Characteristics of the Atlantic Subtropical Cells inferred from ARGO data

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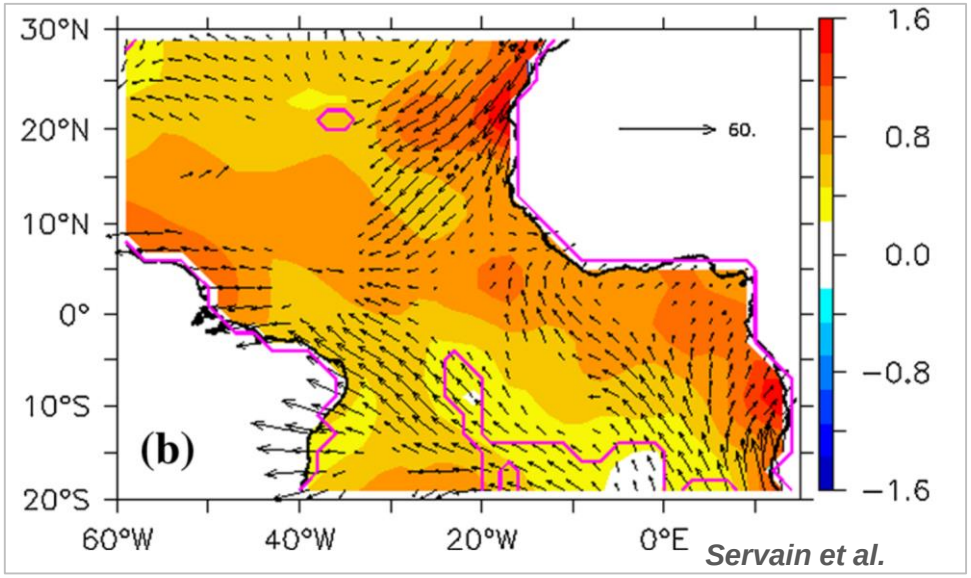
GEOMAR

Warming trend in the Tropical Atlantic



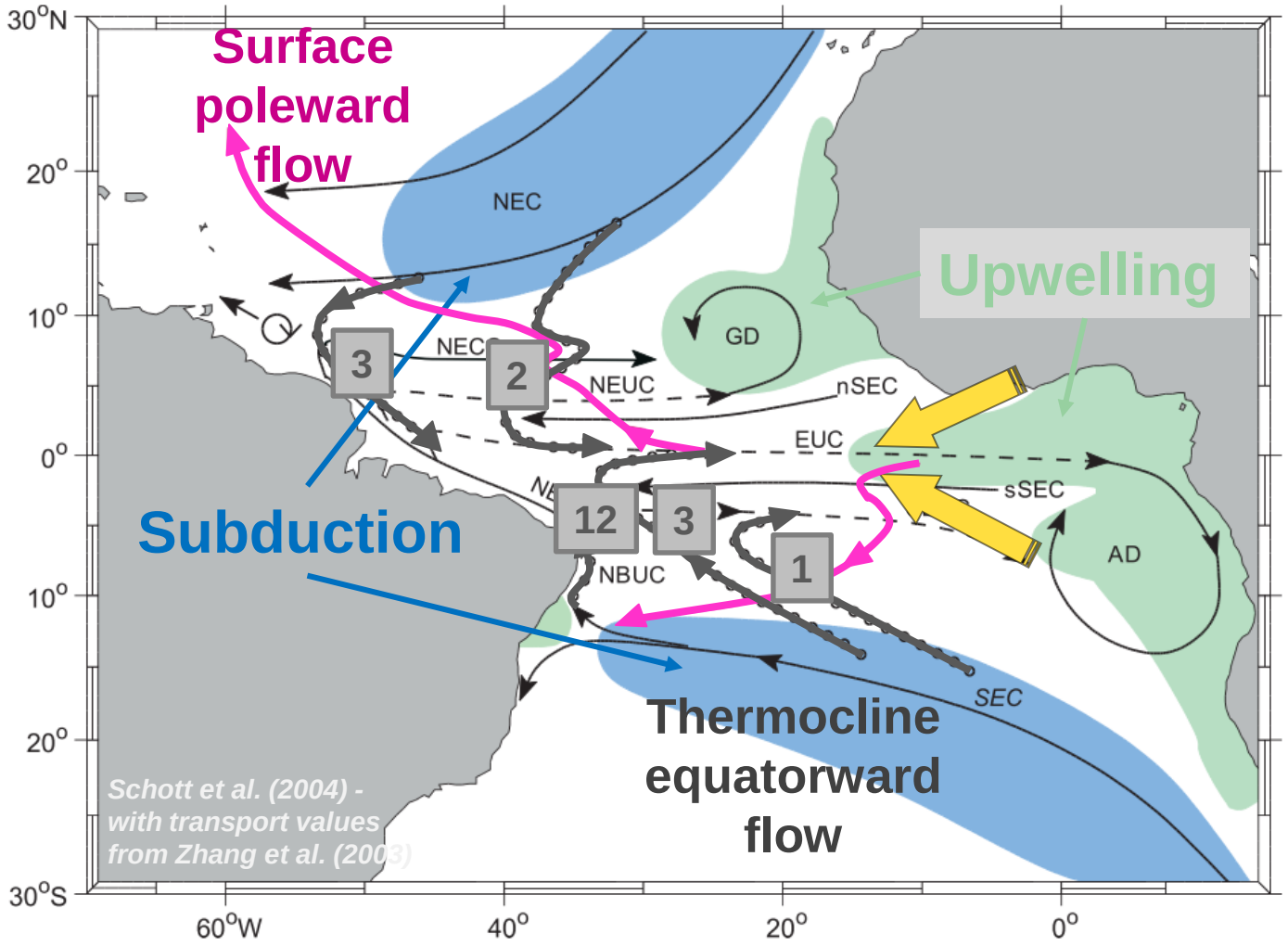
Servain et al. (2014)

