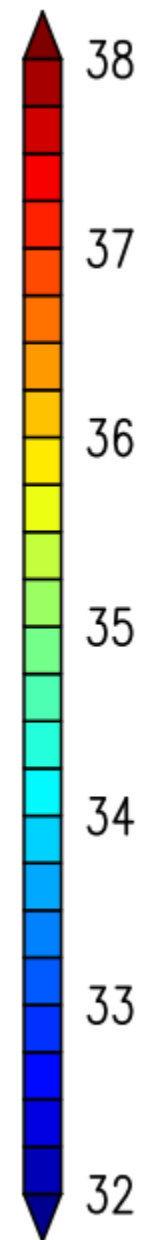
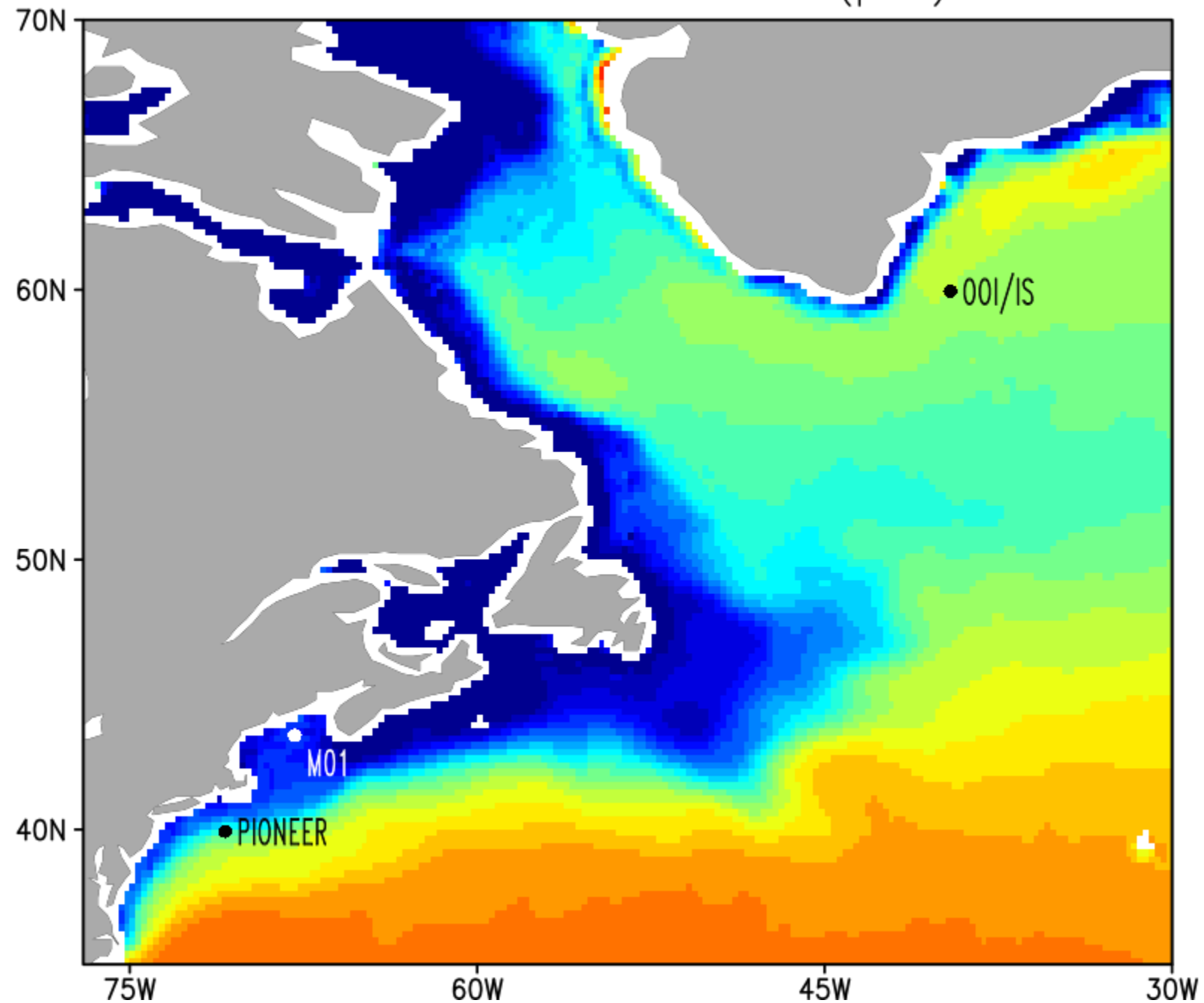


SMAP-buoy comparisons in the North Atlantic

Senya Grodsky (UMD) and Doug Vandemark (UNH)

Time-mean SMAP SSS (psu)

