Building a consistent multi-satellite SSS data record: A case study in the Eastern Tropical Pacific (SPURS-2)

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Why?

We are stitching Aquarius and SMAP. Why if there is SMOS which provides continuous data record?

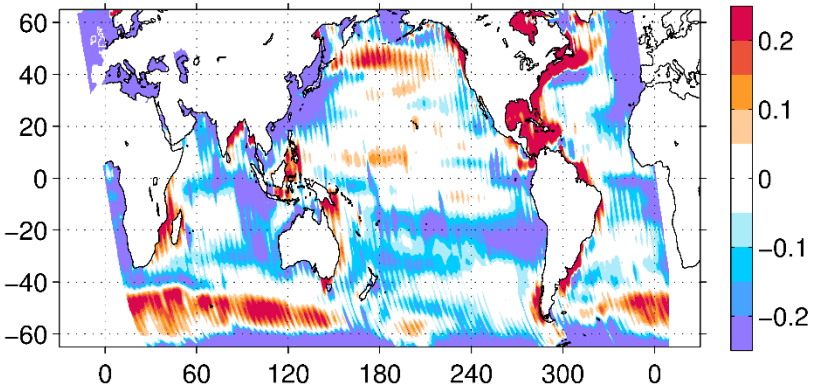
1. SMOS is not eternal; besides, there are significant biases, both static and time varying; large areas of land/IRF contamination, etc.
2. Aquarius is still a gold standard considering its accuracy. It may lack resolution, at the first look, but resolution is a relative term; all depends on the signal to noise ratio.
3. SMAP data are getting better and better. More importantly, it looks like there are no or very small time-varying biases.
4. End of Aquarius and start of SMAP happened during El Nino year (third the most intense ever recorded). So having a continuous time series through these years is desirable.

We focus on Eastern Tropical Pacific as a pilot project. Why?

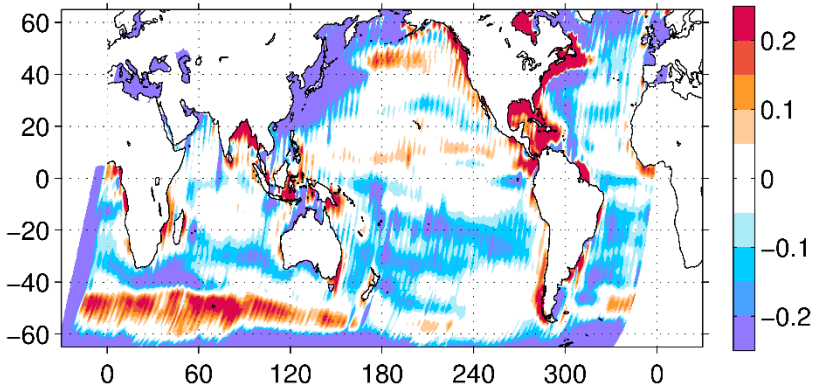
- It is worm in tropics.
- It is very dynamic region;
- TAO array to test time series for consistency;
- Relatively good coverage by Argo
- The SPURS-2 field complain.

