

Surface salinity data assimilation experiments in the North-eastern Atlantic Ocean

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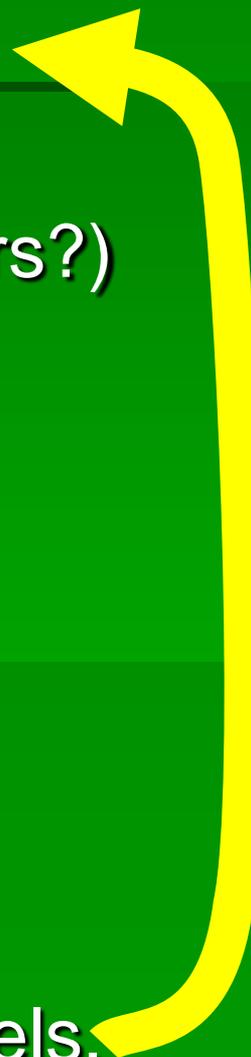
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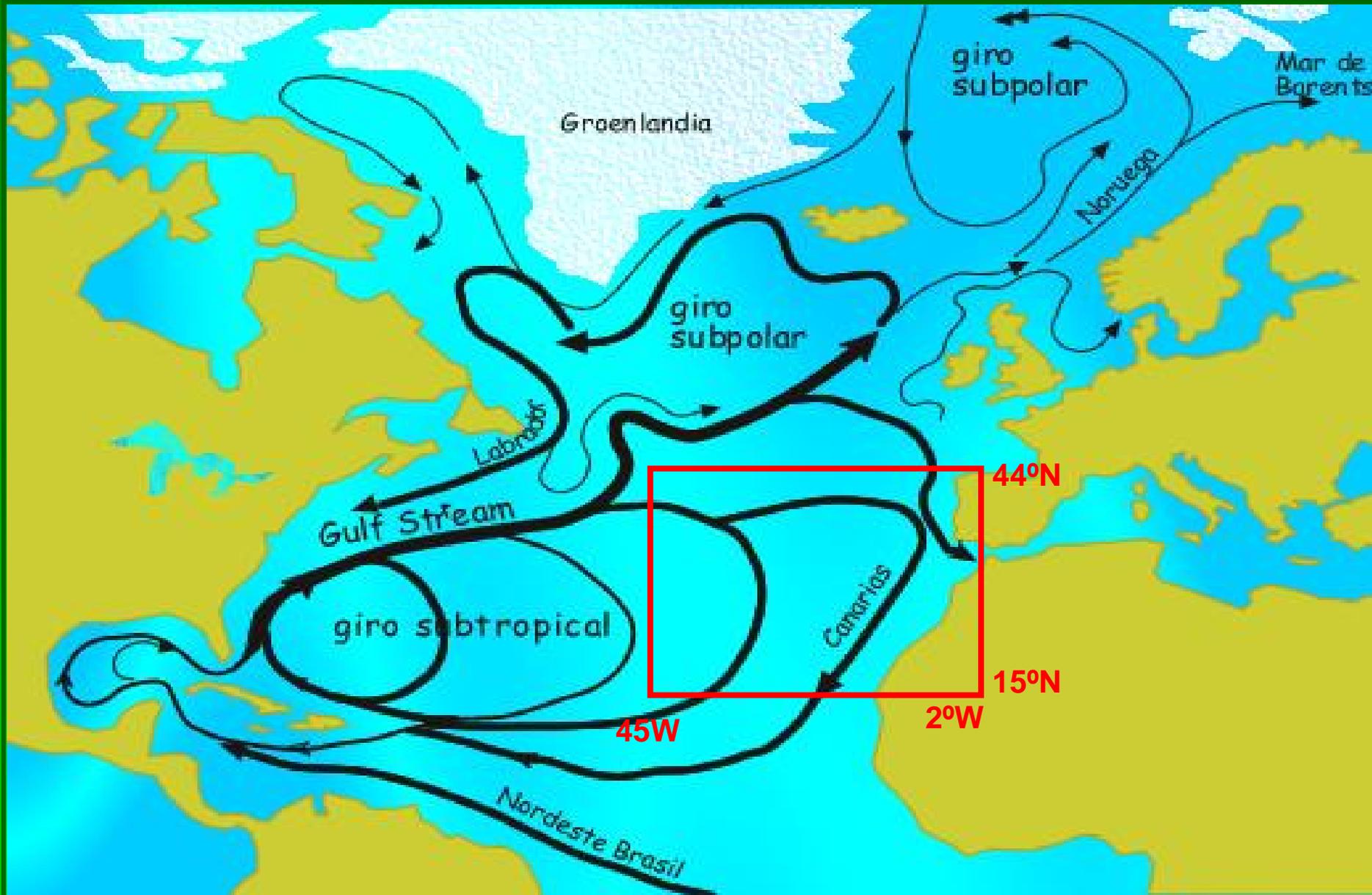
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To Assimilate or not to assimilate