- SST warming in the equatorial Atlantic and coastal eastern tropical Atlantic over the last decades (here: 1976-2012)
- Simultaneous increase of trade winds
  → ***intensified upwelling would decrease SST***

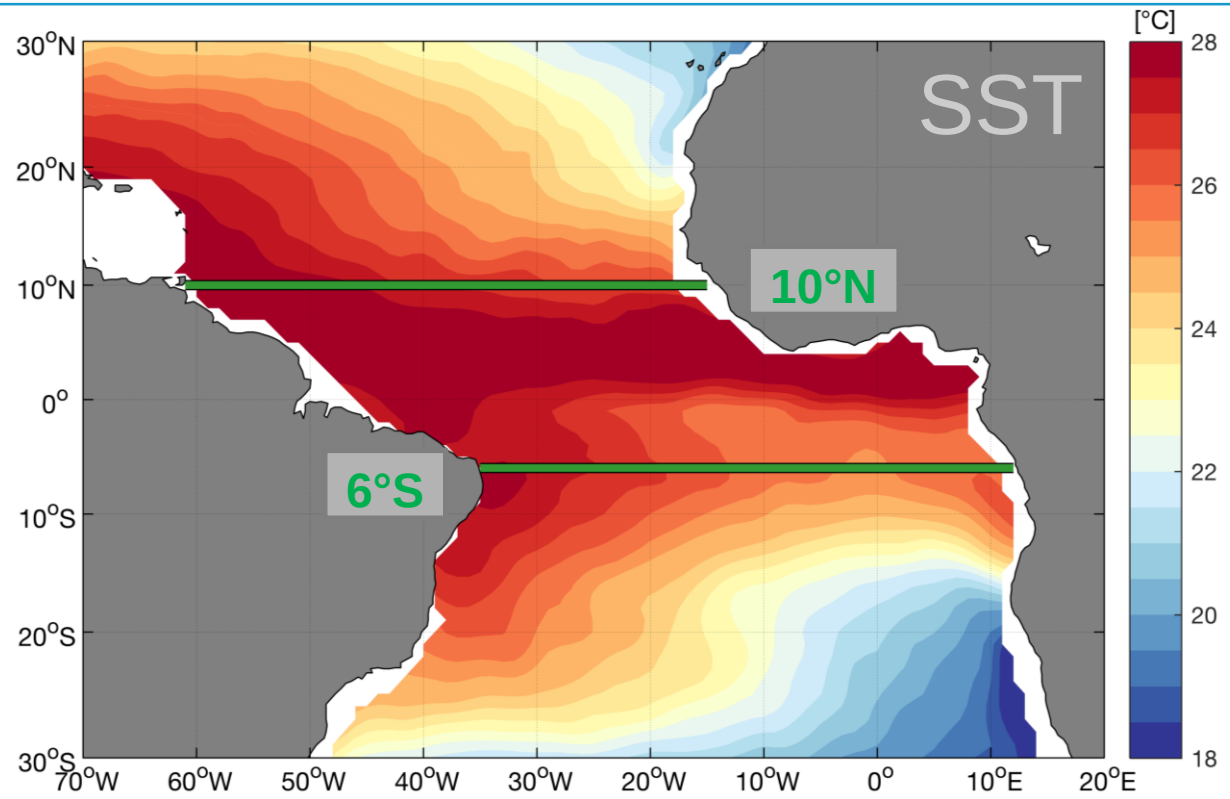
Hypothesis:

- Upwelled subsurface water has warmed at a higher rate than the surface water
- Role and contribution of the Atlantic STCs ?