Aquarius time-mean biases

(a) Ascending

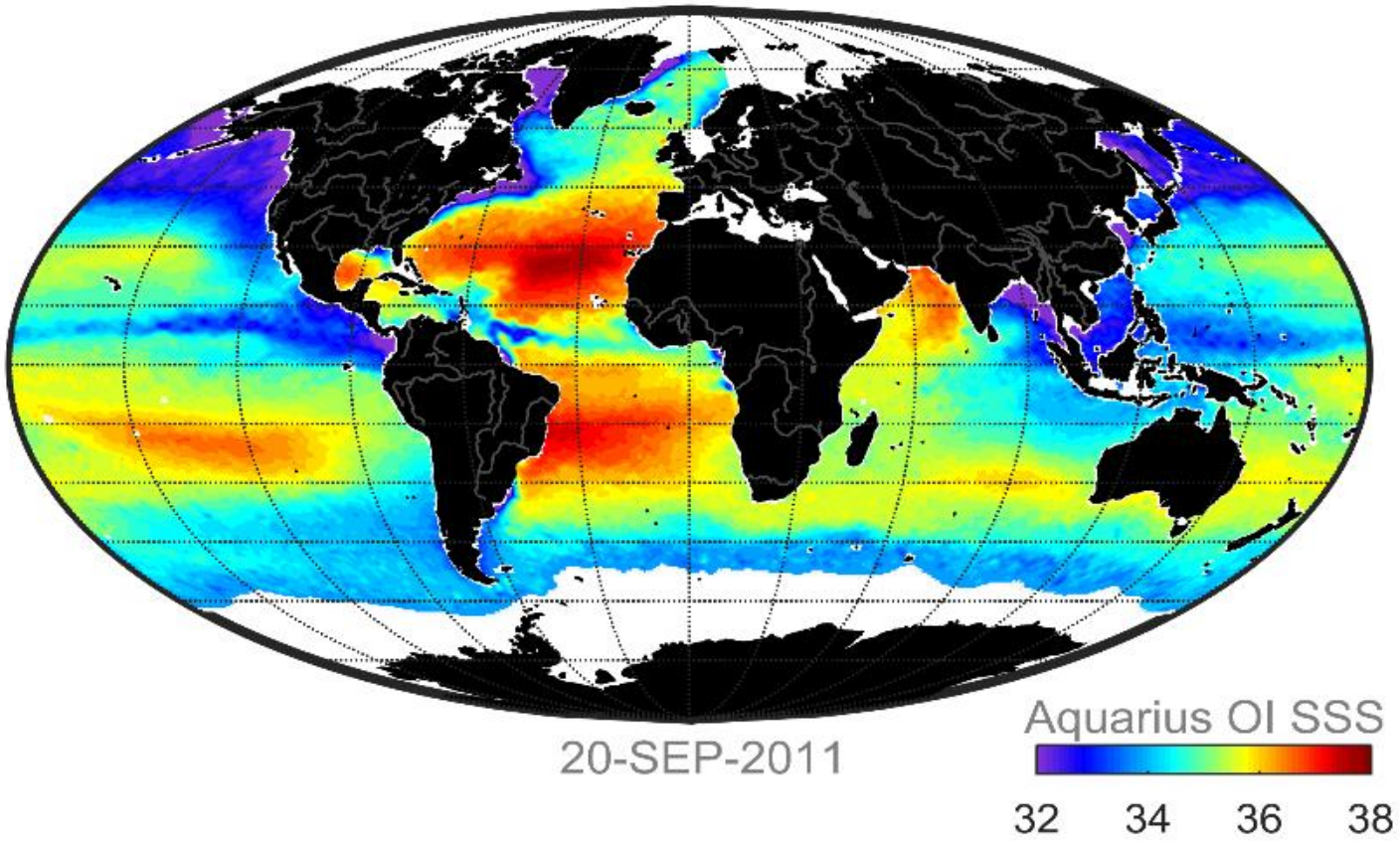


(b) Descending



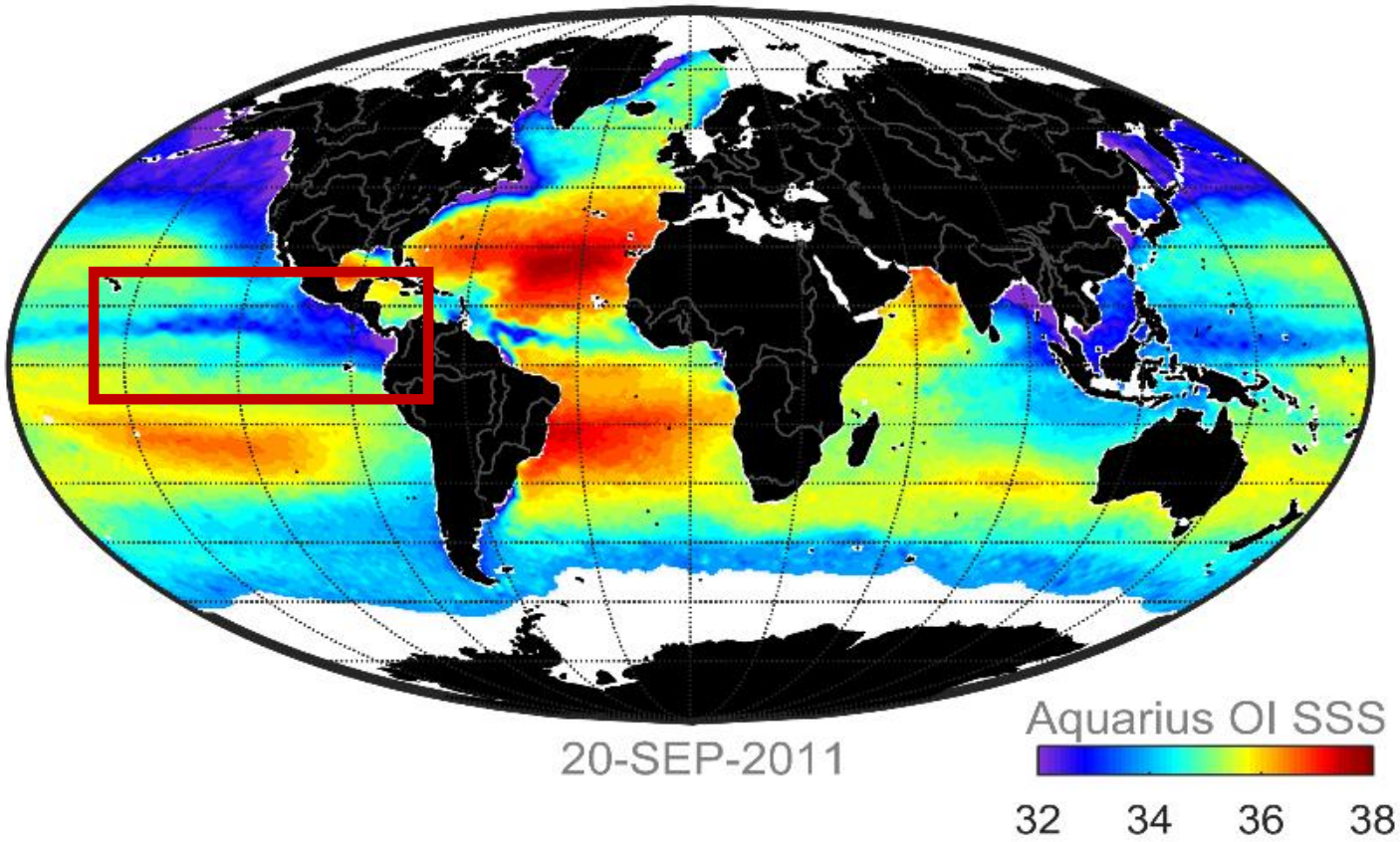
Mean spatial bias correction fields (psu) for Aquarius ascending (a) and descending (b) data.

The beginning segment (September 2011-June 2015) is based on Aquarius OI SSS