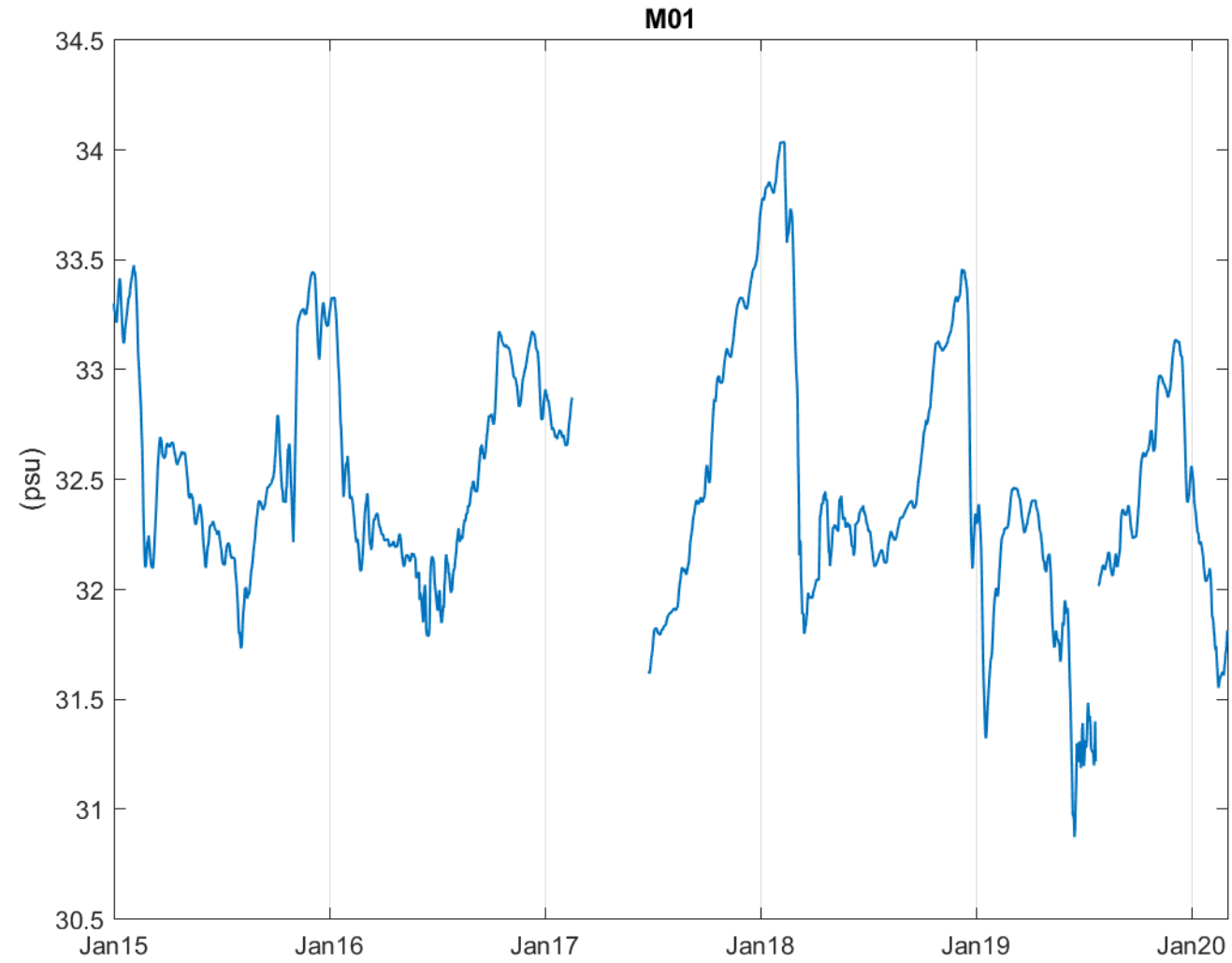


BUOY	Land contamination (%)	SST max/min (degC)
M01 (NERAC OOSE)	0.55	20°/4°
PIONEER (OOI)	0.36	26.5°/8.5°
Irminger Sea [IS] (OOI)	0.17	10°/3.5°

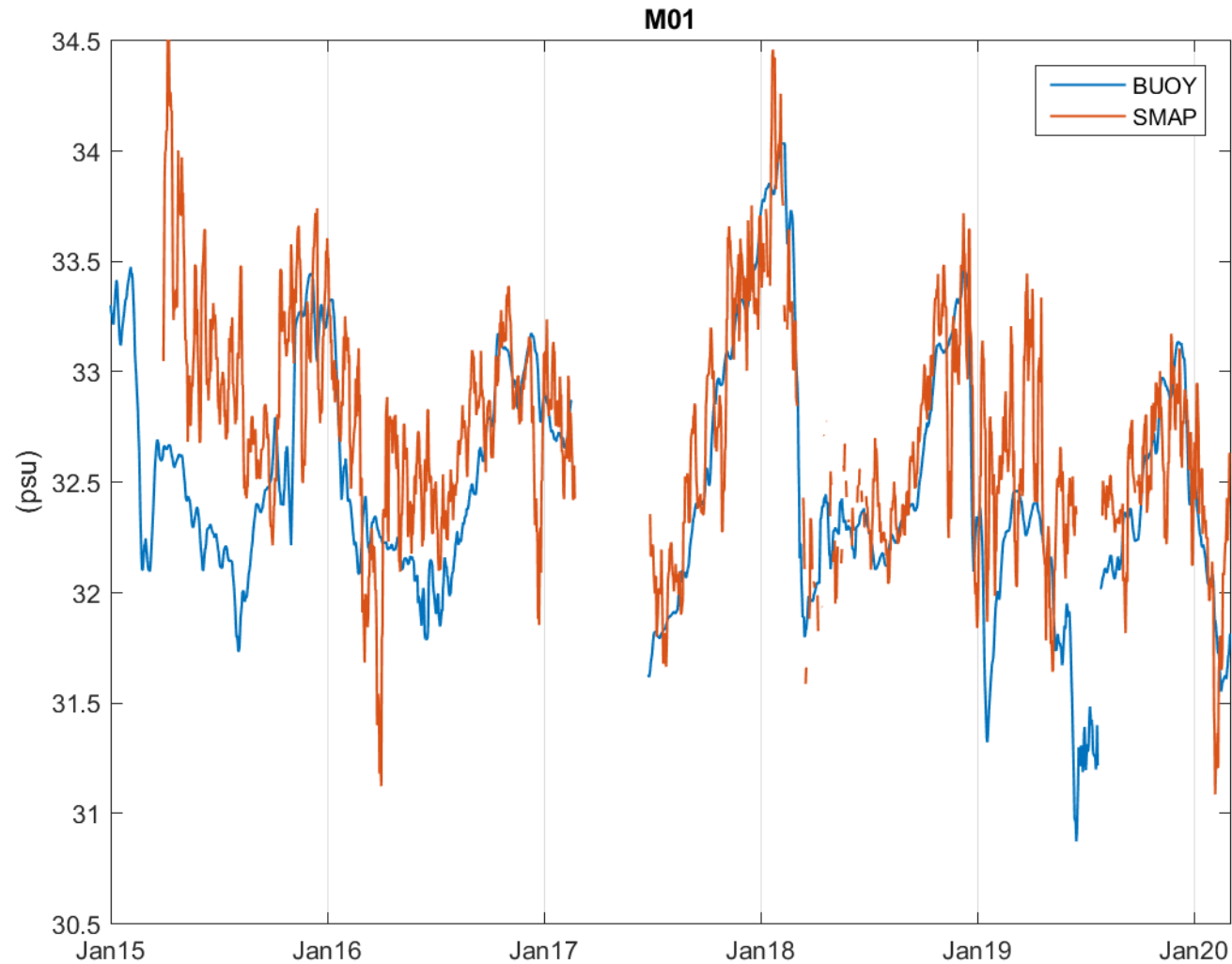
Intention:

- At each buoy location, several year SMAP and in-situ timeseries of SSS are available, from which SSS error timeseries are estimated.
- We will look at the temporal behavior of satellite SSS errors in order to examine
 - (*) the relative importance of the seasonal error component
 - (**) check for the presence of longer scale correlated errors at these locations.

