

Analysis of the variability of sea surface salinity and temperature extremes in the North Atlantic ocean

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Triggering question:

How does sea surface salinity vary before, during and after extreme sea surface temperature?

SST dataset: ESA CCI SST

SSS datasets:

- **in situ-based:**

ESA CCI SSS (2010 - 2023)

SMOS/SMAP L4 OI

Multi Observation Global Ocean SSS

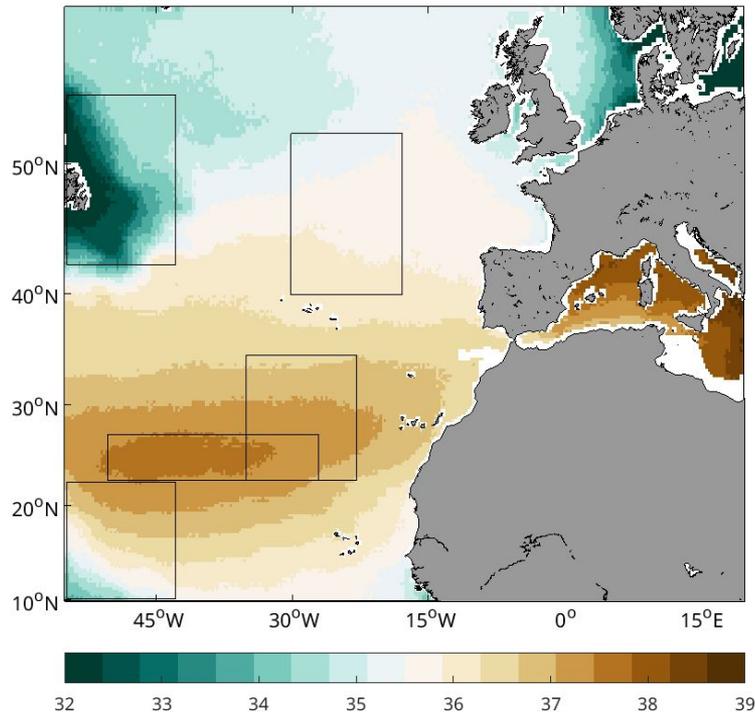
- **Reanalyses:**

GLORYS2V4 from Mercator Ocean

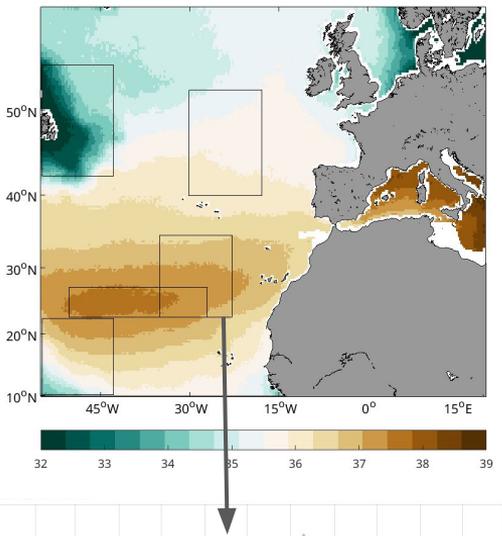
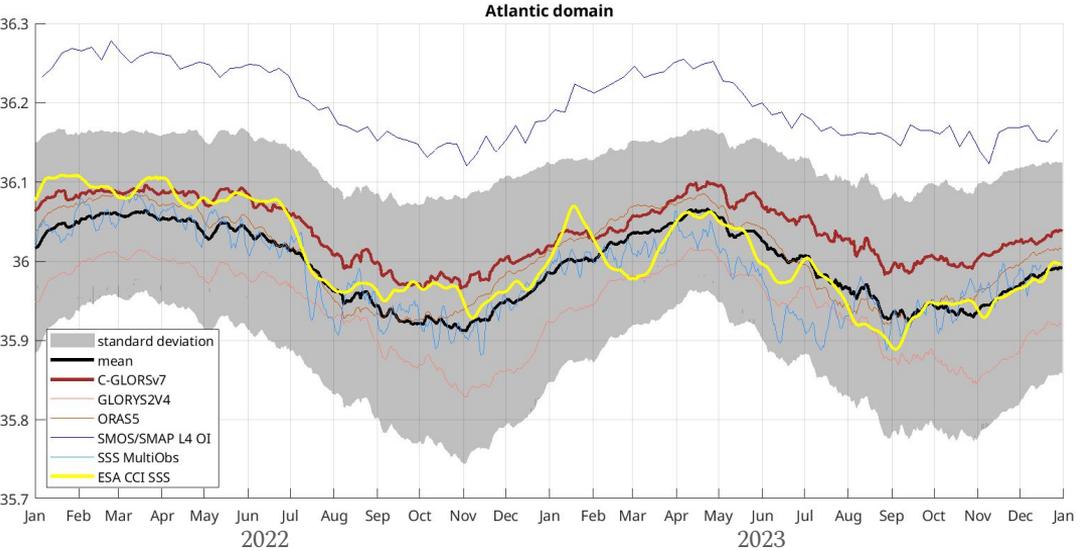
ORAS5 from ECMWF