Aquarius V5.0 OI SSS field for the week 17-23 September 2011

The beginning segment (September 2011-June 2015) is based on Aquarius OI SSS



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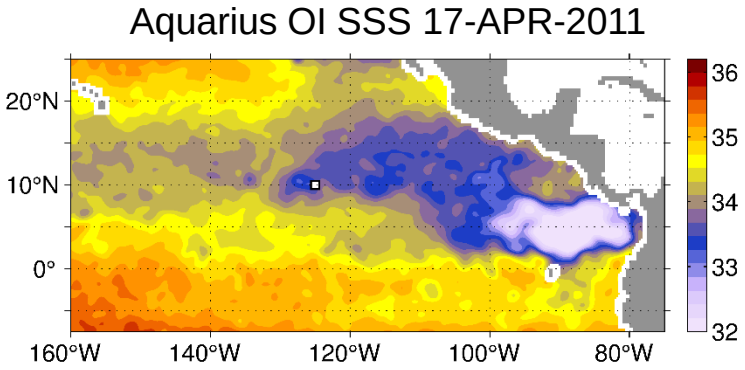
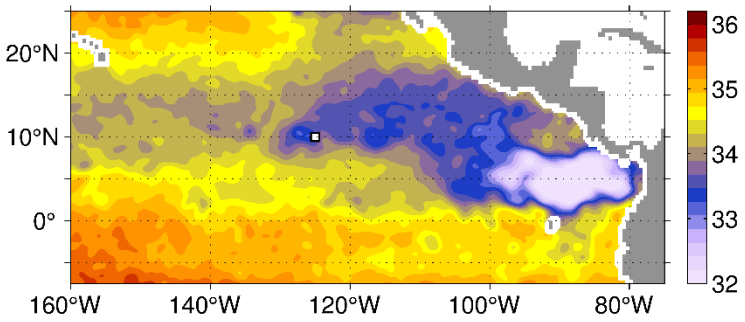


