# Interannual mixed layer salinity in the tropical Atlantic. A sample study using 8S30W PIRATA and Argo

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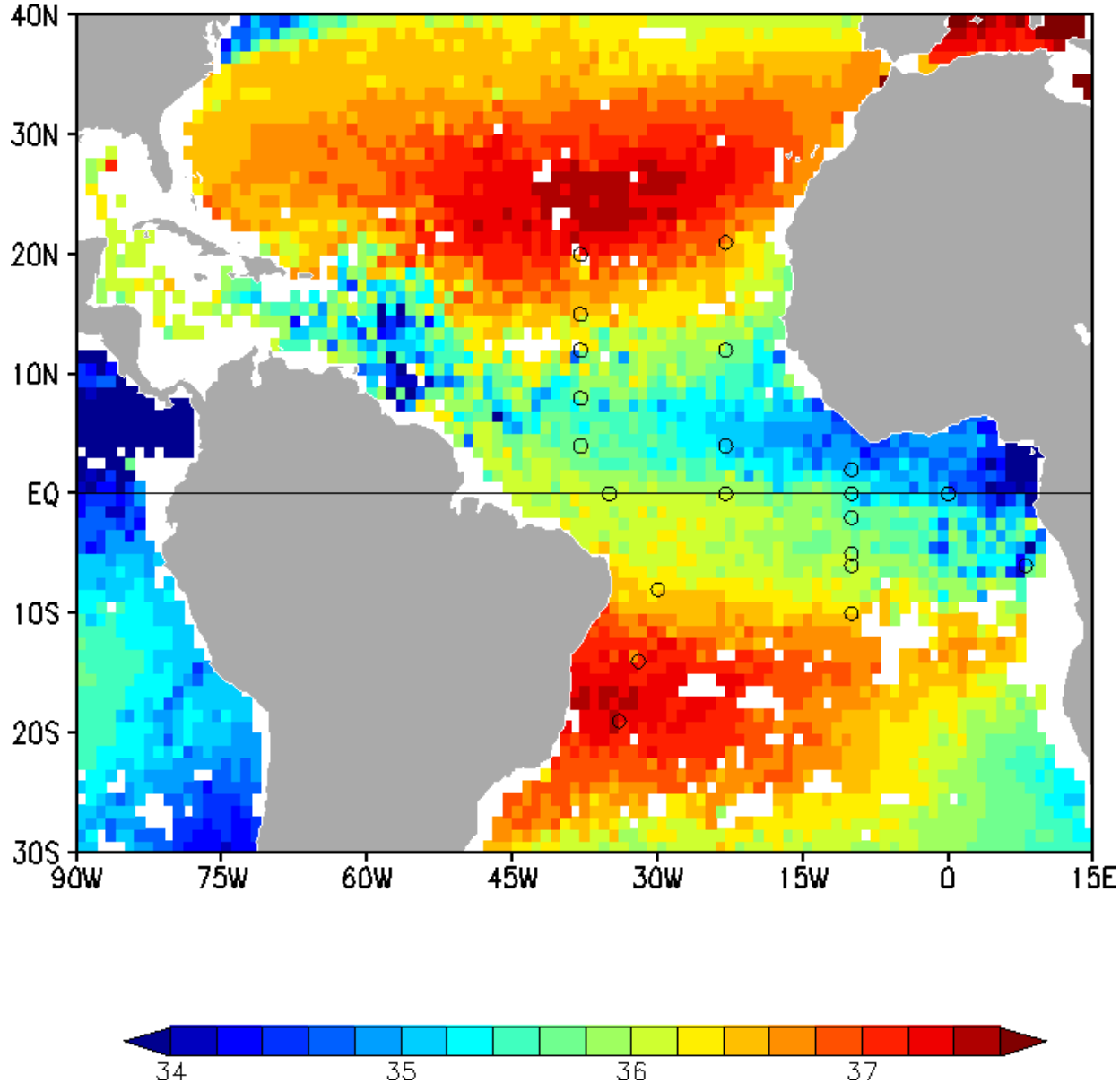
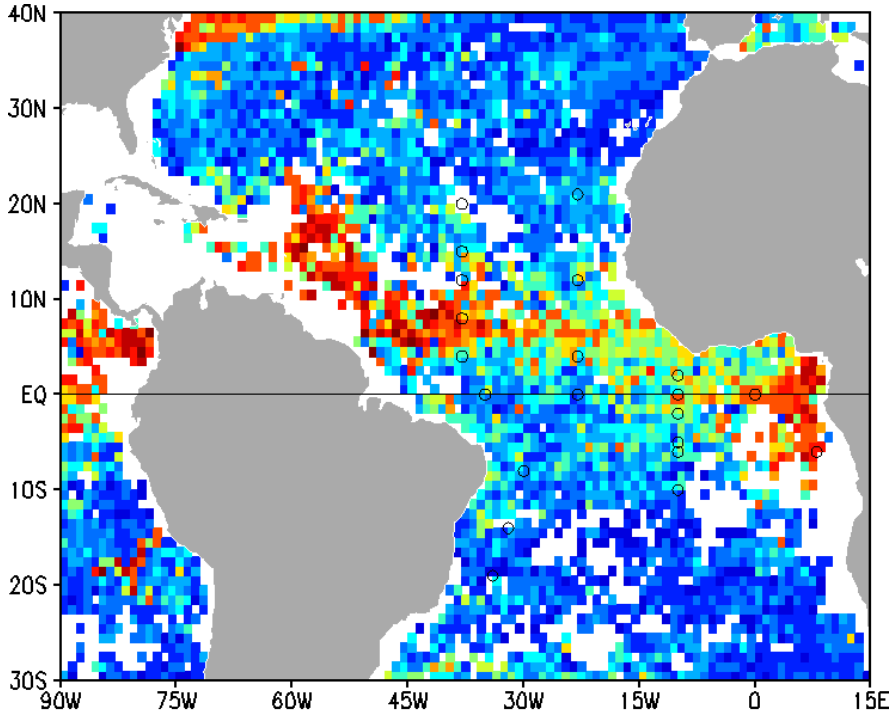
# Motivation

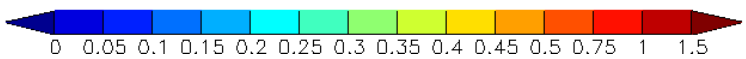
- Evaluate the magnitude of interannual variability of near-surface salinity in the tropical Atlantic.
- What variability do we expect to see in the region with the forthcoming AQUARIUS satellite mission?
- Which processes do contribute to SSS variability on interannual periods?
- **But**, present study focuses on the 8S30W PIRATA location only.