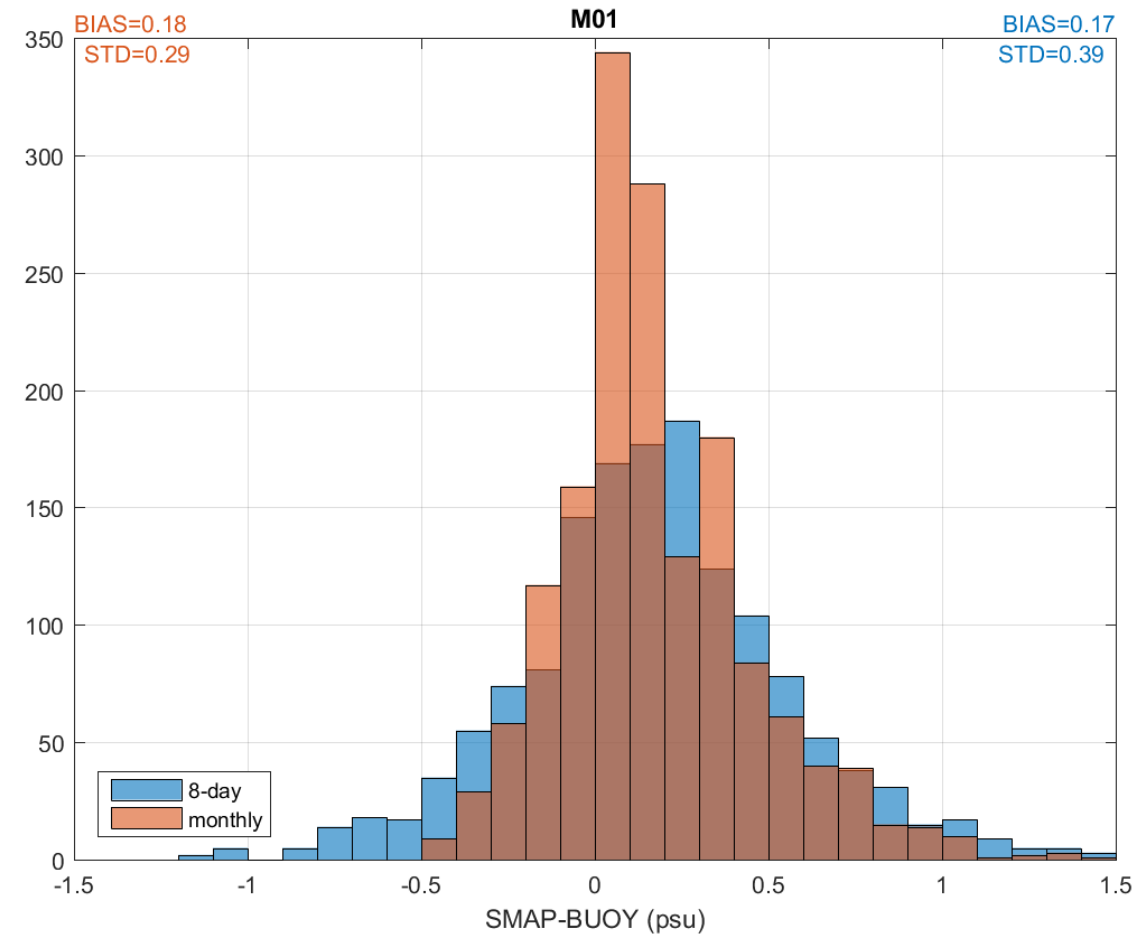
Gulf of Maine buoy M01 salinity at z=1m



Gulf of Maine buoy M01 daily salinity and collocated SMAP 8-day SSS

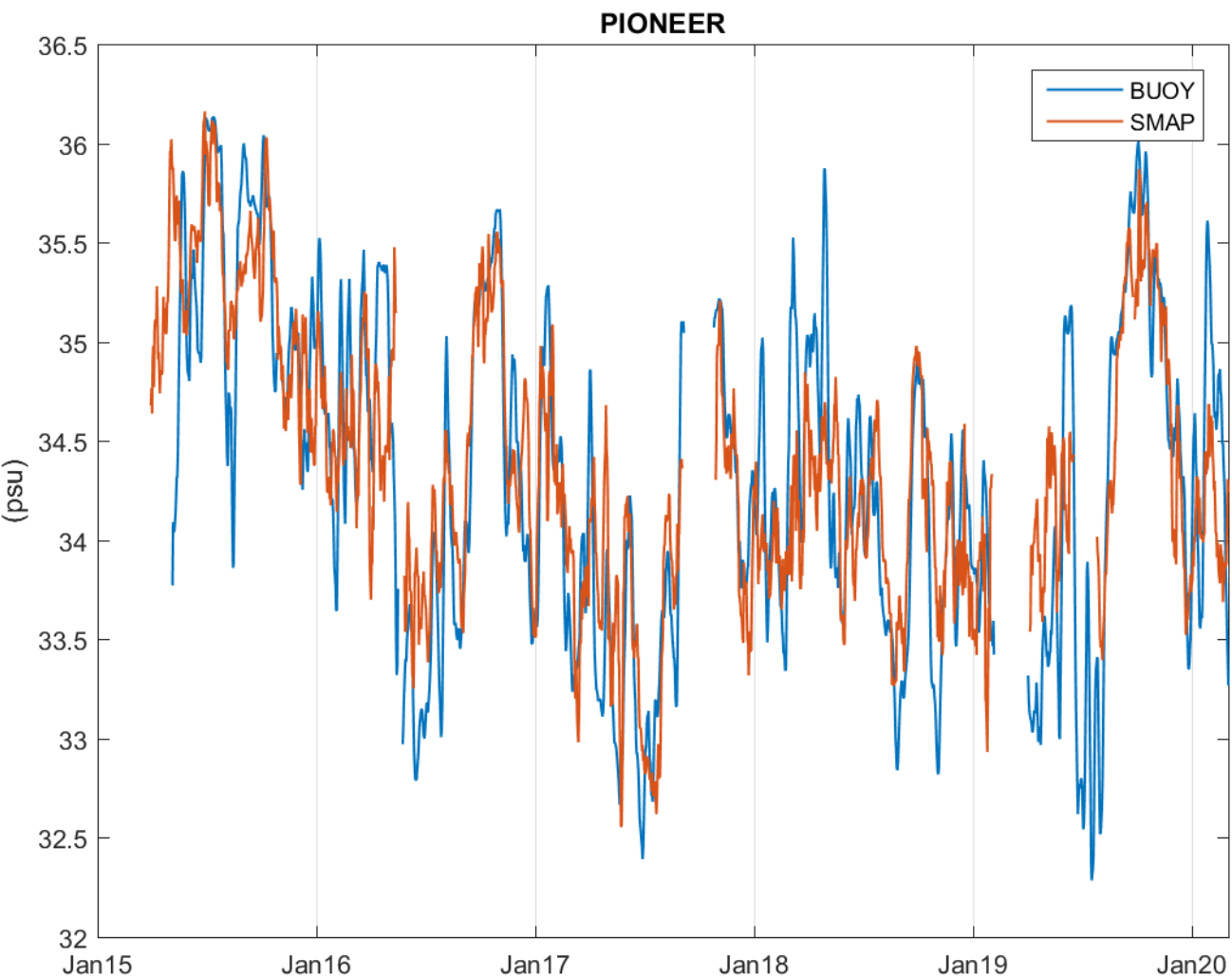


SSS error histograms for 8-day and monthly SMAP data