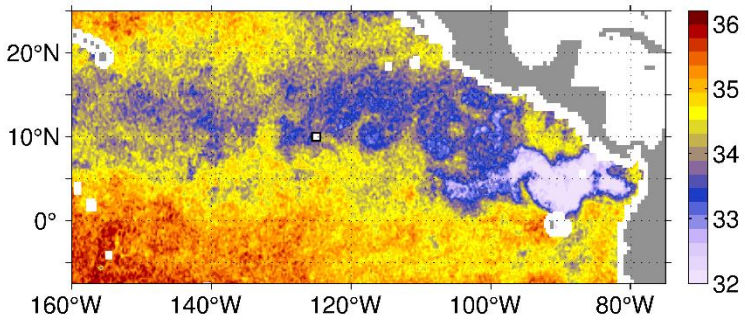
The beginning segment (September 2011-June 2015) is based on Aquarius OI SSS

Continue with SMAP

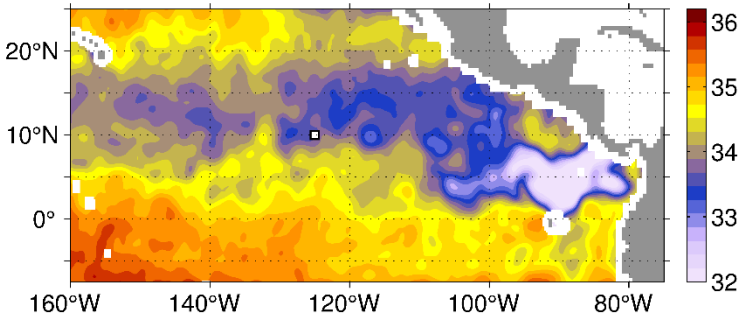
Aquarius OI SSS 17-APR-2011



RSS SMAP SSS v2.0 40-km 17-APR-2011

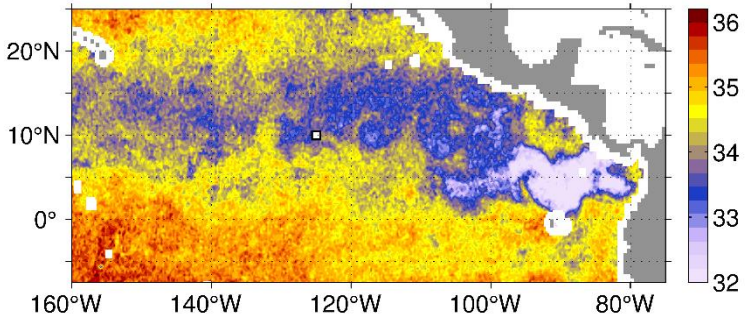


SMAP SSS 17-APR-2011



Filtering

Adjusted for large-scale static biases



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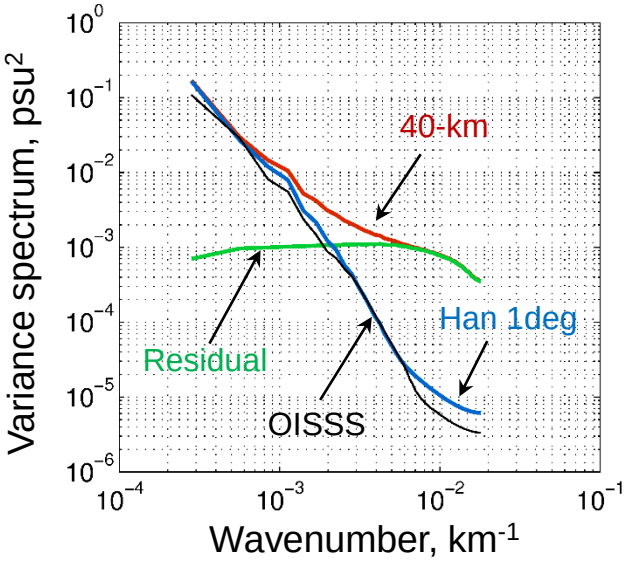
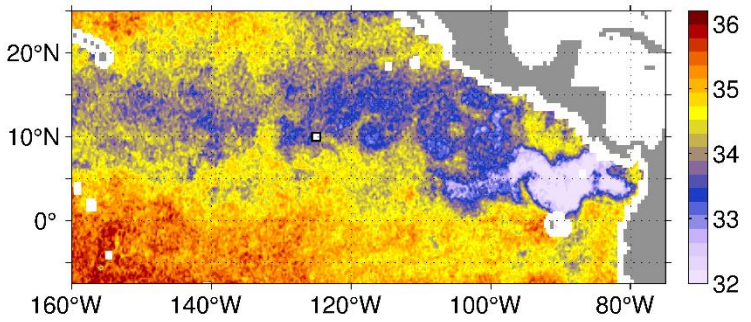