# Time-mean mixed layer salinity from Argo

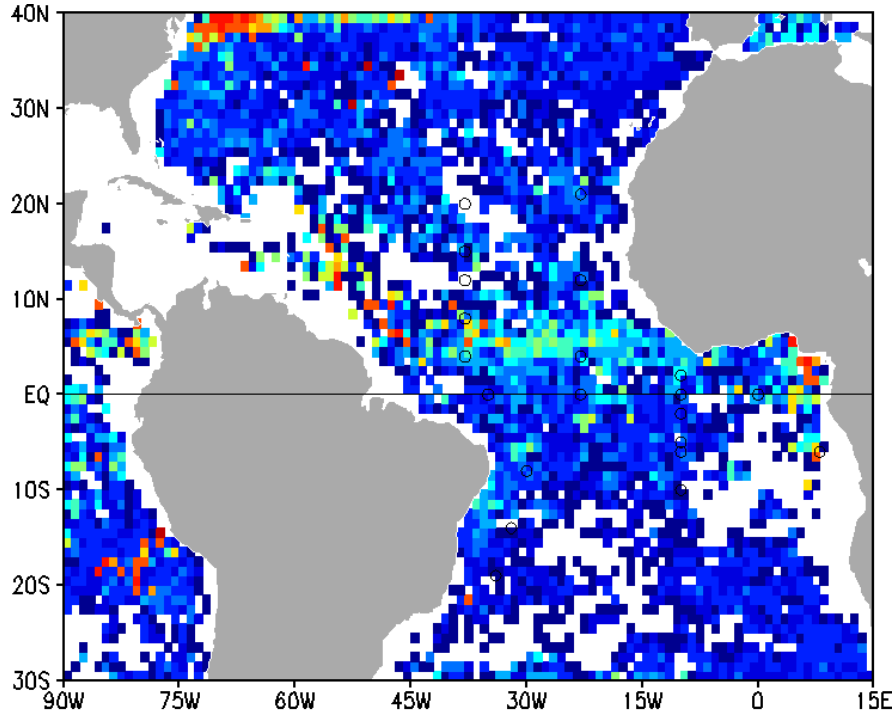


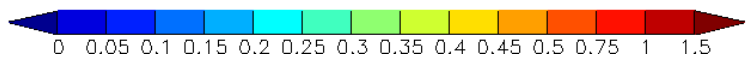
# STD of (left) seasonal cycle and (right) anomalous SSS (from Argo)



