have had zero or very little effect on the biases. The RMSD (SMAP L3 weekly minus Argo) reduced by ~15% globally.

- The residual (40-km minus 70-km) has signature of white noise. STD= ~0.2 psu in 40^{o}S-40^{o}N. Increases considerably in cold water (T<5^{o}C) and close to the coast.

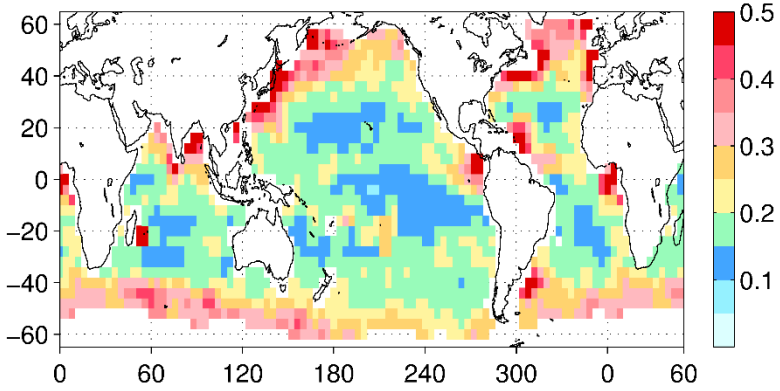
Mean differences and RMSD between Argo buoy observations and Level-3 SSS maps weekly

Aquarius V5.0

Mean Bias

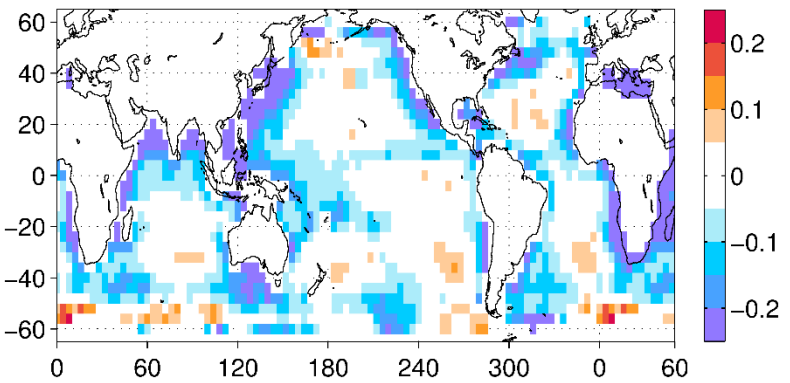


RMSD

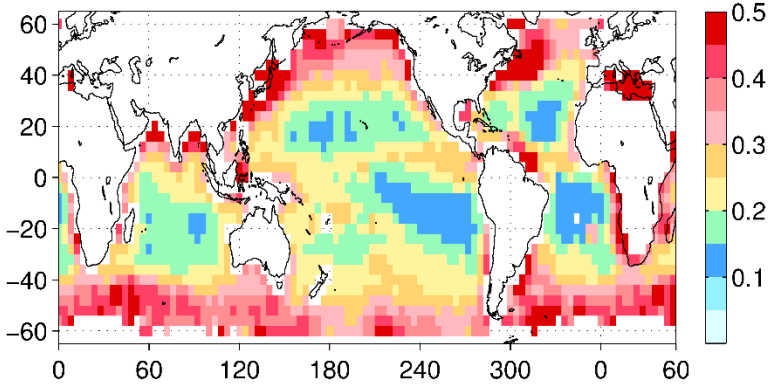


SMAP V2.1 70-km

Mean Bias



RMSD



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