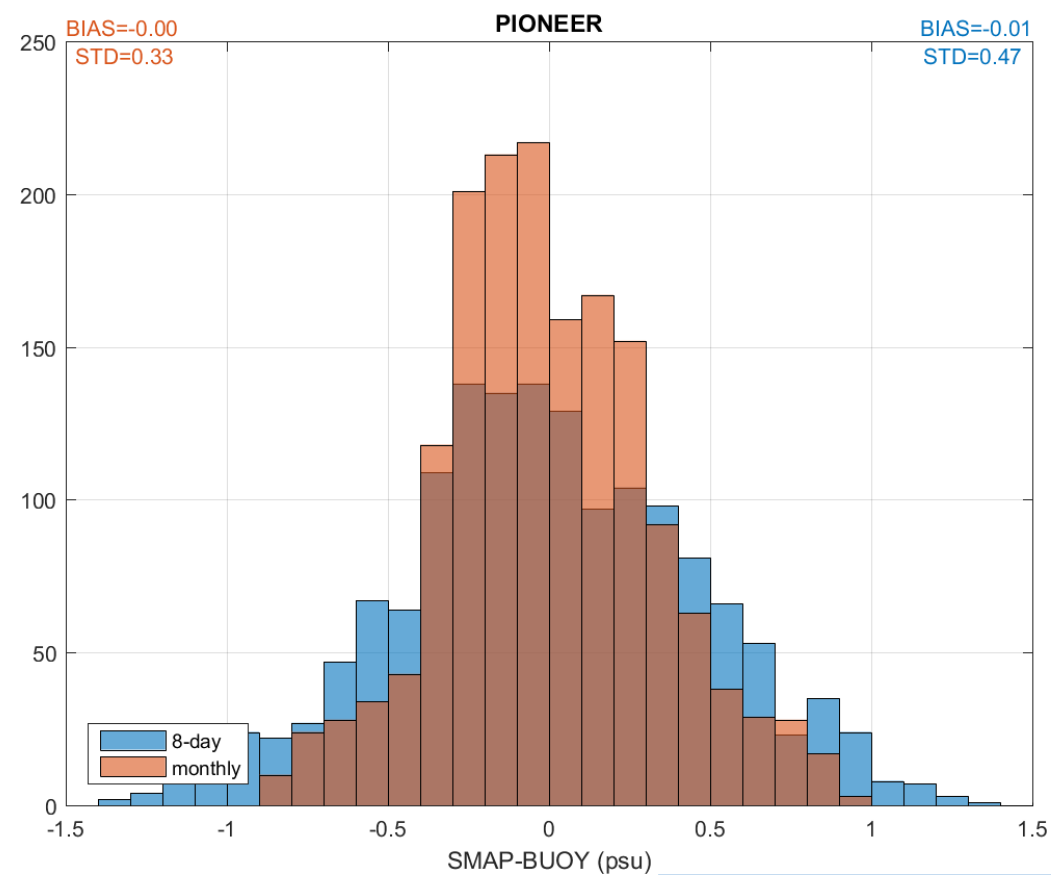


STD(buoy)=0.6 psu

Off Cape Code OOI/PIONEER daily salinity and collocated SMAP SSS

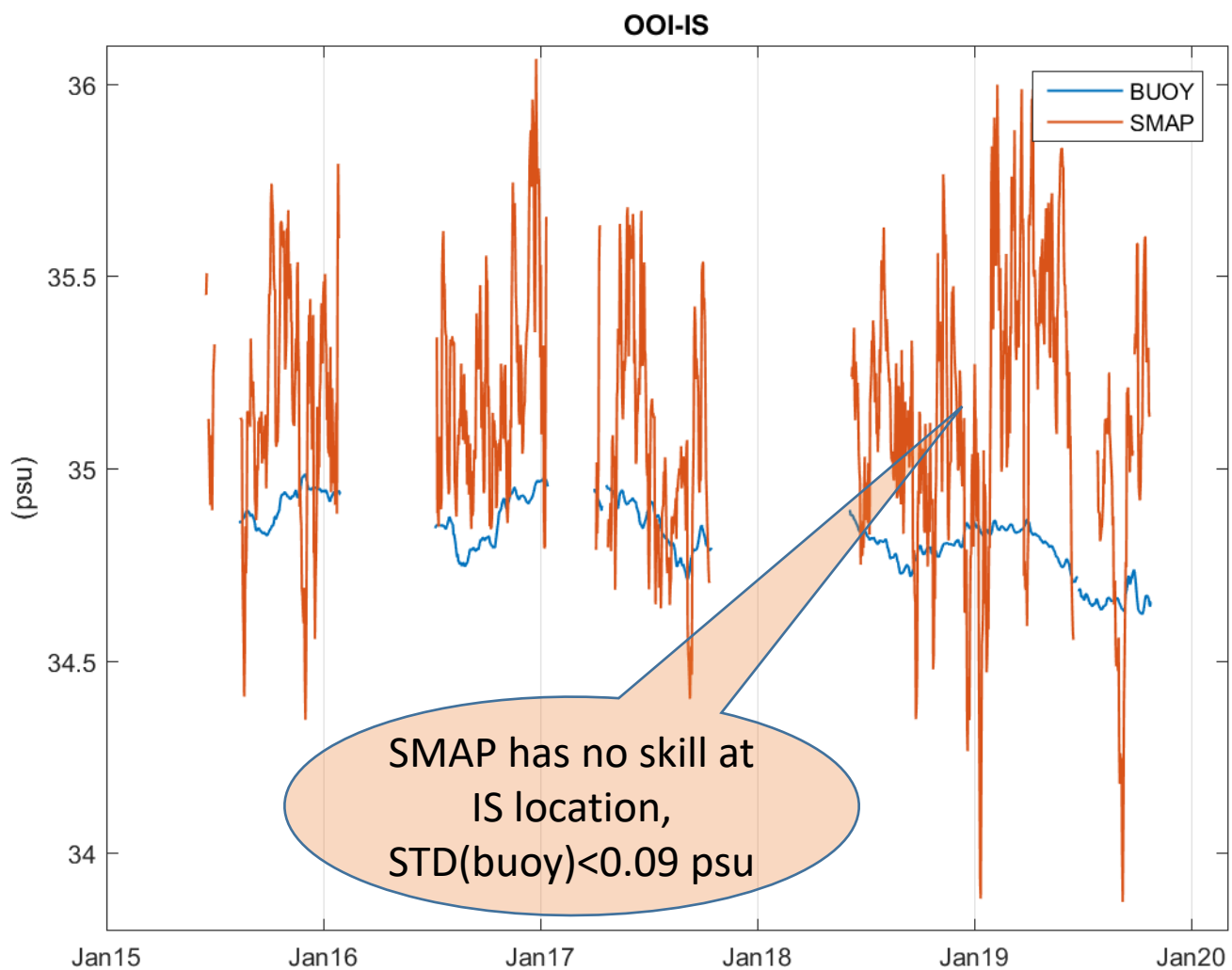


SSS error histograms for 8-day and monthly SMAP data

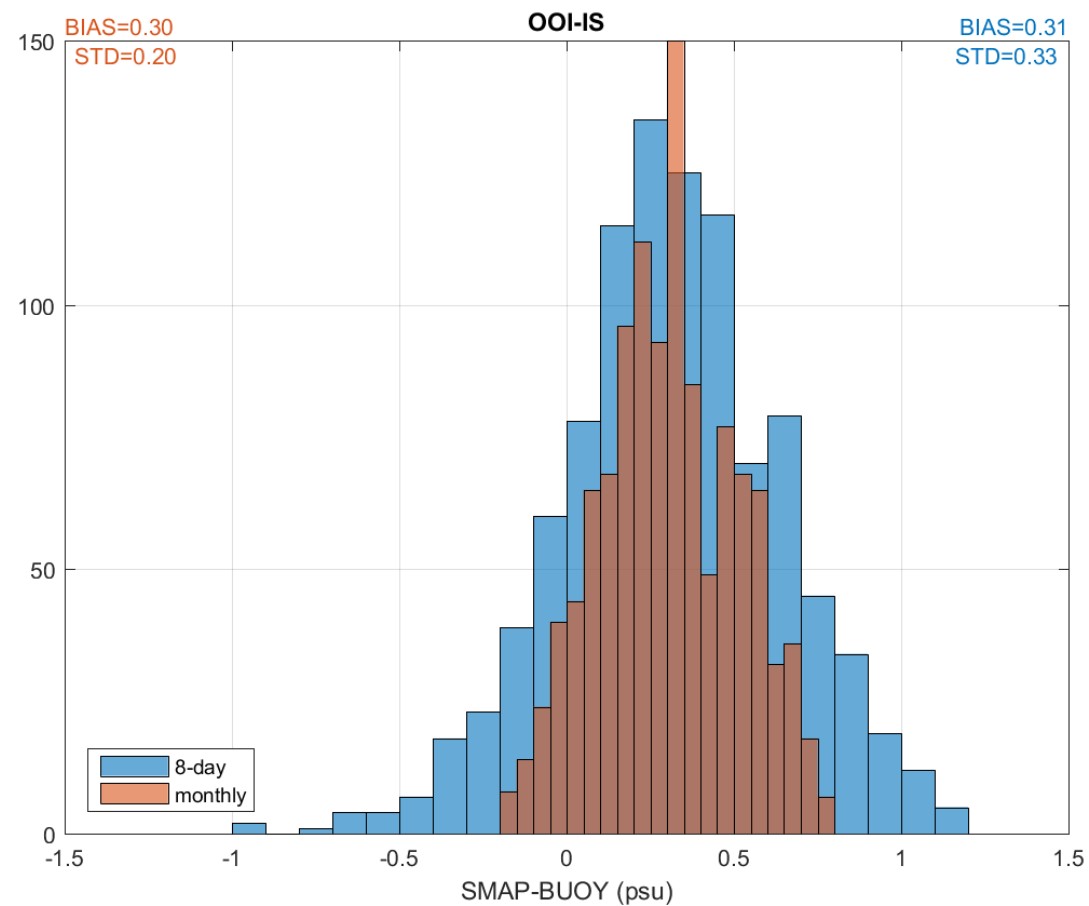