Atlantic Subtropical Cells



Argo data (Roemmich-Gilson)



- Climatological monthly means on $(1°)^2$ grid
- Monthly anomalies (2004-2016)
- Temperature and salinity at 58 pressure levels (0-2000 dbar)
- RT and DM profiles with additional quality control criteria

Methods

- **Thermocline transport (geostrophic):**

Temperature and salinity profiles

⇩

Dynamic height

⇩

Meridional geostrophic velocities through zonal sections

$$-fv = -\frac{1}{\rho_0} p_x$$

- **Surface transport (Ekman):**

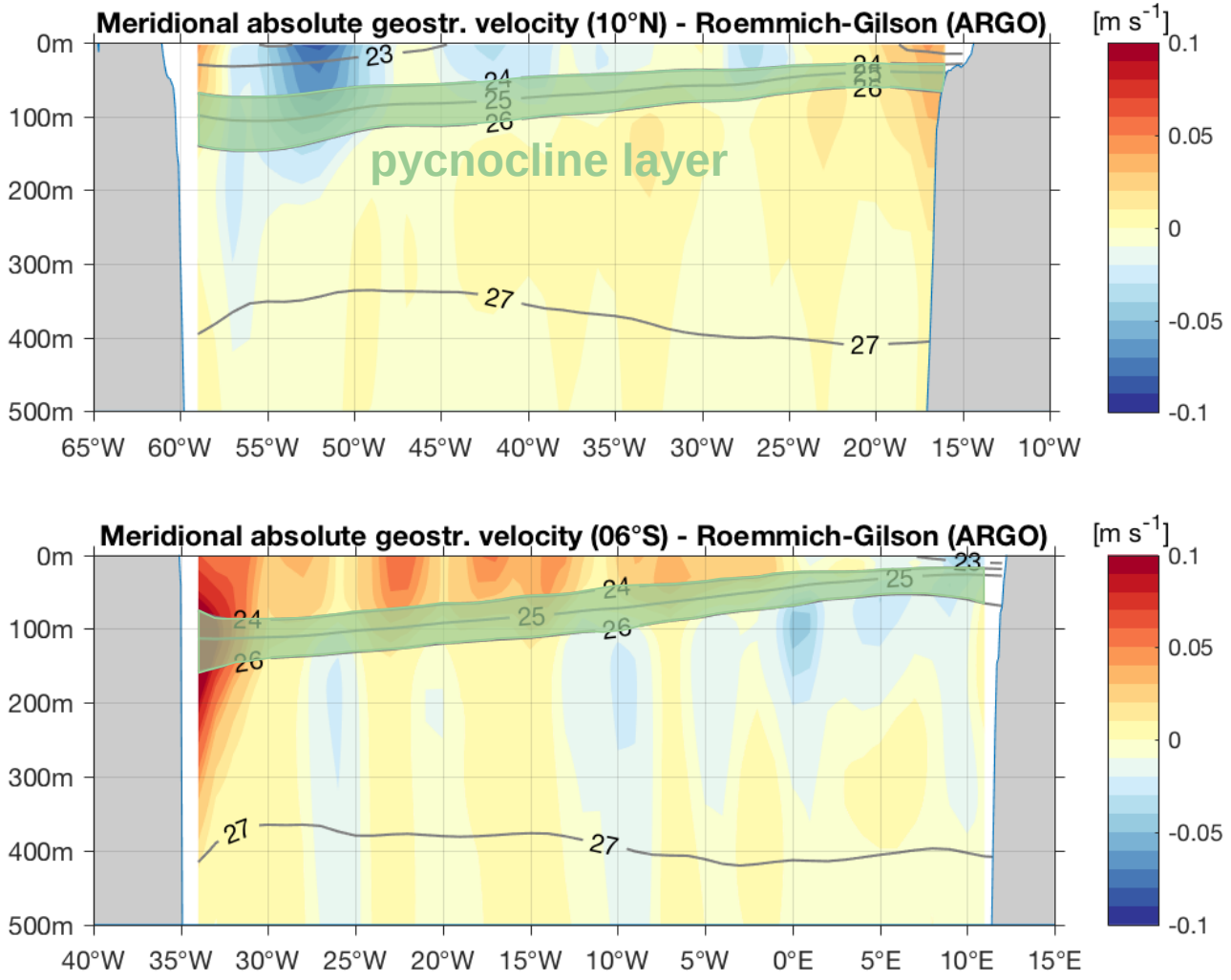
Surface mean wind stress (ASCAT)