Continue with SMAP

RSS SMAP SSS v2.0 40-km 17-APR-2011



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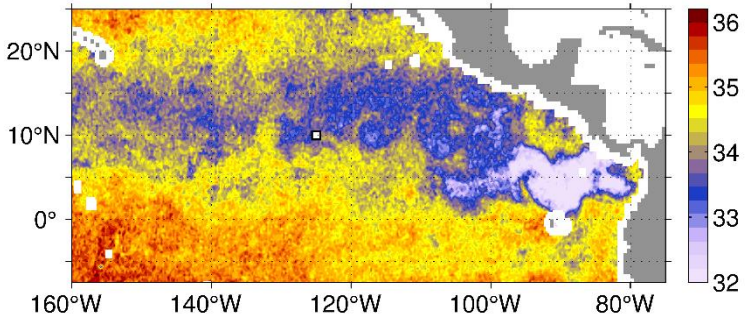
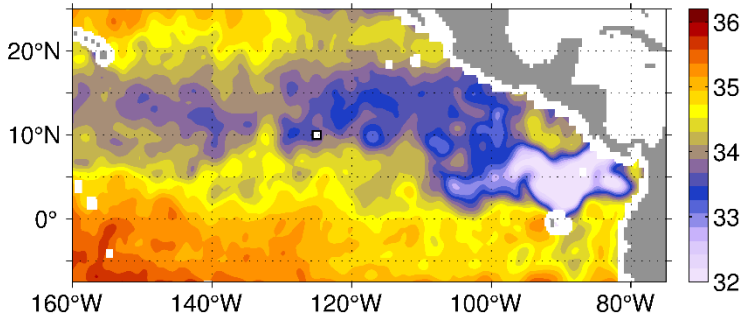
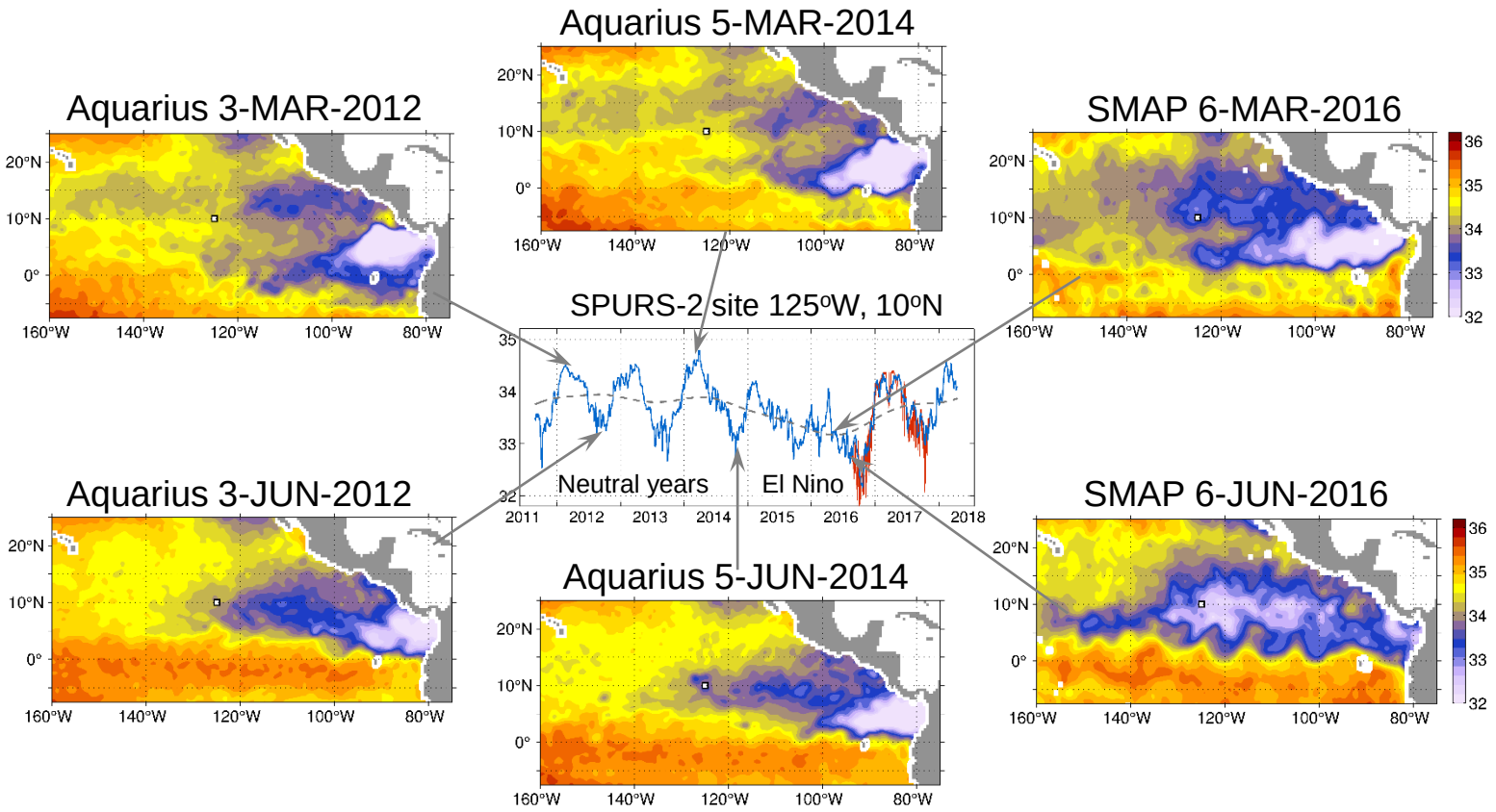