STD(buoy)=0.9 psu

Off Greenland OOI/IS daily salinity and collocated SMAP SSS

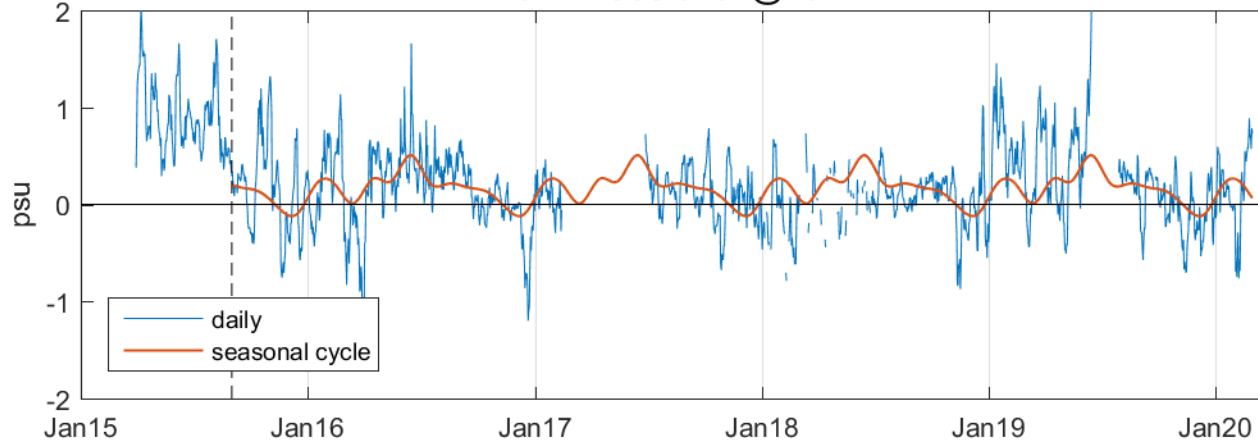


SSS error histograms for 8-day and monthly SMAP



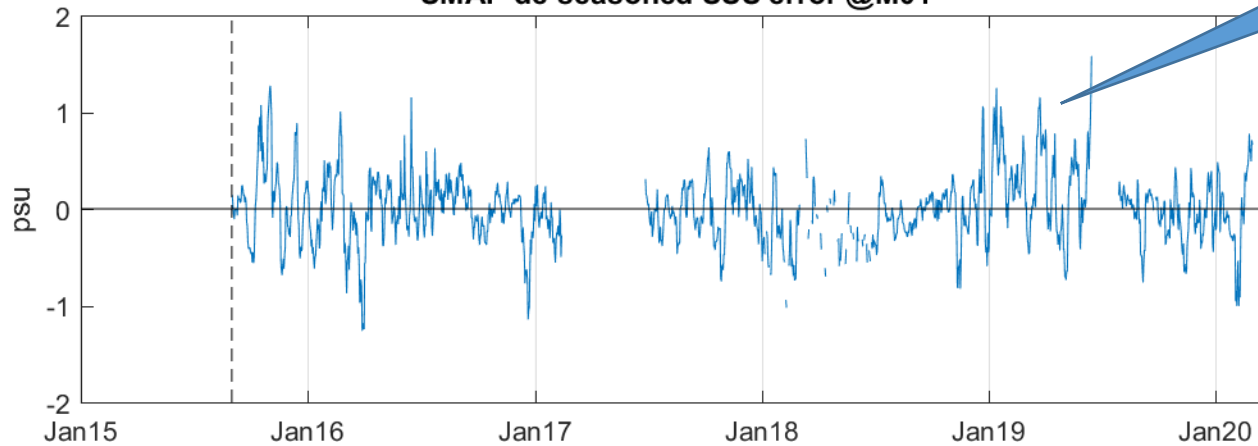
SMAP error @ M01