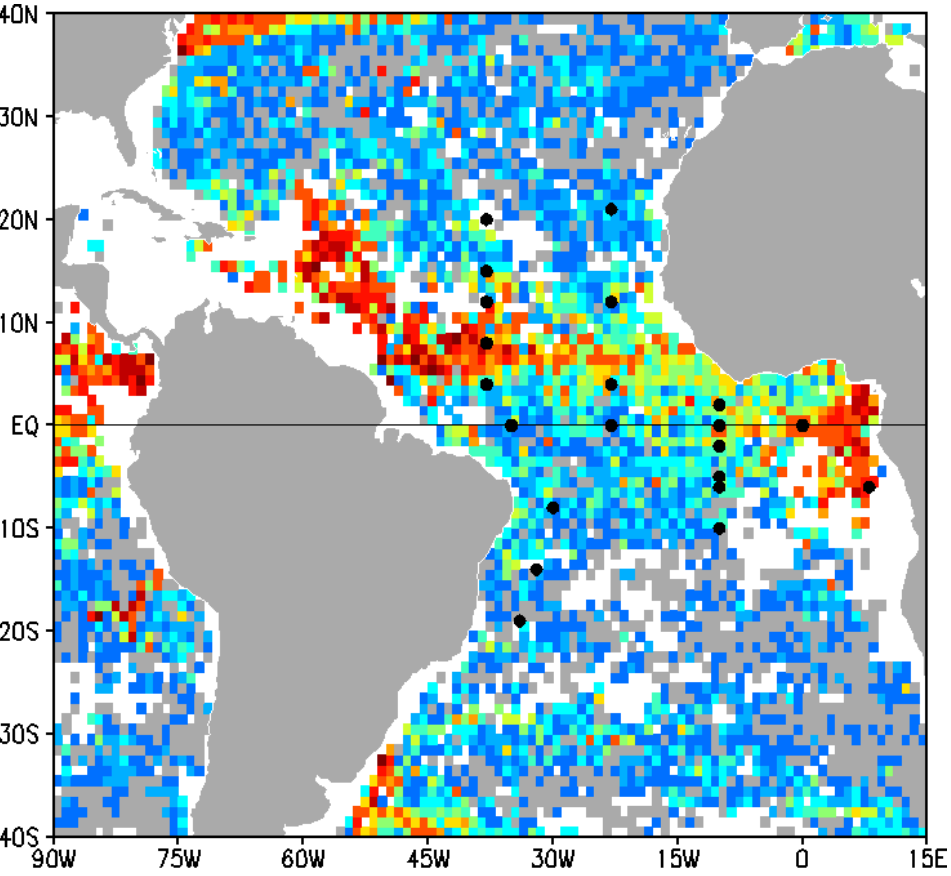

Seasonal, psu

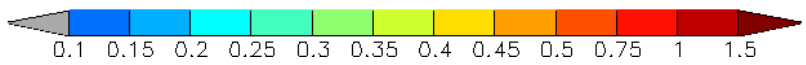


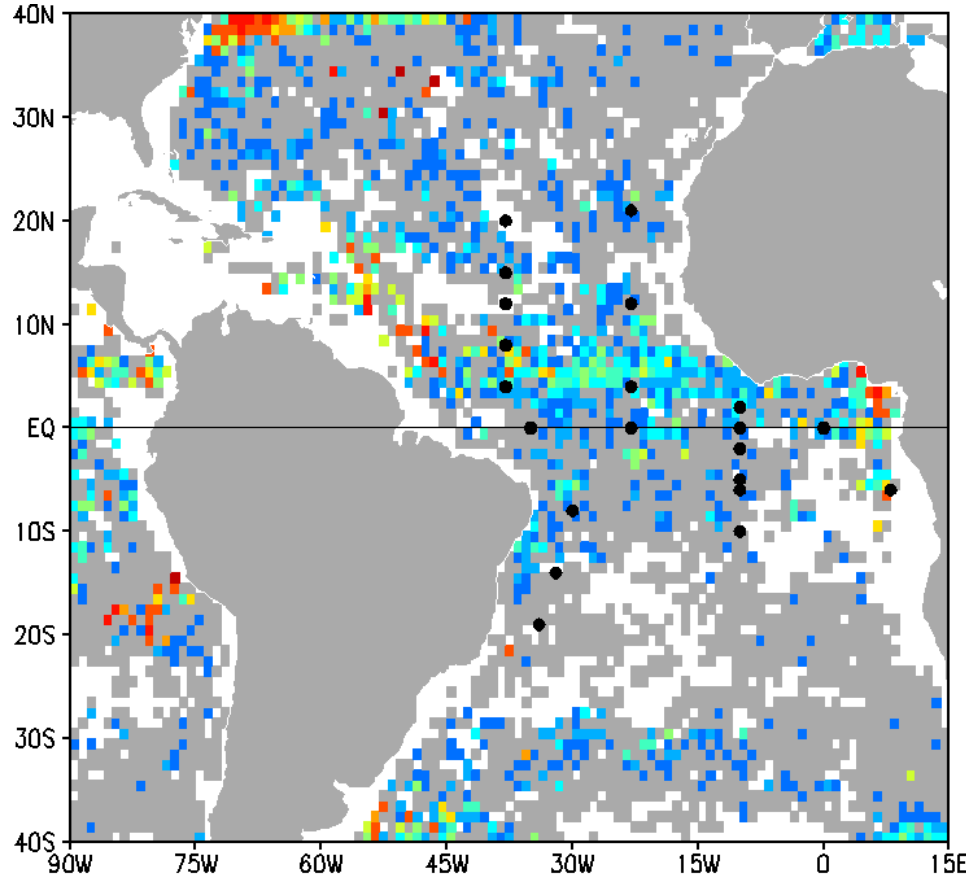

Interannual, psu

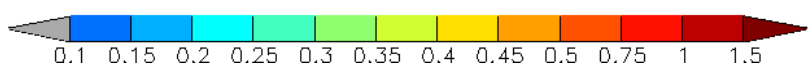
# Areas with variability less than the AQUARIUS sensitivity of 0.2 psu are shaded gray