C-GLORSv7 from CMCC

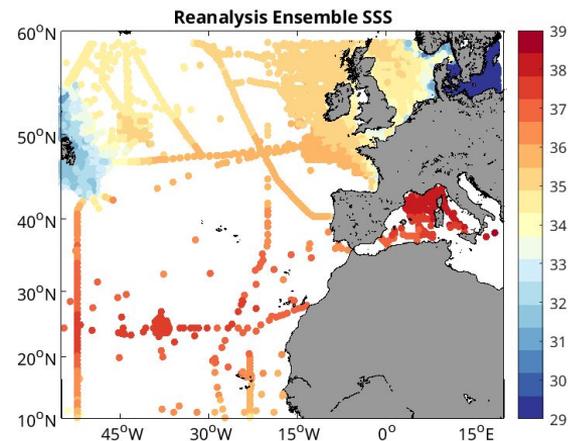
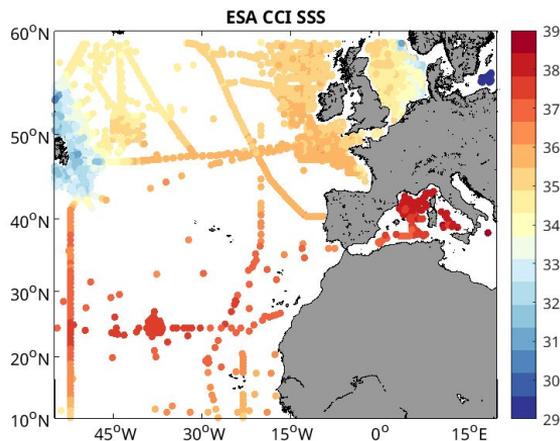
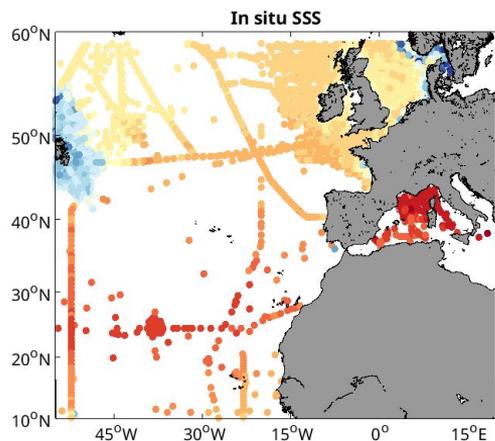
Ensemble mean