Filtering

SMAP SSS 17-APR-2011

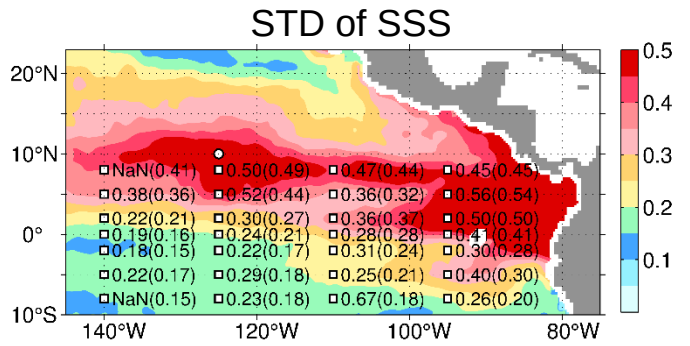


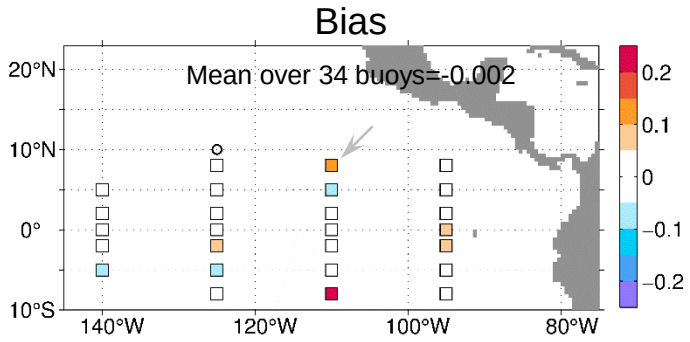
Continuous time series of SSS (Sep 2011 – present)

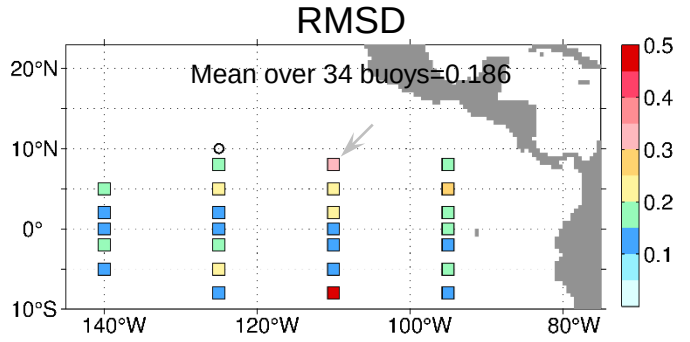


In the center: Time-series of SSS at 125ºW, 10ºN from SPURS-2 buoy (red) and Aquarius/SMAP analysis (blue)**. In panels**: Example plots of Aquarius/SMAP SSS (experimental product). The white rectangle marks the location of SPURS-2 buoy at 125ºW, 10ºN.