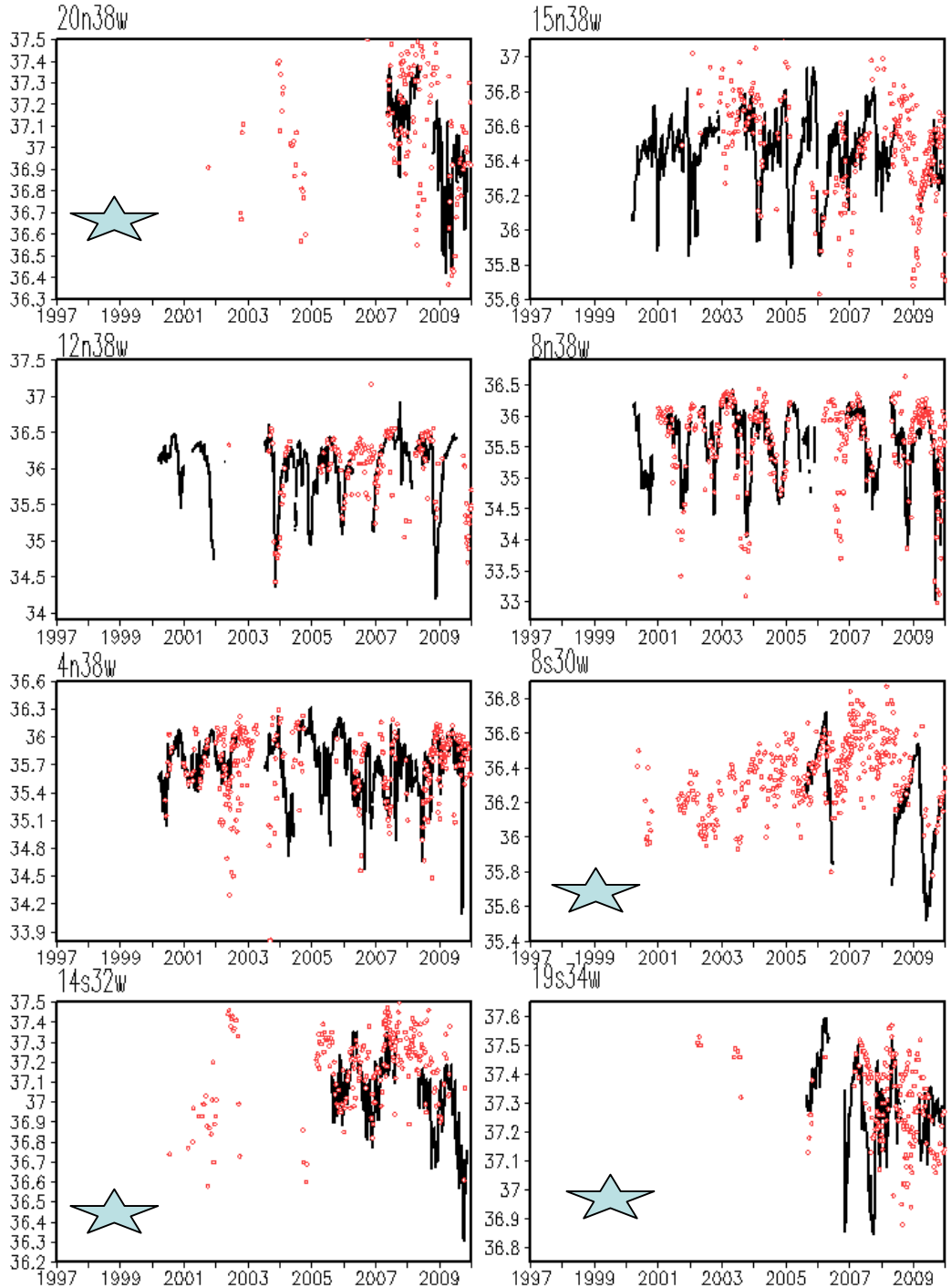

Seasonal, psu

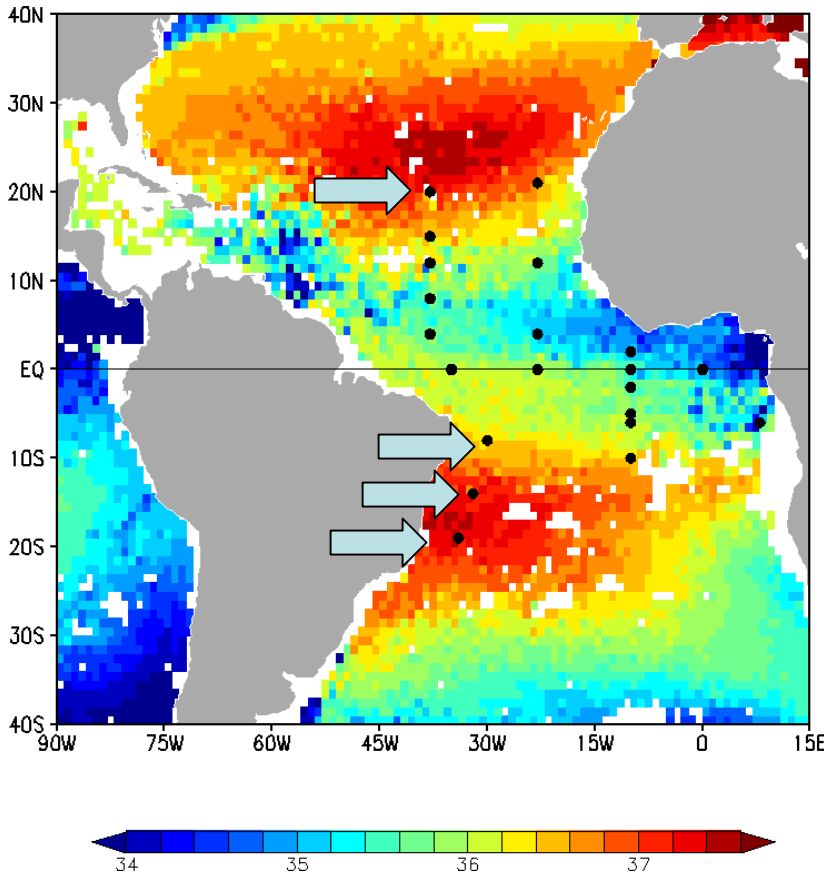


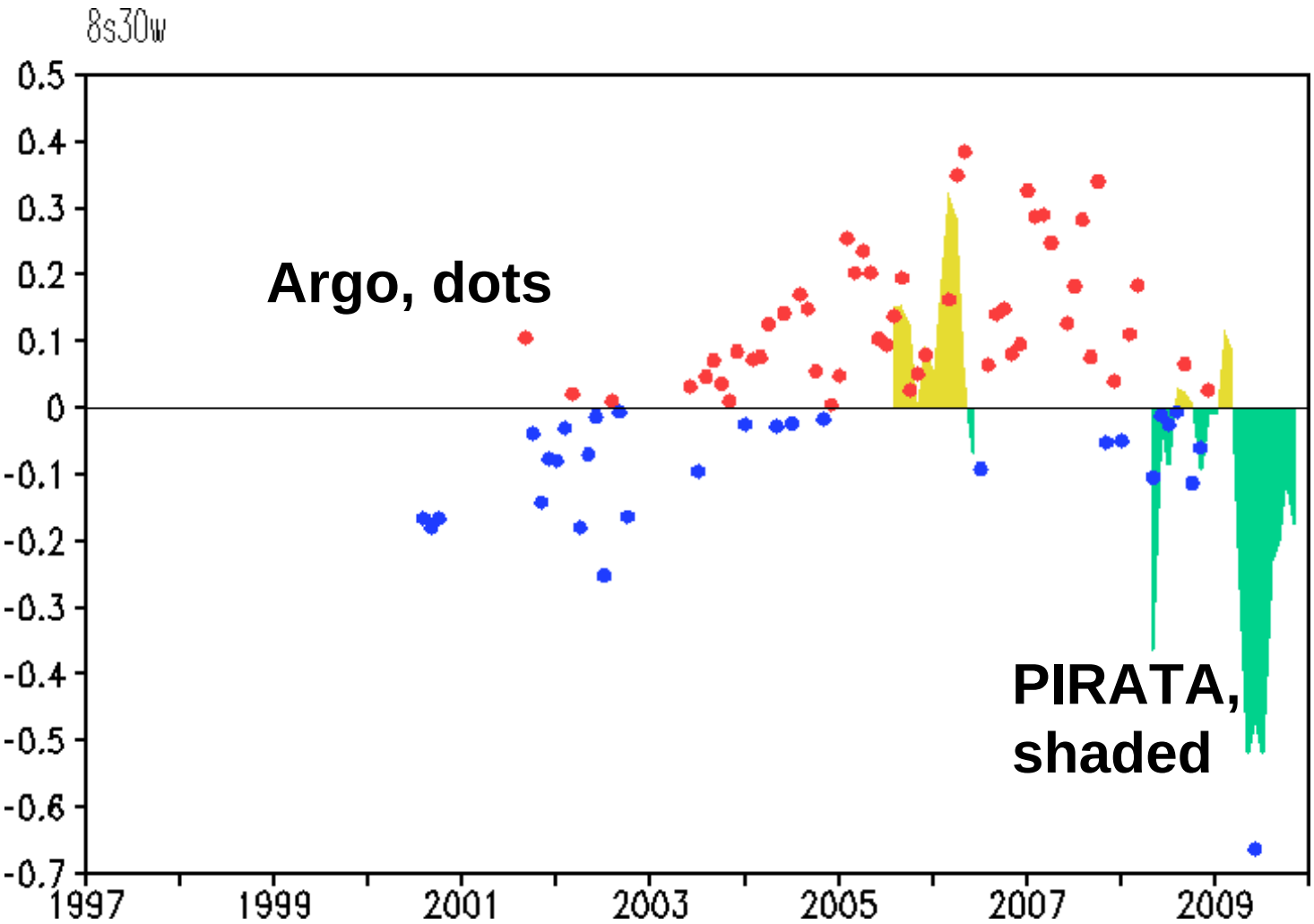

Interannual, psu

# PIRATA (black) and Argo (red) mixed layer salinity at the western mooring