A high degree of variability among SSS products

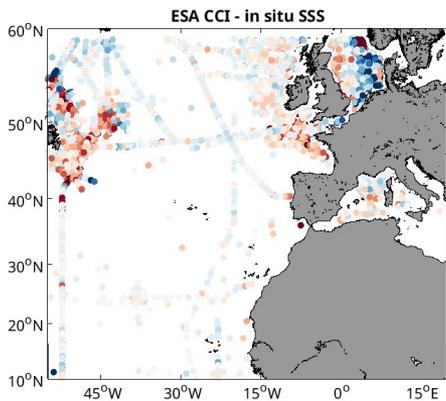


In situ data (2010-2023) from World Ocean Database

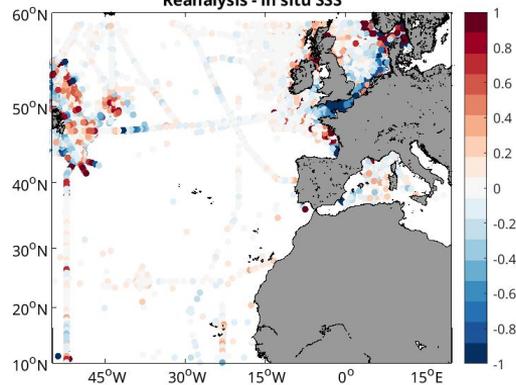


ESA CCI SSS

RMS	0.5
Bias	0.06
Correlation	0.95



Reanalysis - in situ SSS

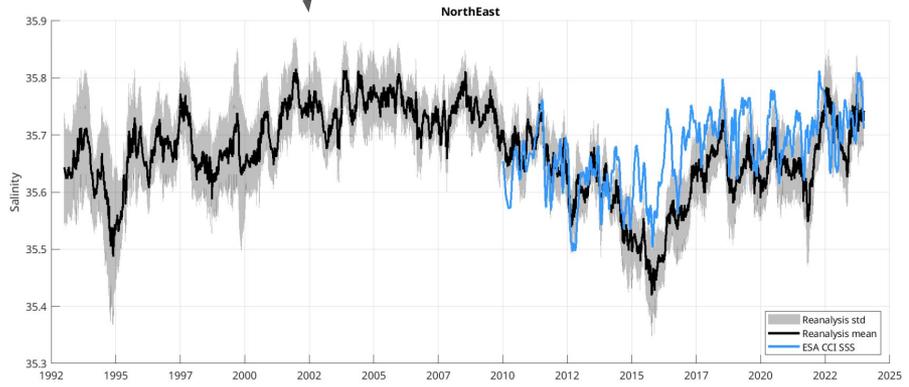
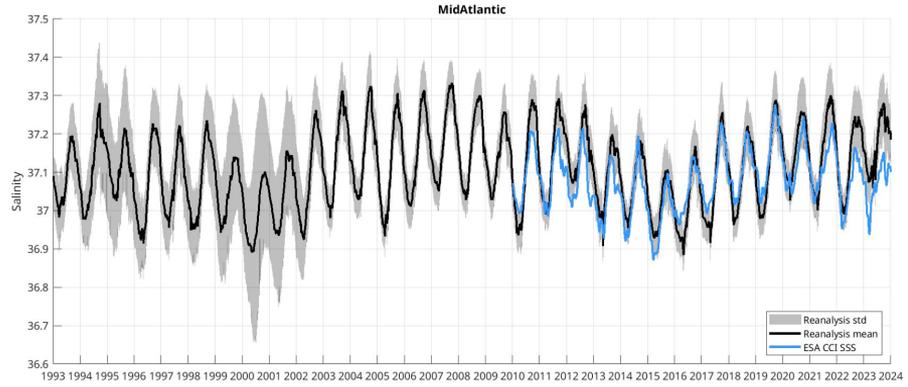
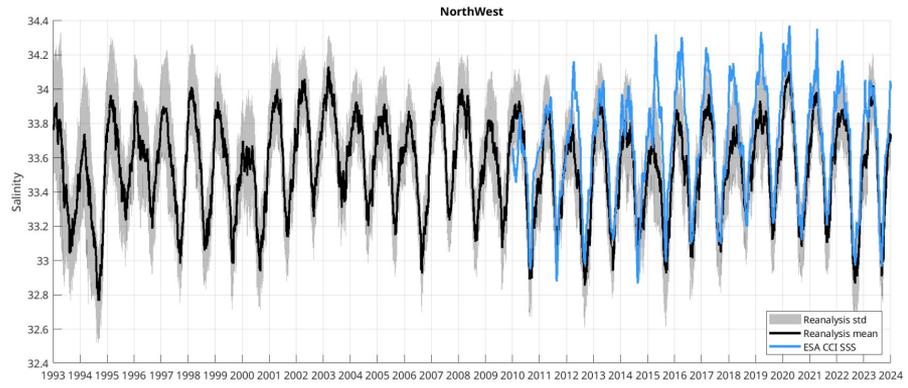
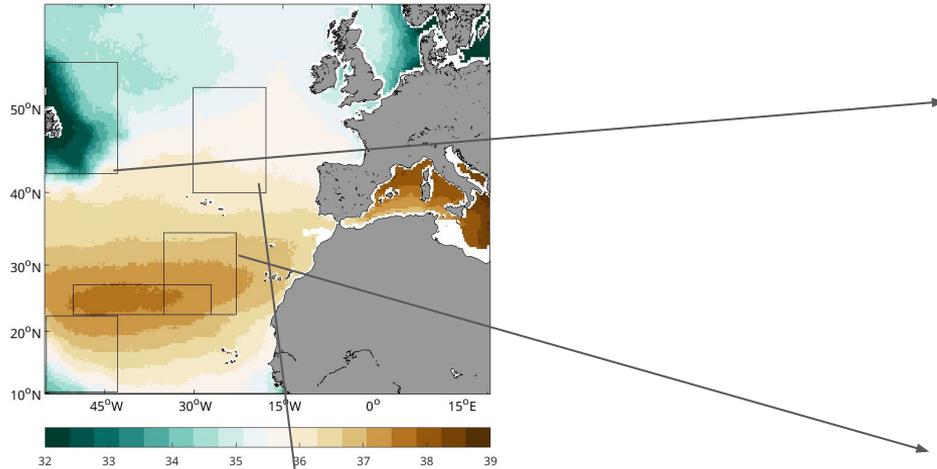


Reanalysis

RMS	0.67
Bias	0.04
Correlation	0.92

are these data
assimilated?