SMAP SSS error @M01



Long-period errors are still present after removing the seasonal error

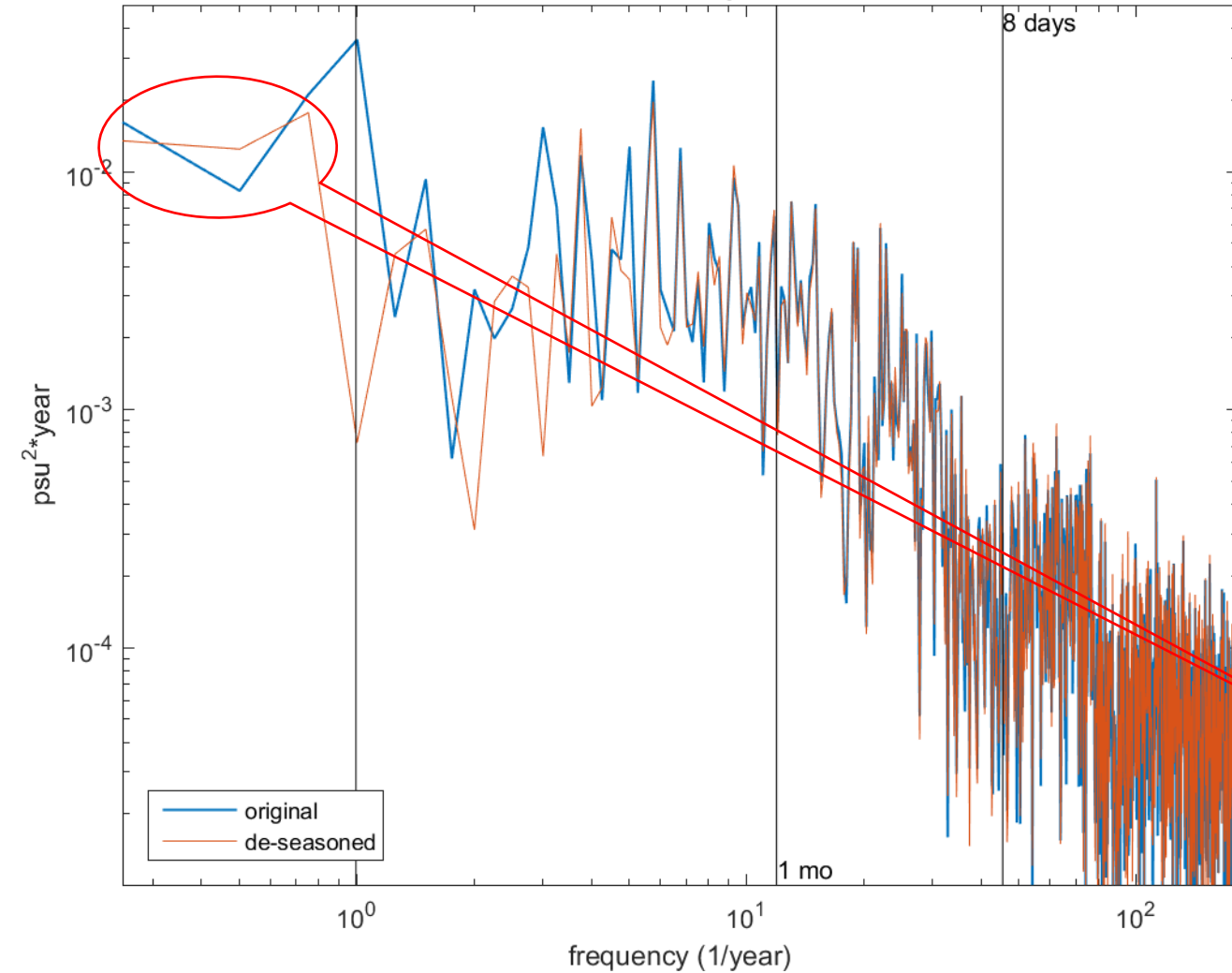
SMAP de-seasoned SSS error @M01



	Bias (psu)	STD (psu)
Daily	0.15	0.39
Seasonal	0.16	0.15
De-seasoned	~0 (by def.)	0.36