locations

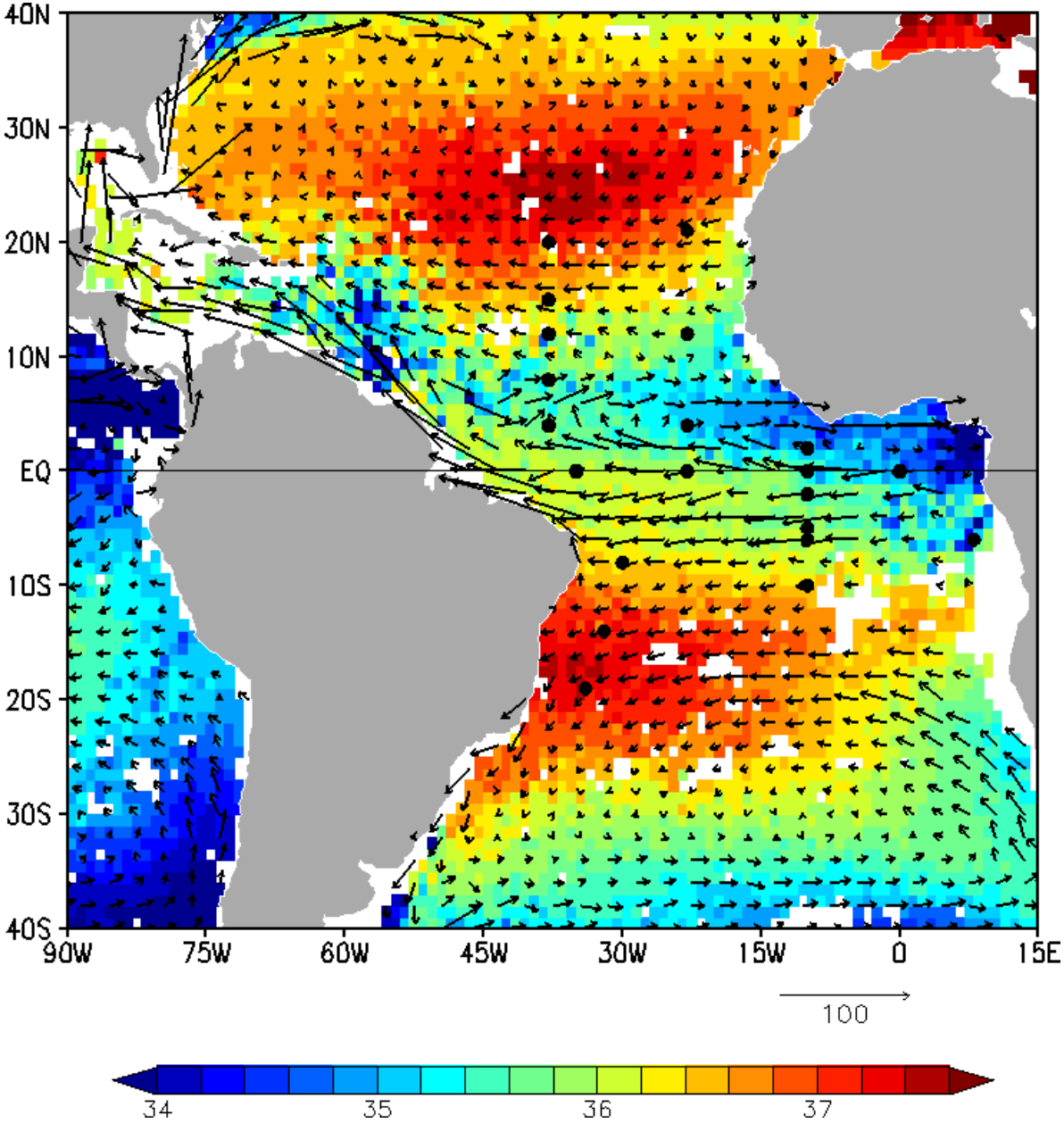


# Anomalous SSS @ 8S,30W



# Time mean SSS (Argo) and currents (GDP)




**@8S30W**

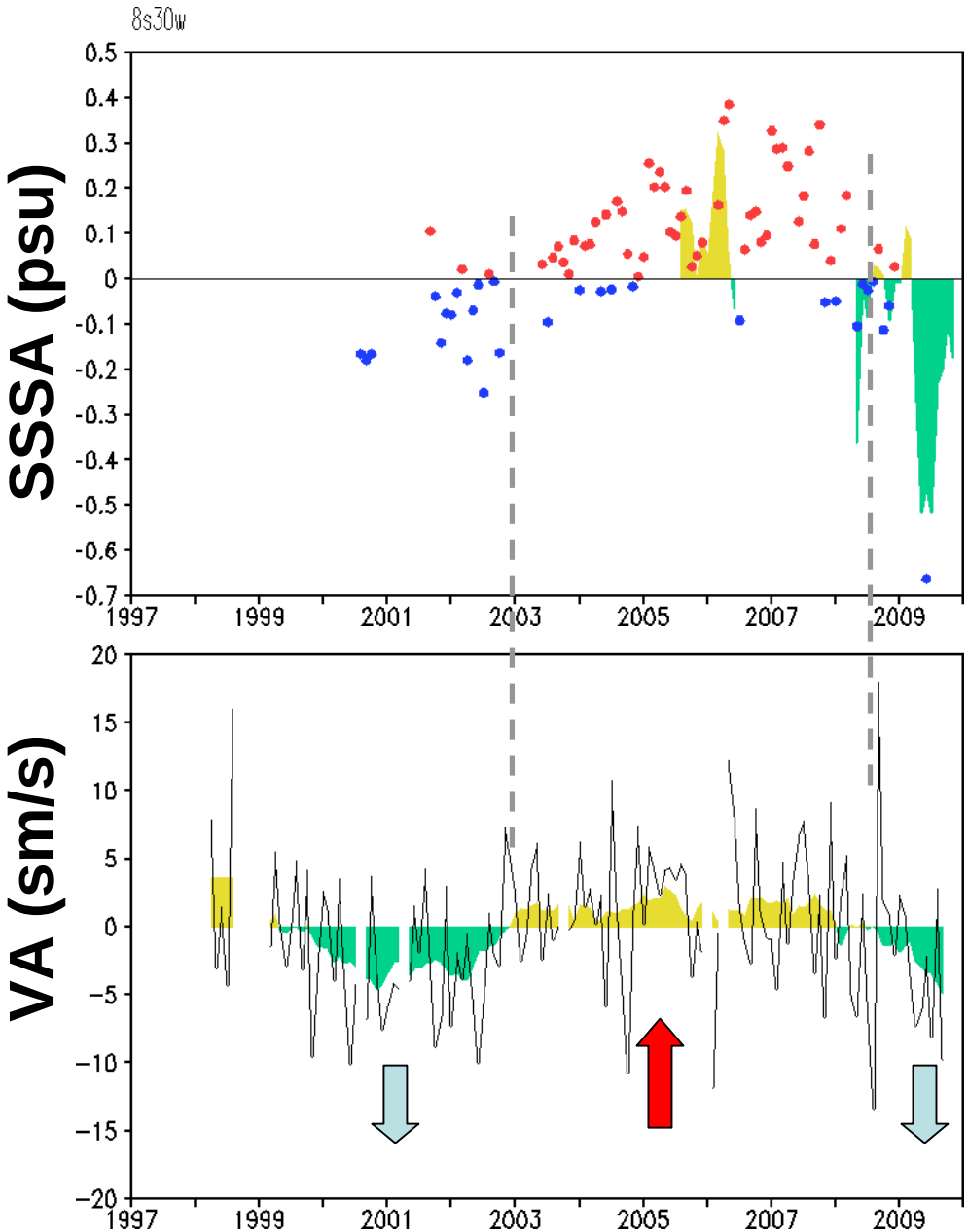
$\partial S / \partial y$ **=-10$^{-6}$ psu/m**