SSS climatology: based on reanalysis

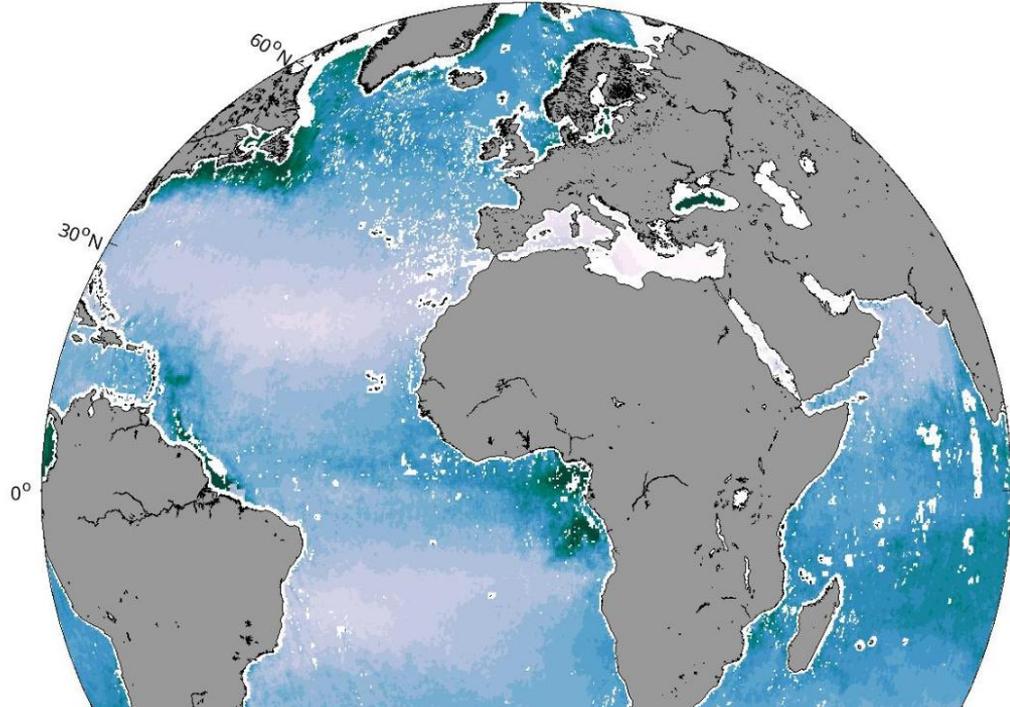


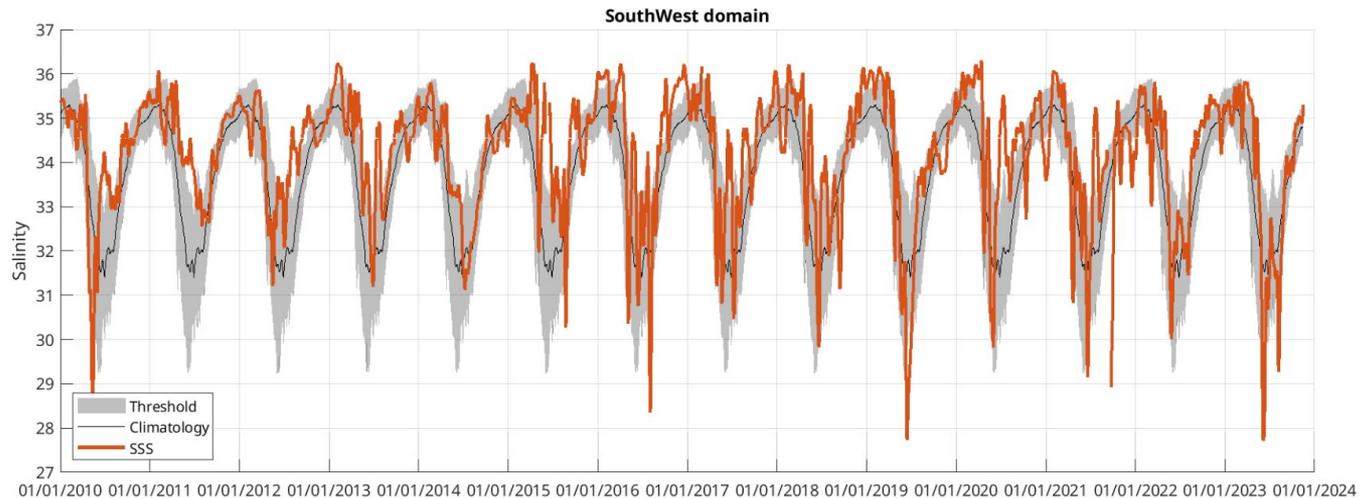
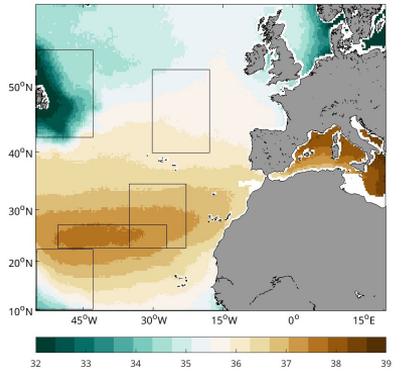
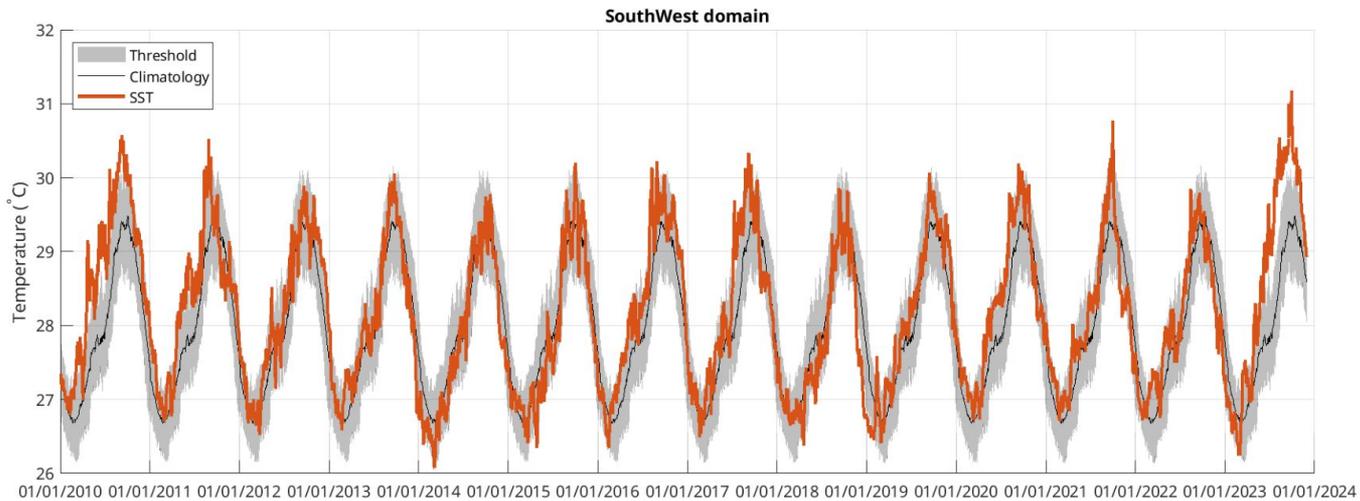
Large discrepancies
Pre-Argo higher standard deviation