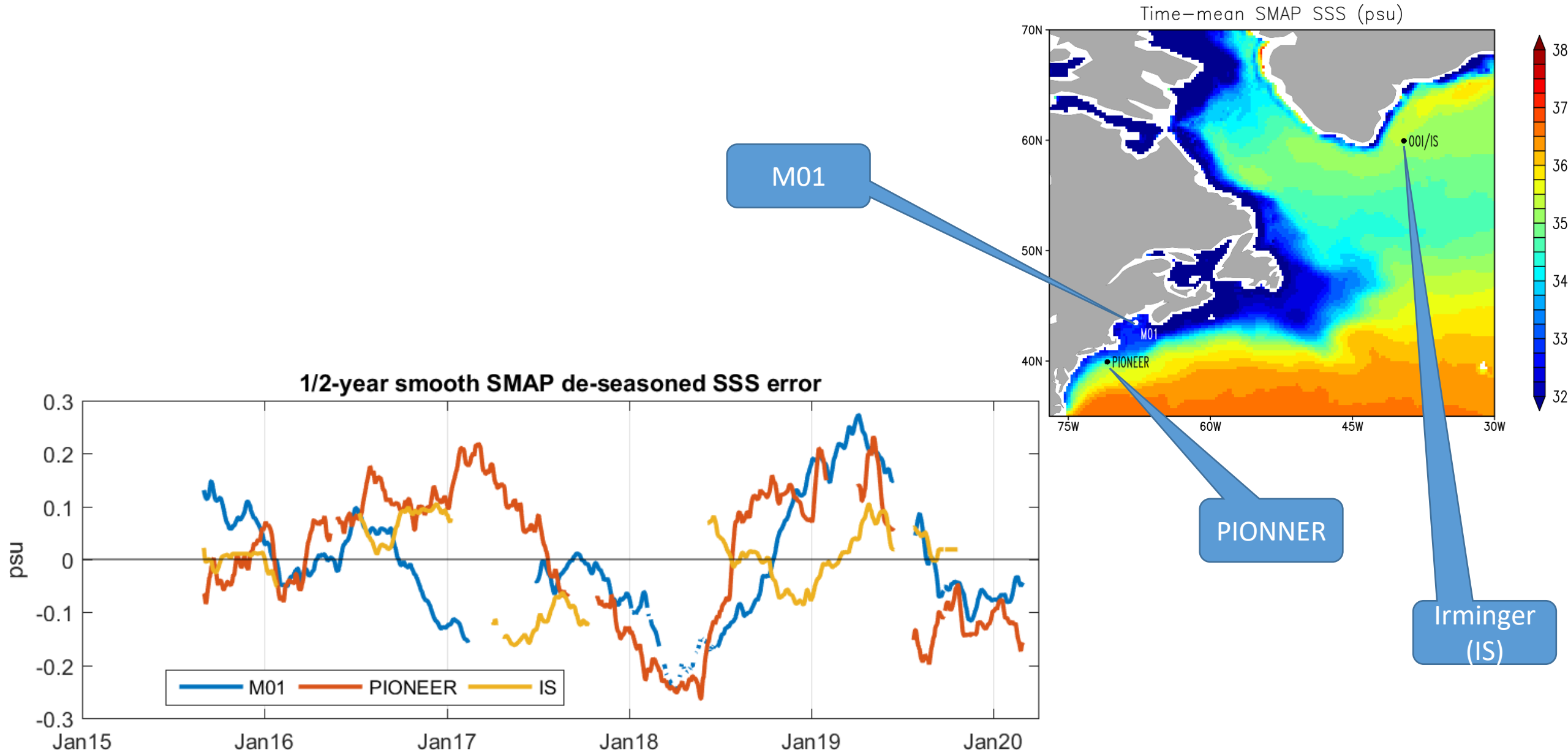
SMAP error spectrum, $S(f)$, @M01 before (blue) and after (red) removing the seasonal error component