**S increases**

**S decreases**

$v' * \partial S / \partial y$

# Anomalous SSS and meridional velocity @ 8S30W

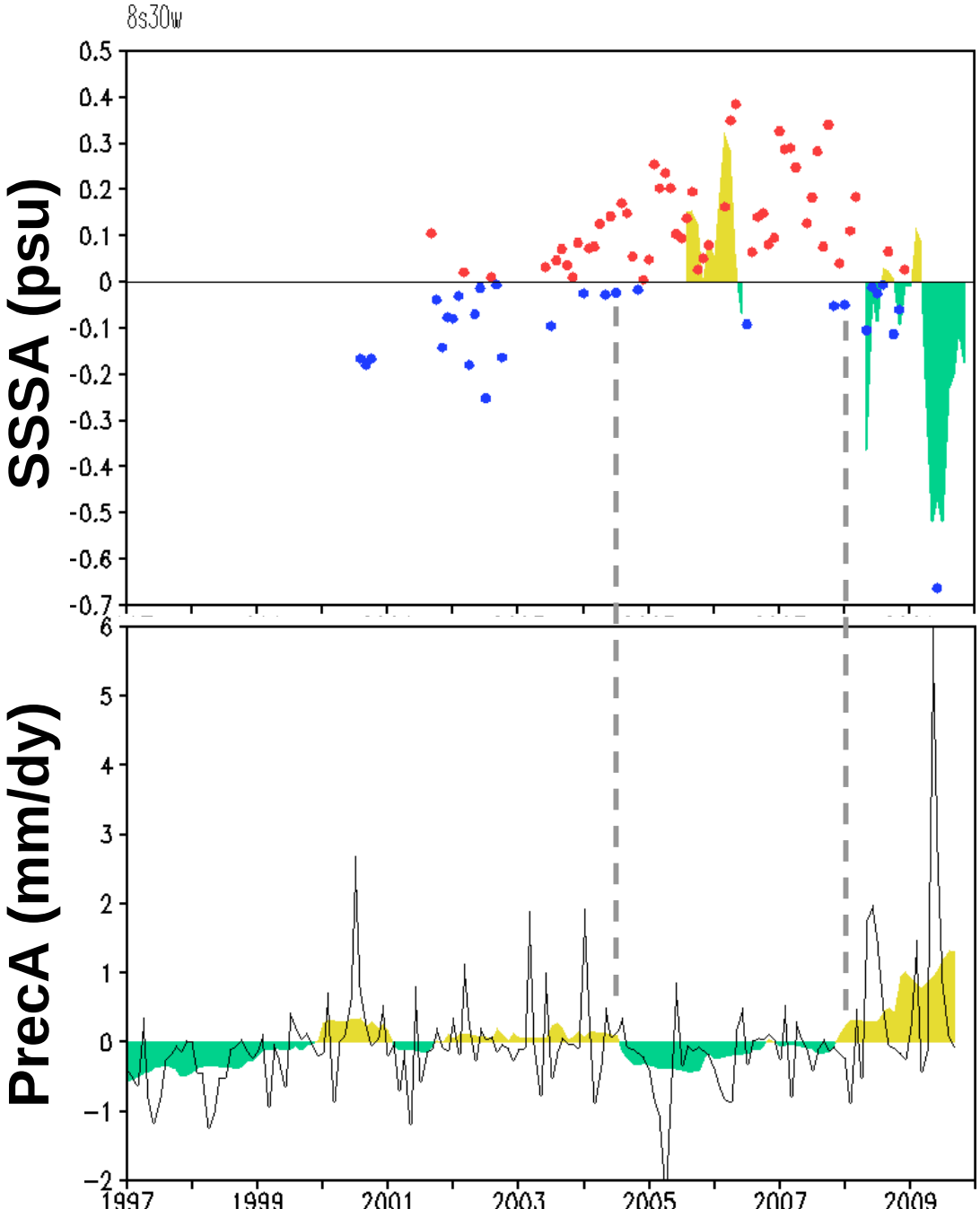



Argo and PIRATA

Are the ocean currents the only source of the observed SSS variability at 8S30W?