SSS climatology based on reanalysis ensemble

Still needs to be improved (ensemble based on higher number of models)

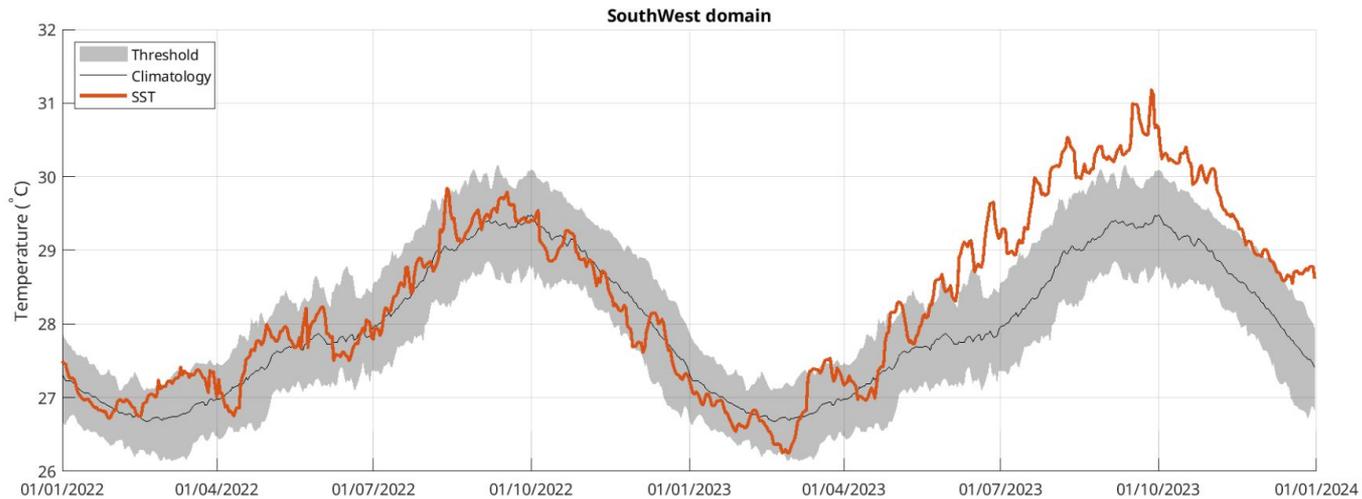
SSS accuracy in earlier record to be assessed, bias corrected?