- **Models** still have problems to reproduce salinity variability
 - Because historical paucity of data (what resolution?, what processes?, parameters?)
 - Thus ... relaxation term to climatology
 - **Observations** still have problems to reproduce salinity variability
 - Because Argo too sparse (space, time)
 - Because too few surface data
 - Because satellites still too noisy
 - Thus ... little information to improve models.
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To Assimilate or not to assimilate

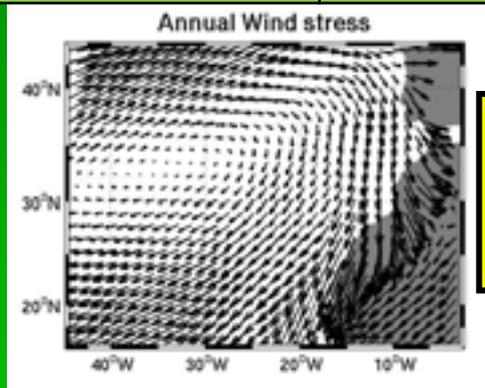
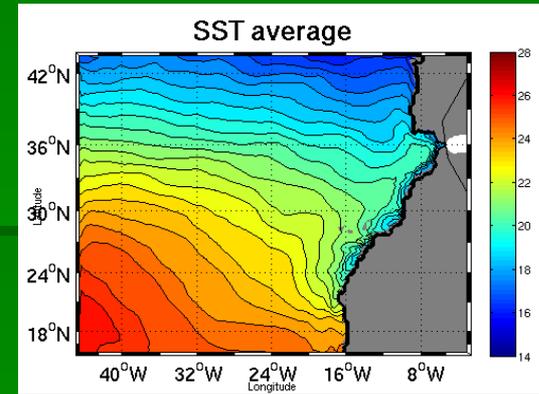
- By not assimilating ...
 - Save time, efforts, and €€€€€€
 - Avoid getting over-excited
- By assimilating ...
 - Obtain relative strength by which each data set can push the model (if everything were perfect strength would be related to observational “effective” error)
 - Where model accepts data, where rejects them
 - Current added value of each dataset



The Tarfaya Simulation (Mourre et al, 2008)

Physical domain

Boundaries	45°W-5°W, 15°N-44°N
Grid size	128 x 100 x 31
Partial step	Z-coordinates
Spatial resolution	1/3° (33 km at the equator)
Time step	1800s (48 time steps/day)



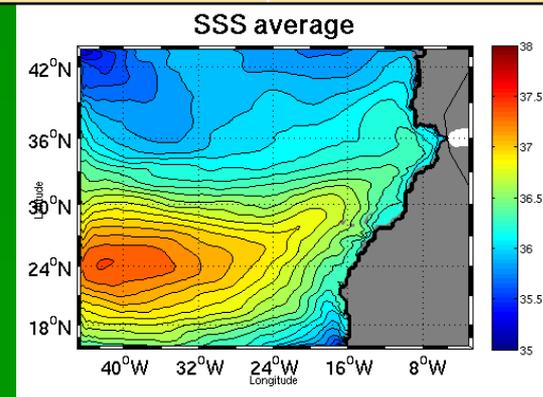
No surface relaxation term (SSS or SST)

Atmospheric Forcing (NCEP-NCAR)

Daily	Wind stress, 10m Wind speed, 2m Air temperature
Monthly	Precipitation rate, Cloud cover and Humidity
boundary conditions	
Open boundary	Seasonal data (MERCATOR)

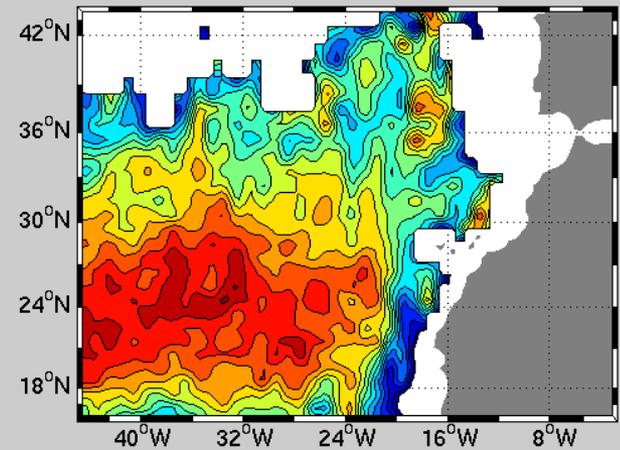
Parameterization

Horizontal turbulent diffusivity	Laplacian, $300 \text{ m}^2 \text{ s}^{-1}$
Horizontal turbulent viscosity	Bilaplacian, $-1.2 \cdot 10^{-11} \text{ m}^4 \text{ s}^{-1}$
Deep vertical diffusion	Laplacian, $1 \cdot 10^{-6} \text{ m}^2 \text{ s}^{-1}$
Surface vertical diffusion	Laplacian, $1 \cdot 10^{-4} \text{ m}^2 \text{ s}^{-1}$
Vertical turbulent mixing	TKE model