Surface drifters

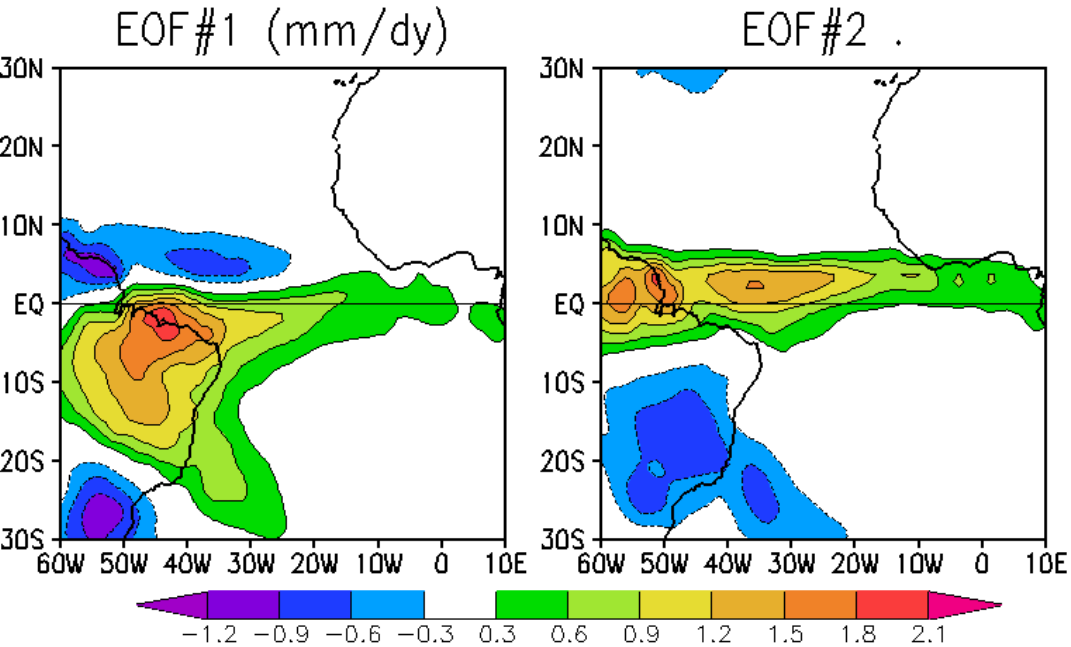
# Anomalous SSS and Prec @ 8S30W

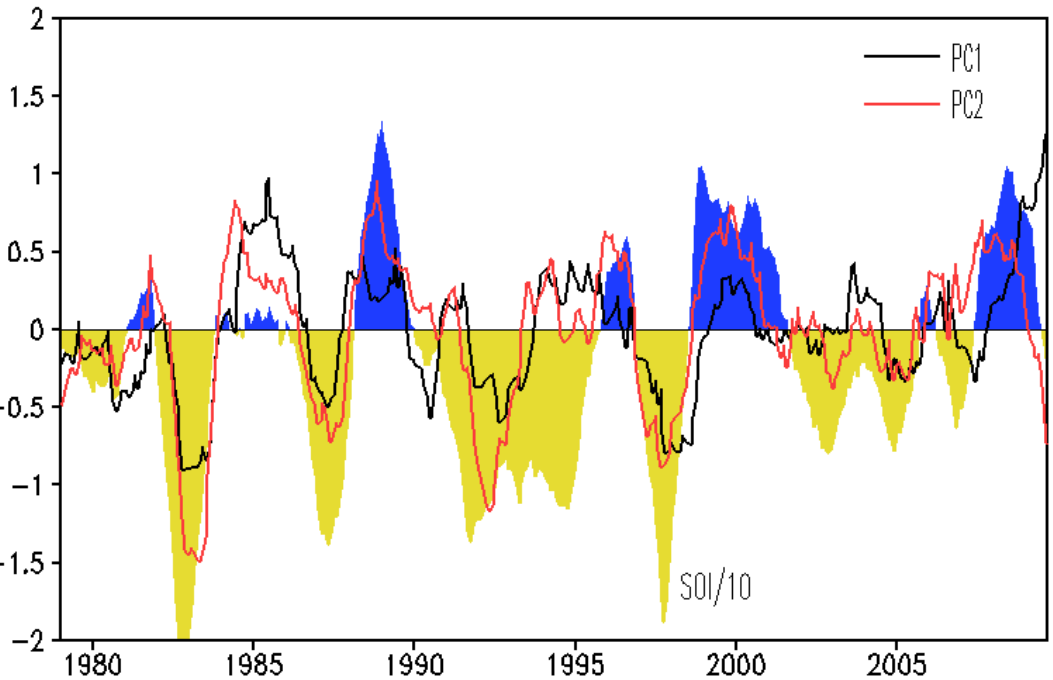



Argo @ PIRATA

**Negative correlation between anomalous SSS and Prec suggests that surface freshwater forcing could also contribute to salinity variation at this location.**