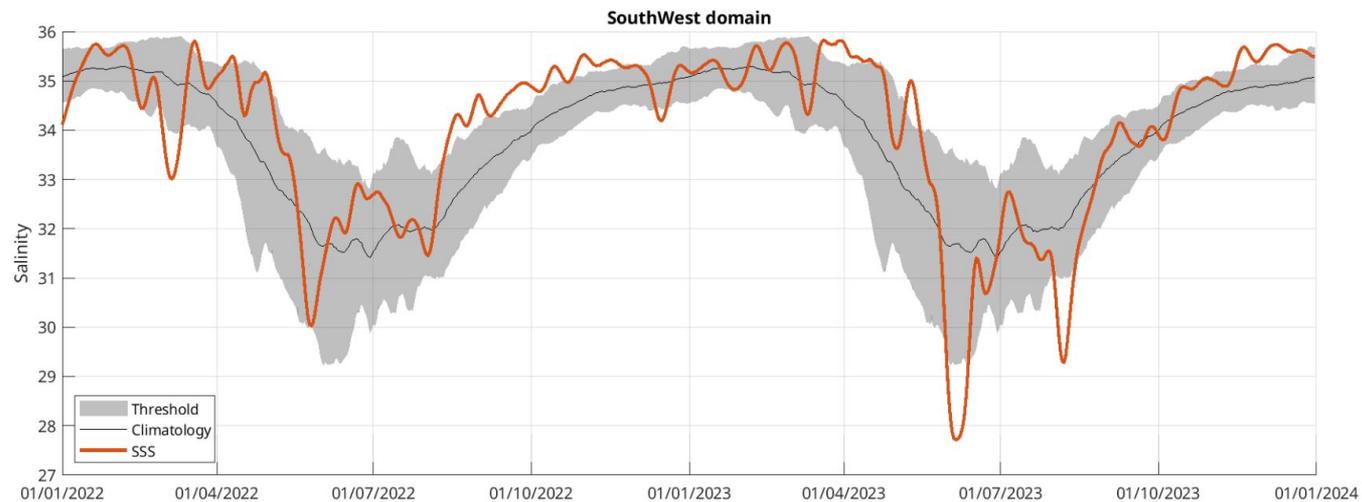


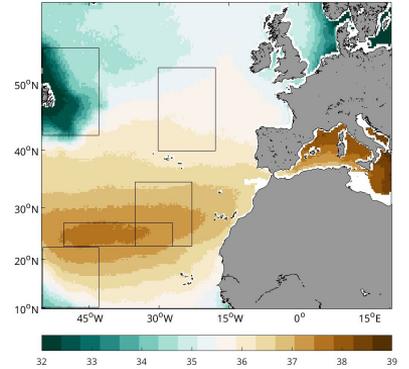
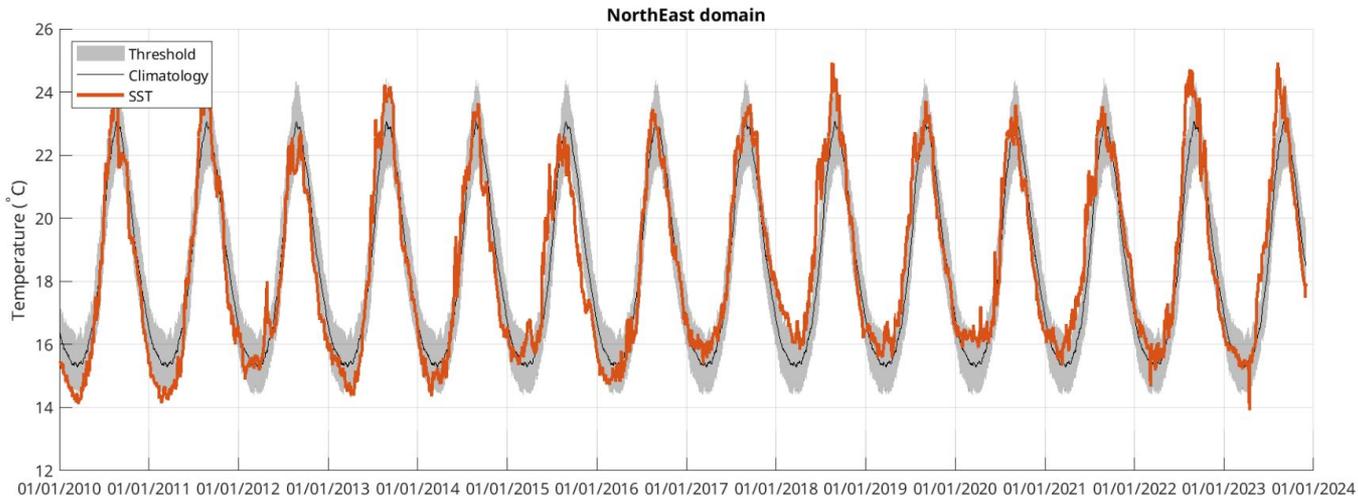
High SST linked to positive SSS anomalies in earlier record