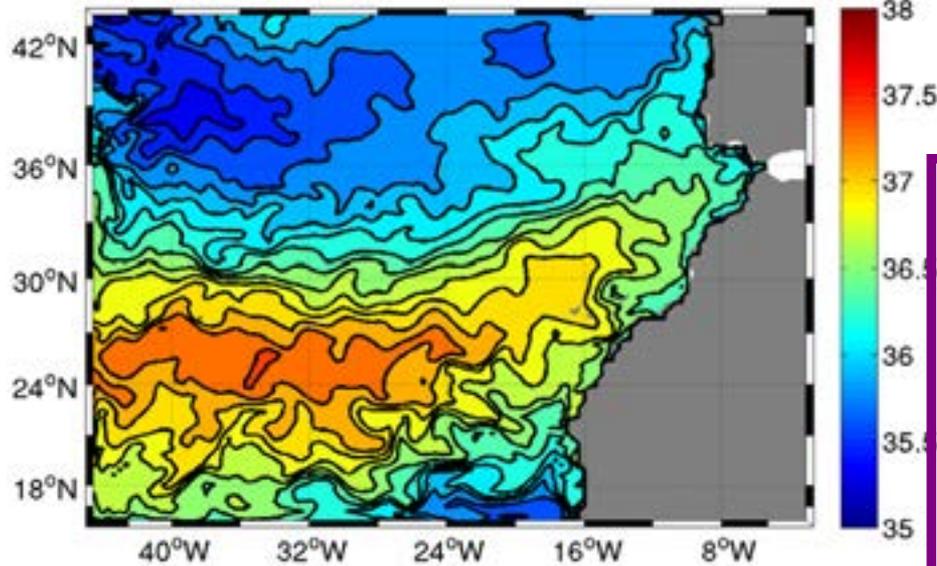


December 2011

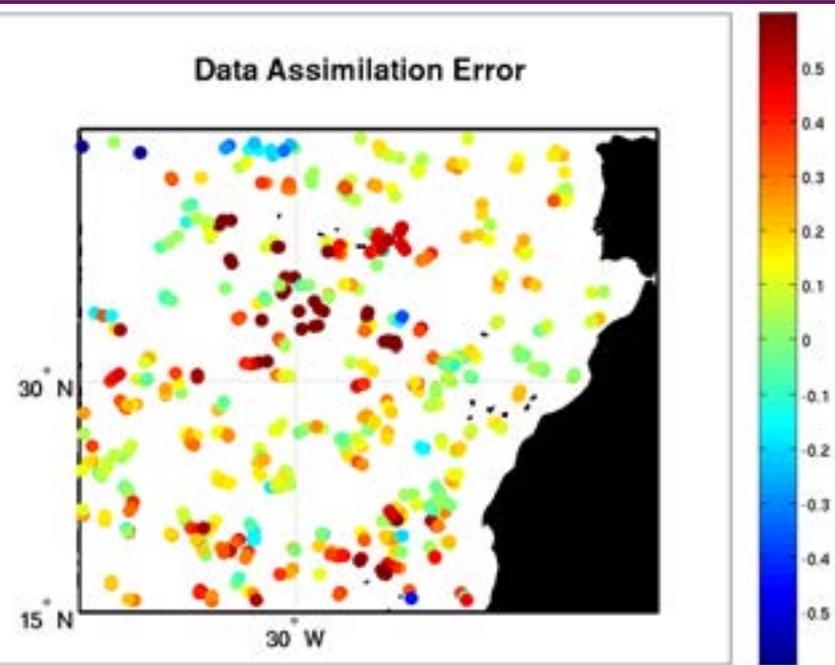
SMOS SSS



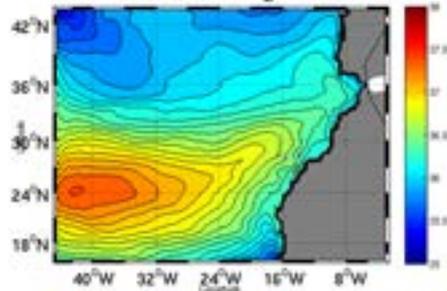
Assimilation



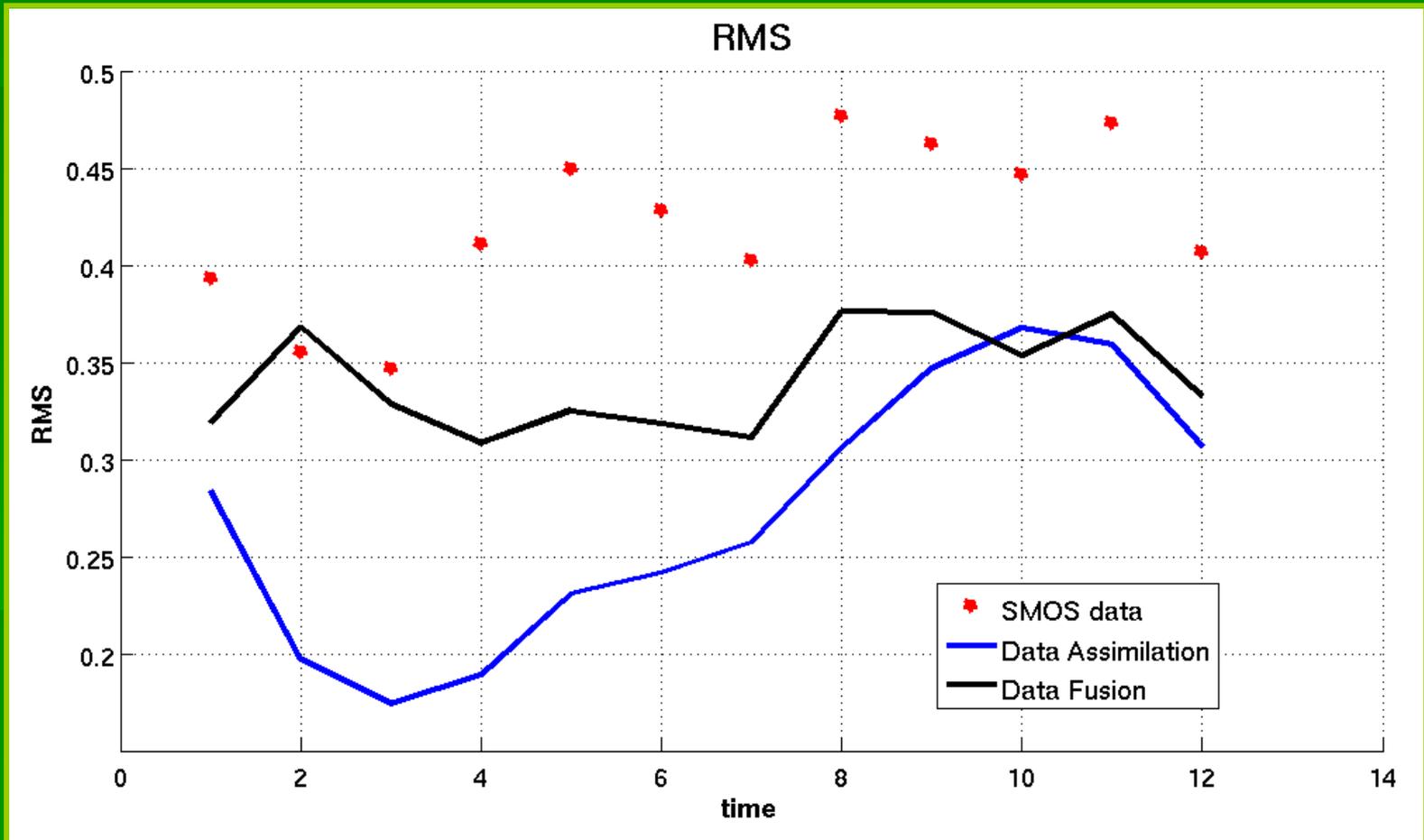
Data Assimilation Error



SSS average



RMS: *Experiments-ARGO*



Conclusion

- We have implemented two data algorithms to produce Level 4 SSS maps from SMOS.
- Improvements by assimilating SMOS data have been found in regions far from coasts or RFI sources.
- Unrealistic results are due to the lack of data, or in regions where the data was not flagged as bad, but it had to be, providing information for the lower SMOS processing levels.
- This is an ongoing work and we plan to:
 - Data Assimilation:
 - Implement the EnKF
 - Simultaneously assimilate additional data (T,S profiles, sea level, ...)
 - Data Fusion:
 - Use OSTIA SST (daily, $1/10^0$) as a SST template, which has a more realistic singularity exponent maps.

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