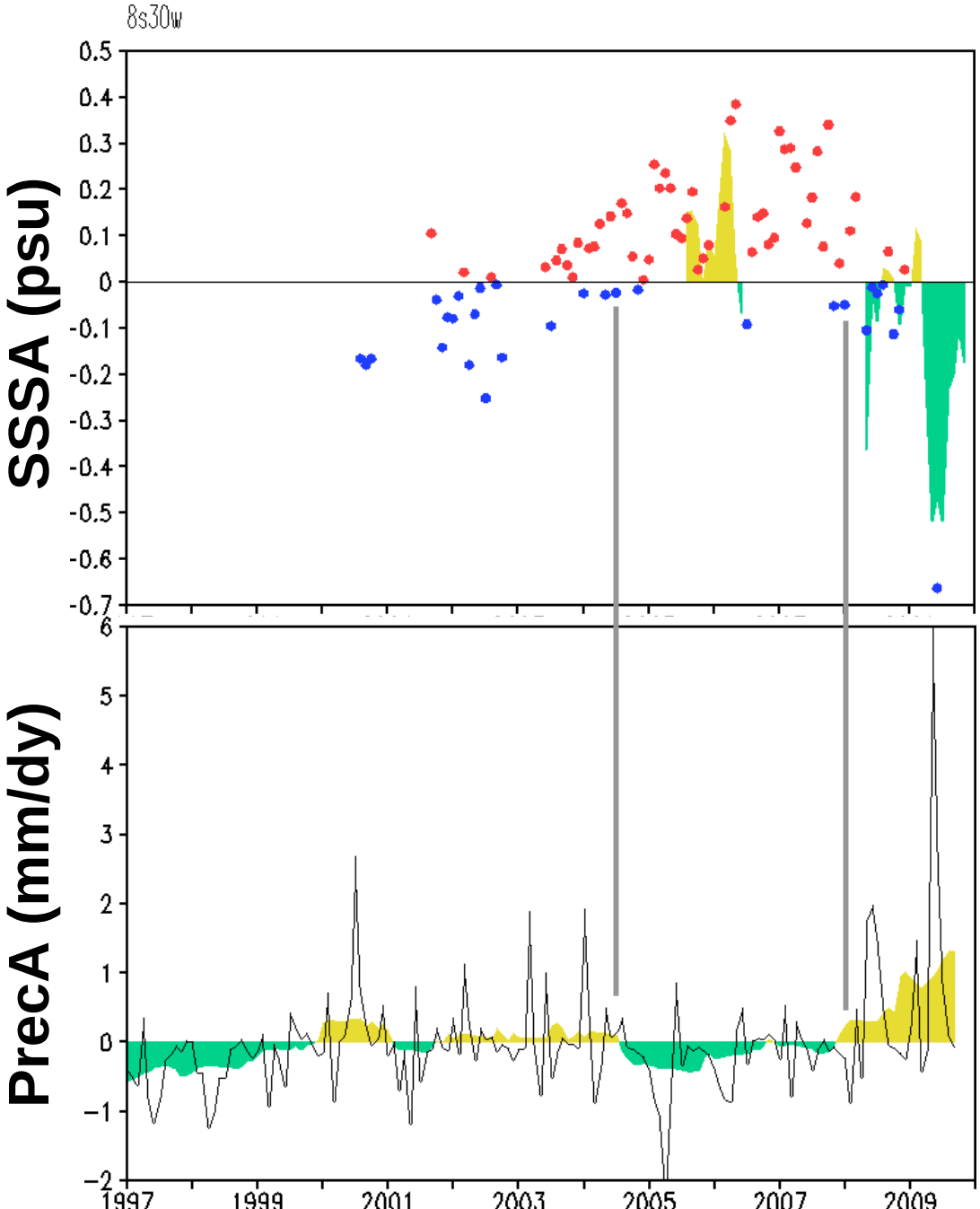
GPCP




**Two leading EOFs of anomalous precipitation in the tropical-subtropical Atlantic (GPCP).**

# Anomalous SSS and Prec @ 8S30W

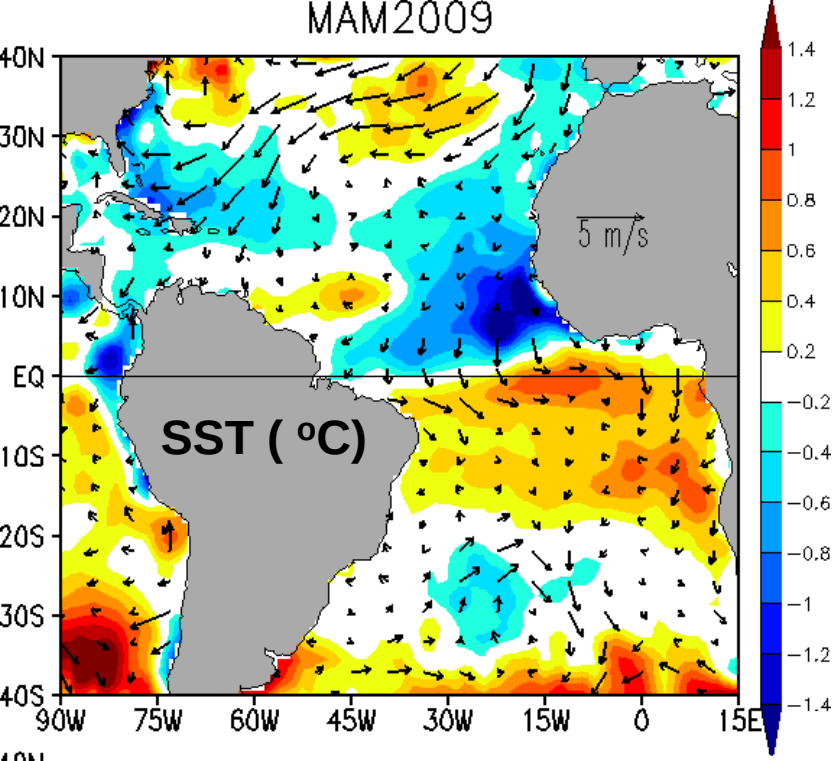


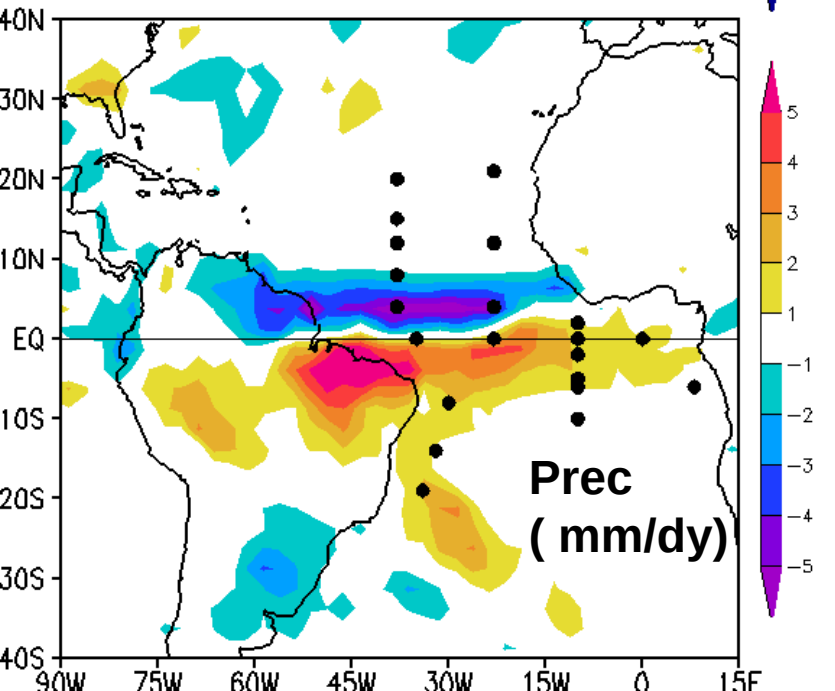

Argo @ PIRATA

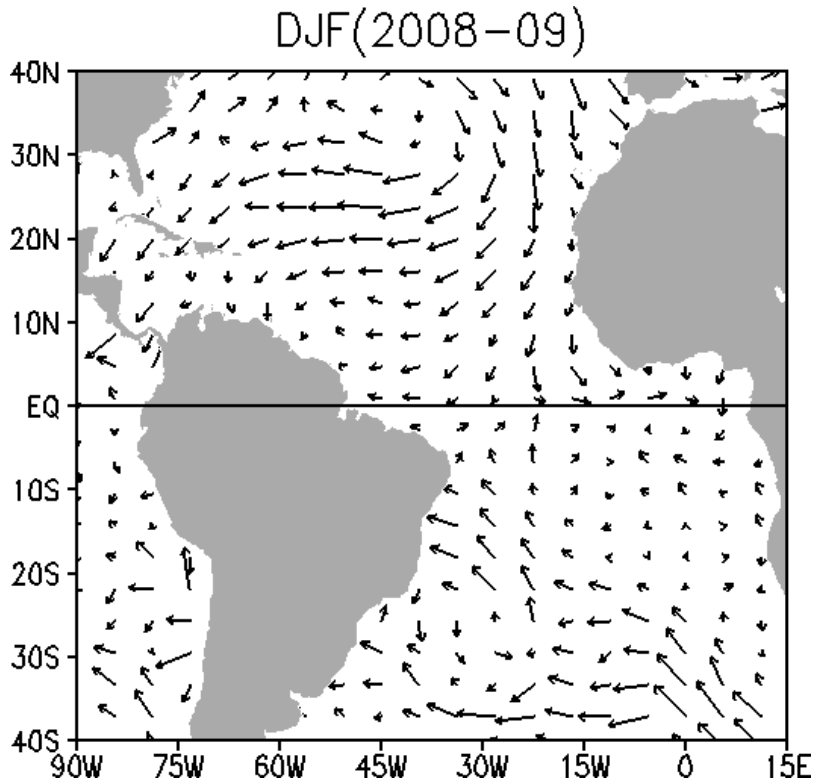
**Why did precipitation strongly increase and salinity drop in 2009?**

GPCP

# Anomalous SST, winds, and Prec in MAM2009



# Conclusions

- At the 8S30W PIRATA location interannual variation of SSS is ~0.5 psu and exceeds the seasonal cycle.
- SSS was above the time mean by 0.3 psu during 2004-2008 and dropped ~0.5 psu in 2009.
- Observations suggest that anomalous northward transport acting on the mean meridional gradient of SSS (v'*dS/dy) as well as anomalous lack of precipitation (northward shift of the ITCZ) both contributed to observed salinification during 2004-2008. Which term does balance the anomalous salt transport?
- Anomalous meridional currents at 8S30W could be linked to the meridional shift of the ITCZ, so that both changes in precipitation and ocean currents are linked to the atmospheric forcing. ITCZ ->south, PREC increases south of the equator, SE trades strengthen, southward transport strengthen -> freshening.