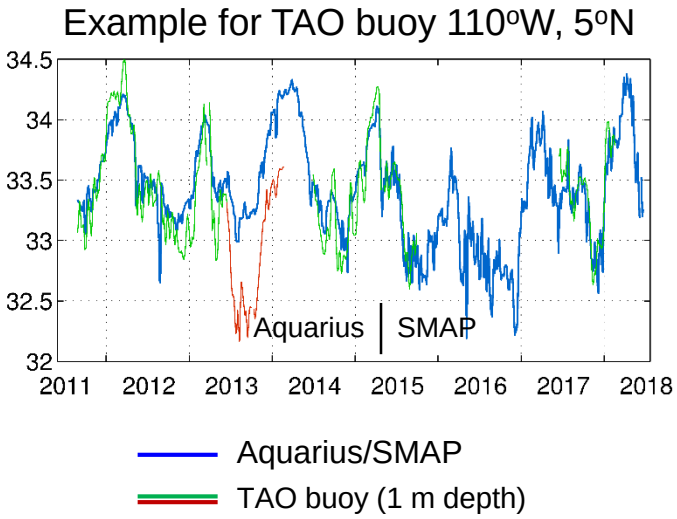
Validation: TAO array



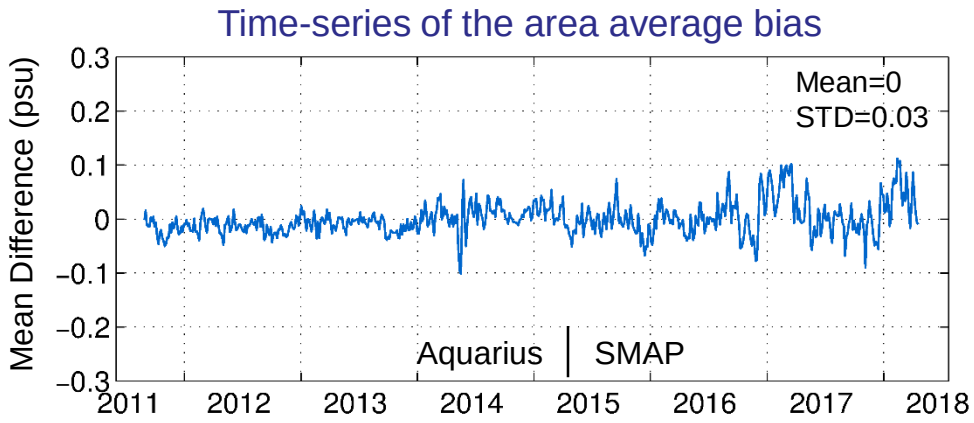


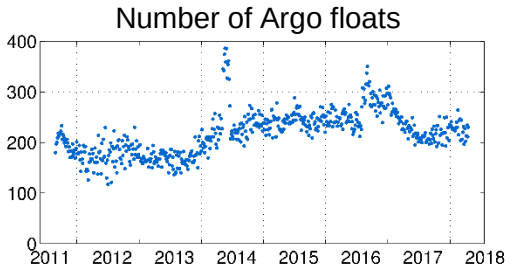


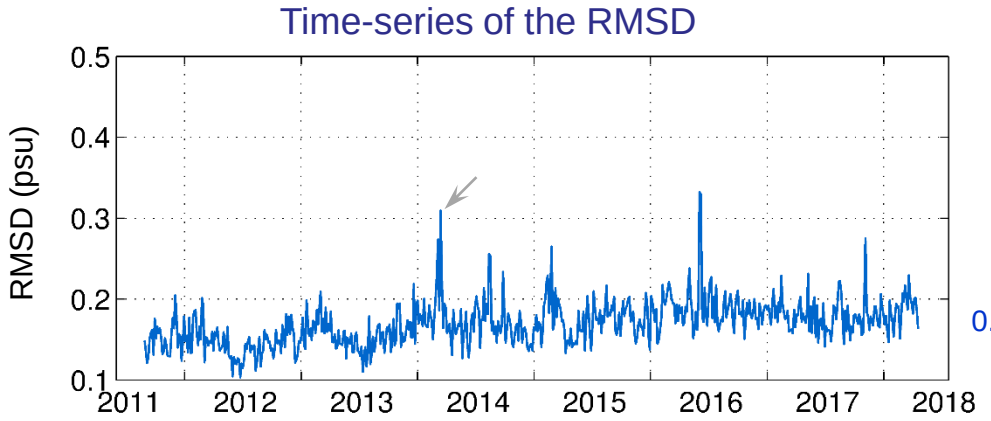
Validation against time series of SSS from TAO moored buoys