SMAP error spectra



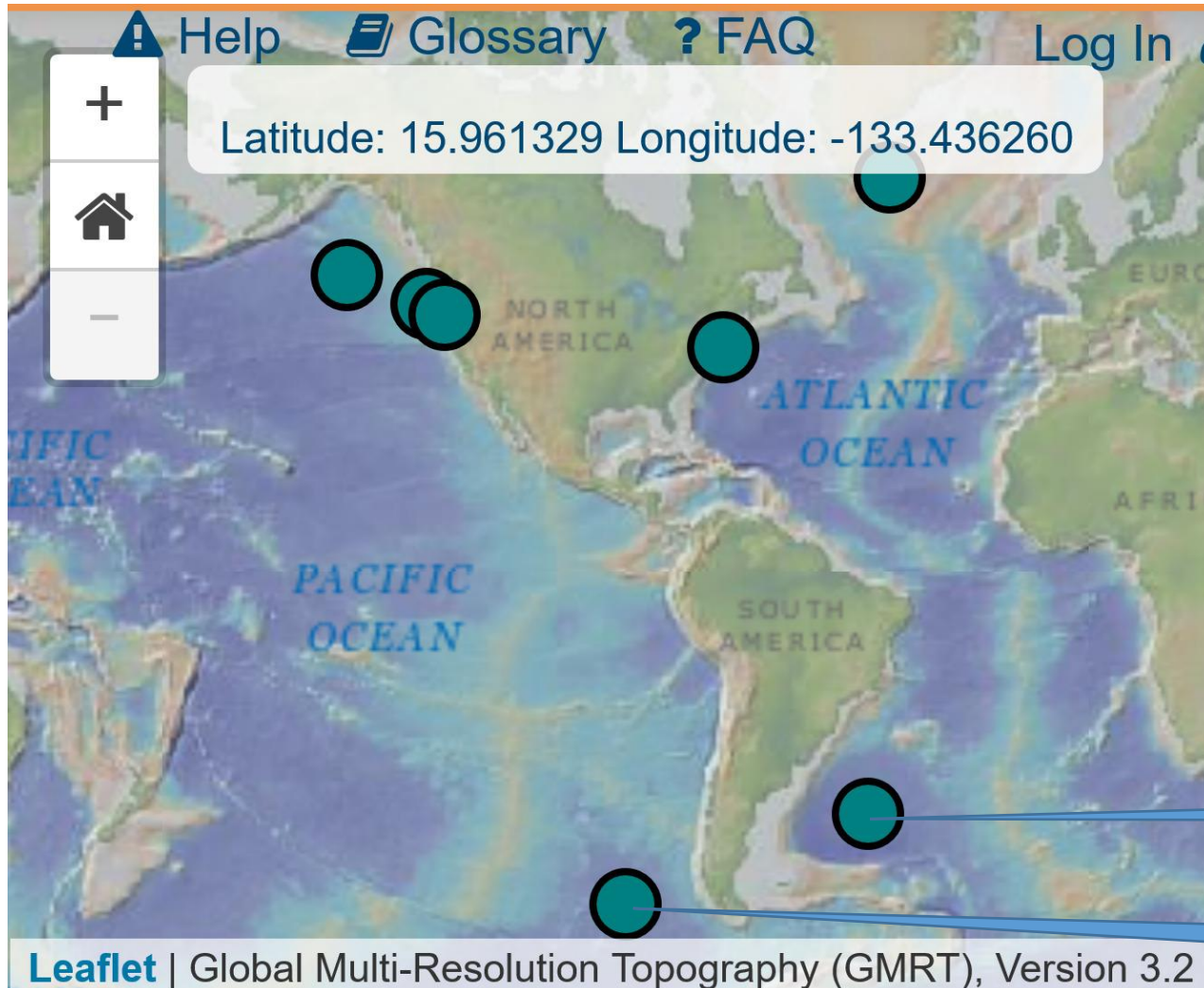
	SMAP error STD for $f < 1 \text{ month}^{-1}$ (psu)
original	0.27
de-seasoned	0.235
if $S(f \leq 1 \text{ year}^{-1}) = 0$	0.21

Long-period de-seasoned errors have similar behavior at the two NWA buoys since 2017, but are different prior to 2017. Could similar factors be involved?



If the similarity in SMAP error variation holds if other distant buoys are added?

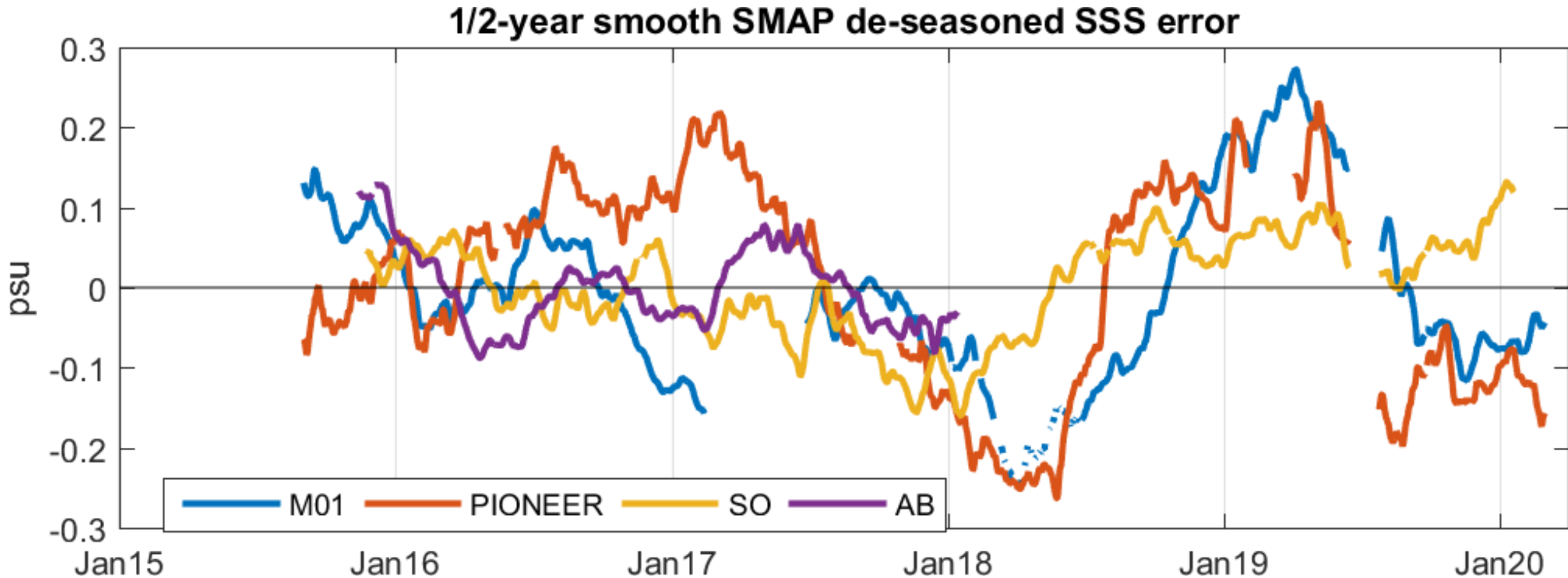
Ocean Observing Initiative (OOI) buoy locations



Argentine Basin (AB)

Southern Ocean (SO)

- The similarity in non-seasonal SMAP errors is present only at adjacent NWA locations (M01 and PIONEER). Non-seasonal errors at Southern Hemisphere buoy locations (AB and SO) are different.
- Land contamination at the latter two locations is approximately zero, and non-seasonal errors < 0.1 psu at interannual periods.



Summary:

- SMAP error spectrum peaks at the annual frequency ($f = 1 \text{ year}^{-1}$). But, the removing of seasonal error component has only weak impact on STD of the remaining (de-seasoned) error due to strong high frequency noise of SMAP SSS.
- Long-period non-seasonal SMAP error is about 0.2 psu on NW Atlantic shelf. Removing it will allow extending the possibility of detection of regional interannual signals into 0.1 - 0.2 psu amplitude range.
- A part of non-seasonal error variability shows similar temporal behavior at different, but adjacent (M01 and Pioneer) NW Atlantic shelf locations, in turn suggesting the presence of similar causes of such variability (time varying RFI?).
- The magnitude of non-seasonal SMAP error at inner ocean locations (SO and AB) is <0.1 psu on interannual periods.