Latest SST extremes (2023) linked to large negative SSS anomalies



SST and SSS
zoom to
2022-2023

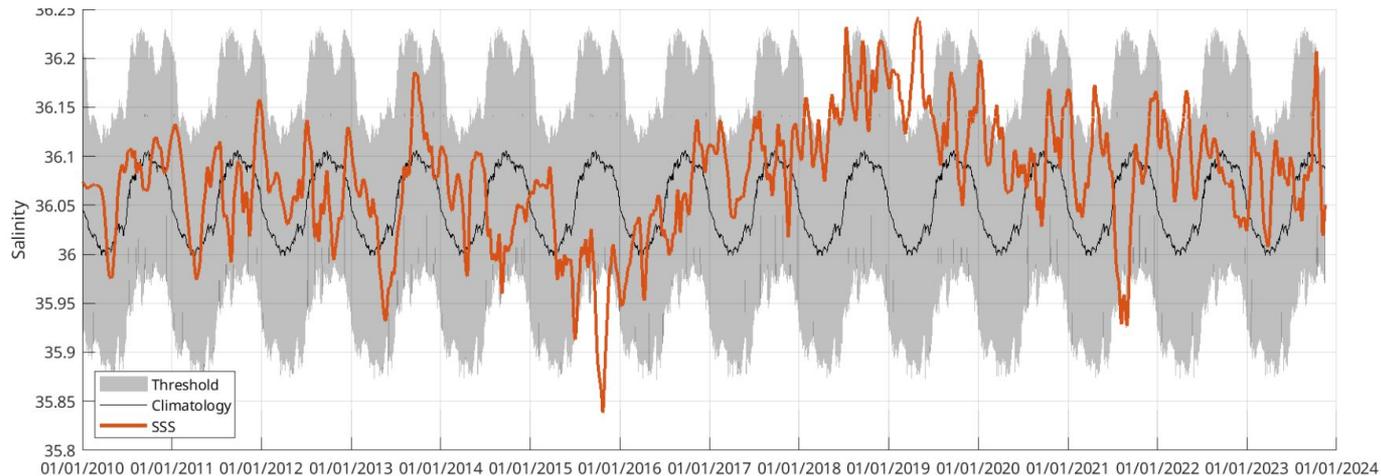


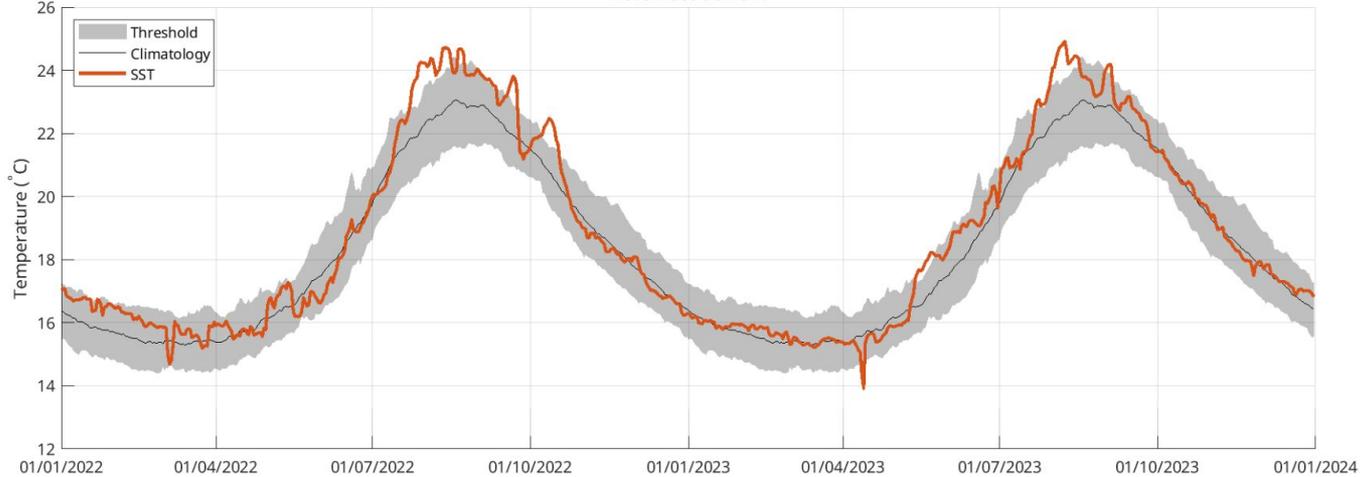


Variability too large

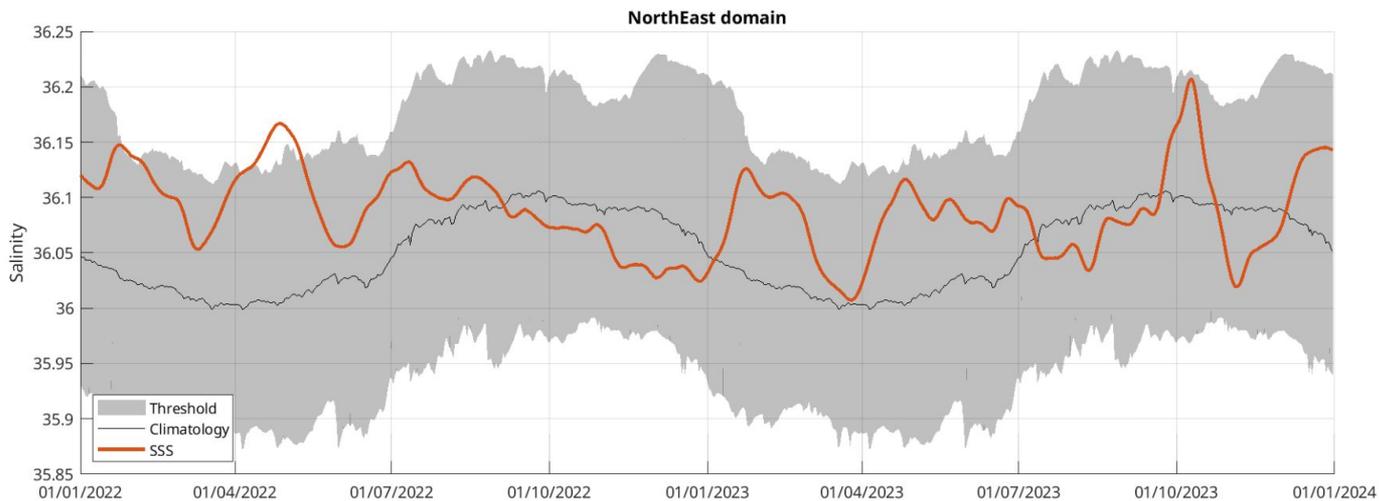
Long-term SSS change

Different SSS behaviour during 2023 extreme



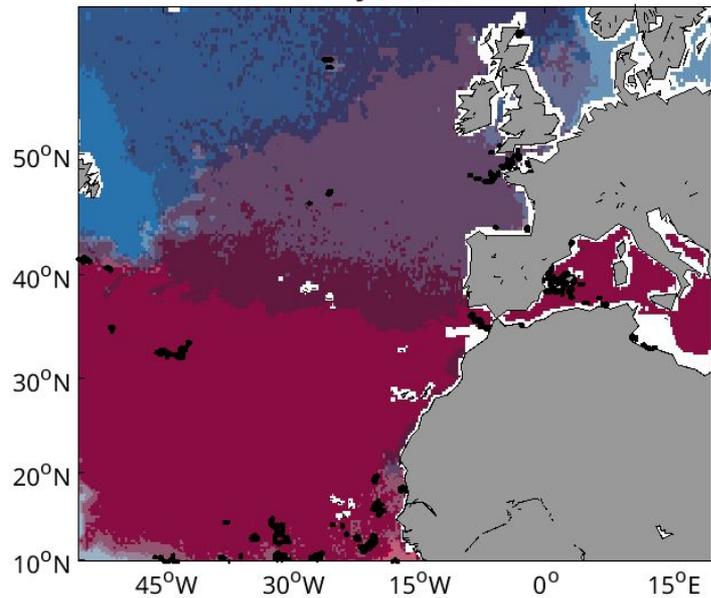


SST and SSS
zoom to
2022-2023

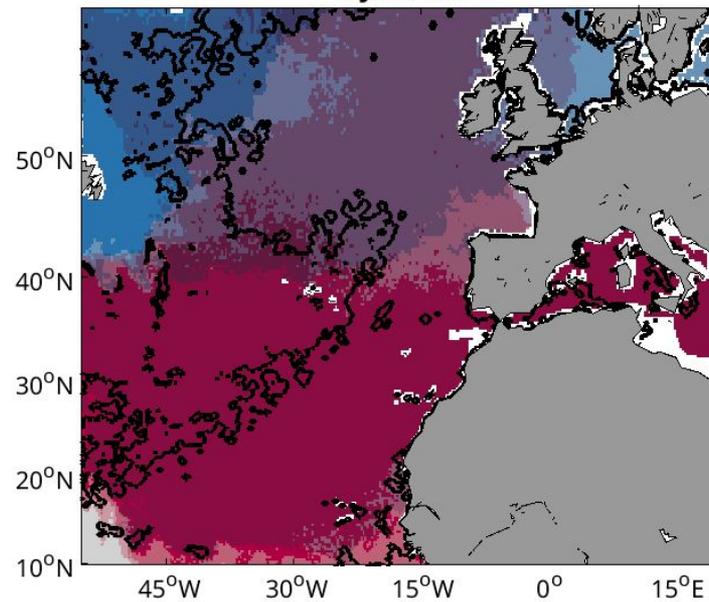


Temperature/Salinity maps

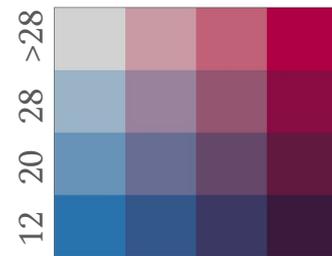
23-Jun-2022



23-Jun-2023



SST



SSS

Conclusions

Large uncertainty in SSS, discrepancies between different products

Larger ensemble, intercomparison of reanalyses

SSS presents both high and low anomalies during extreme high SST, T/S distribution changes during 2023 extremes SST values.

Want to know more about SMOS SSS?:

SMOS Sea Surface Salinity retrieval after 15 years of mission

Estrella Olmedo et al, Room 1.61/62 Wednesday 30 April 14:05–14:25