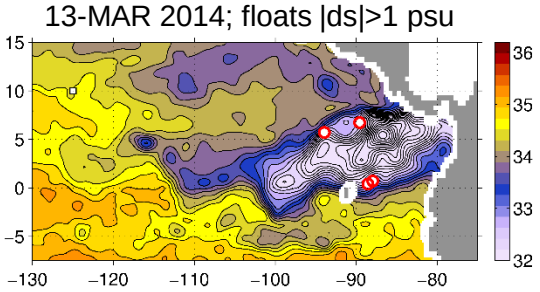
Validation: Argo





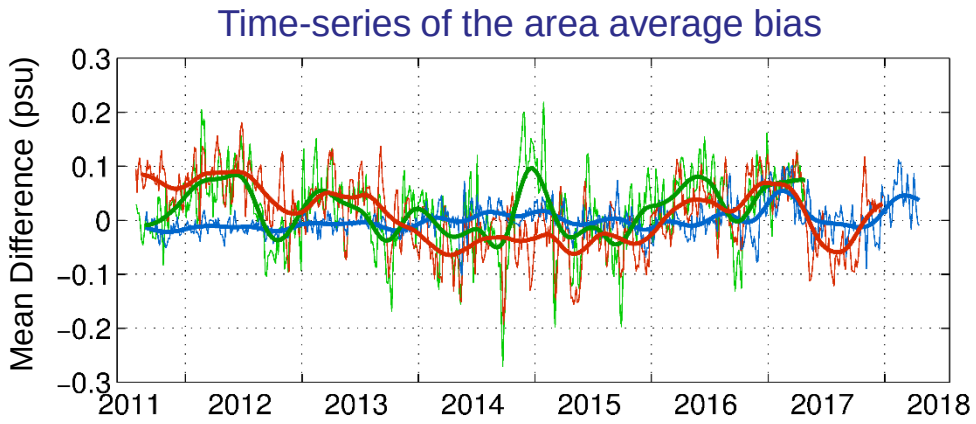


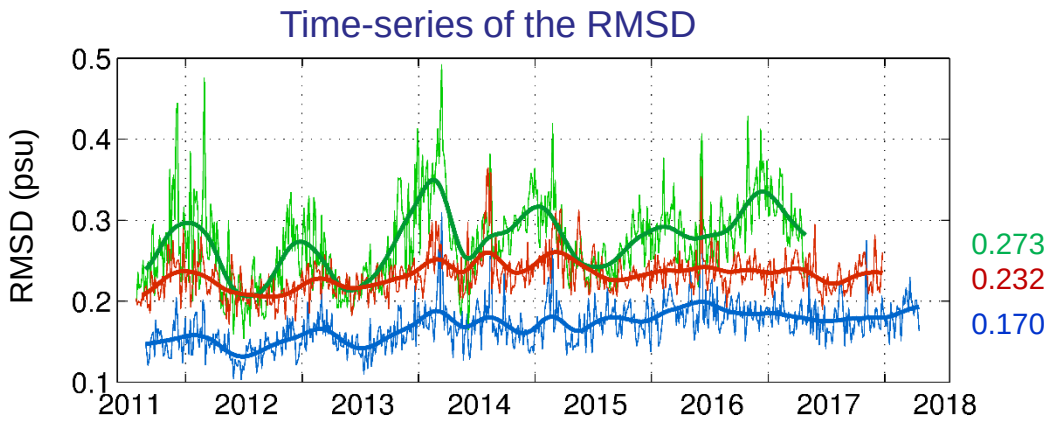
0.170



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 L4 SSS maps

Inter-comparison of SSS analyses





Aquarius/SMAP
SMOS BEC
SMOS CATDS v3.0

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Summary

Grab it here: http://iprc.soest.hawaii.edu/users/oleg/oisss/ETP/