⇩

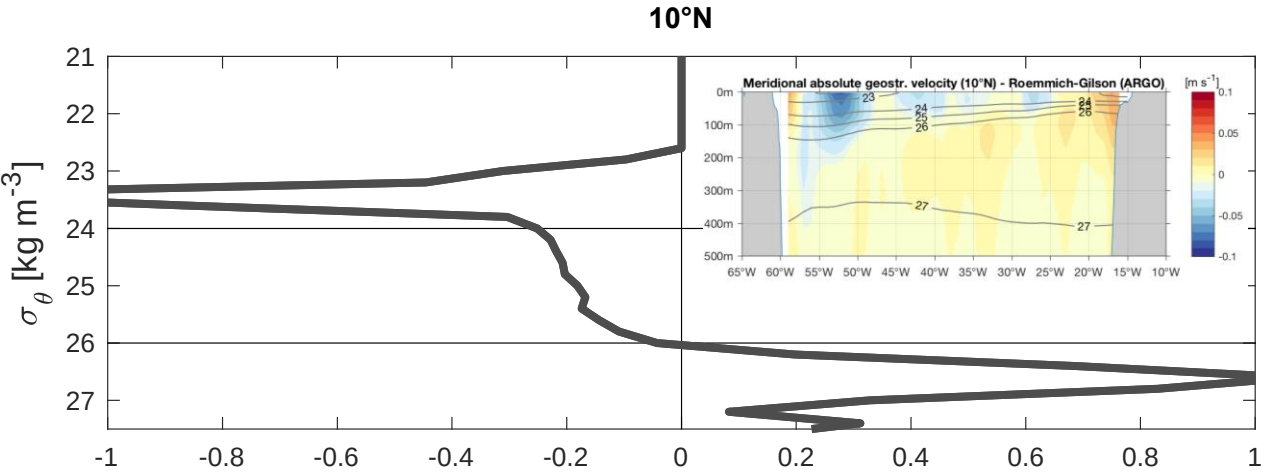
Meridional Ekman transport through zonal sections

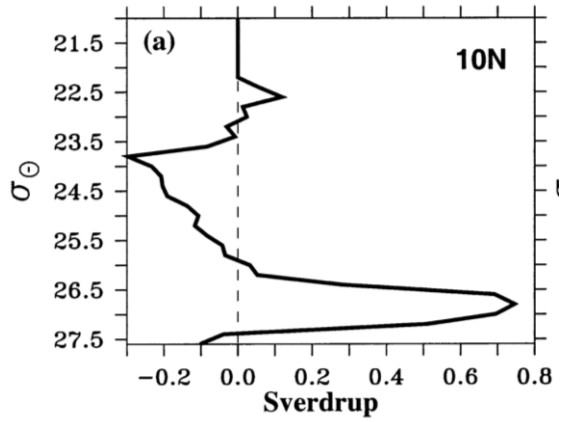
$$M_E = -\frac{1}{\rho_0}\frac{\tau_x}{f}$$

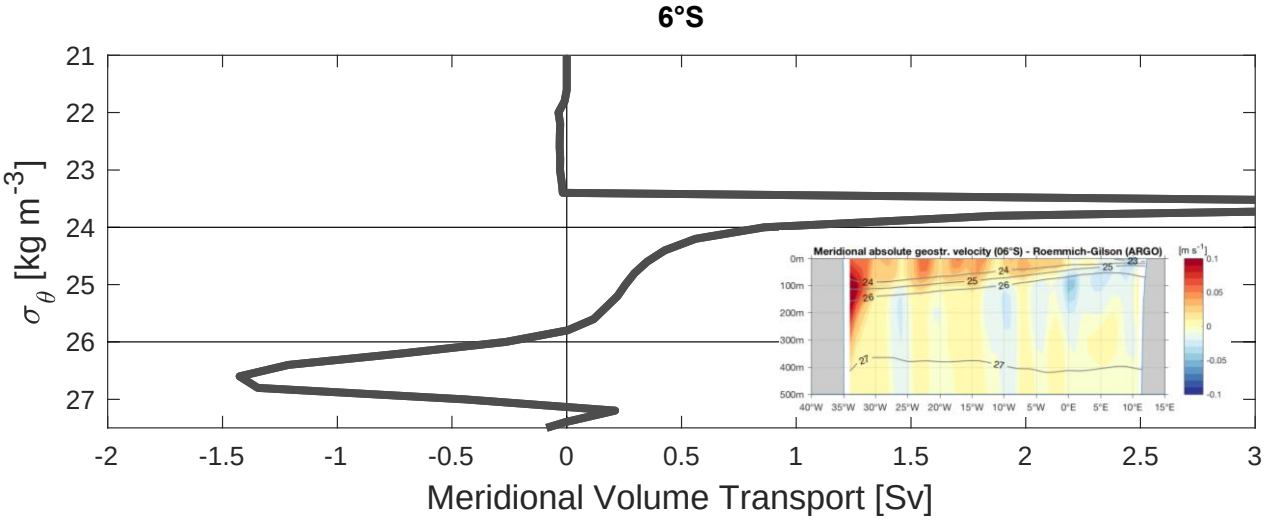
Geostrophic velocity sections



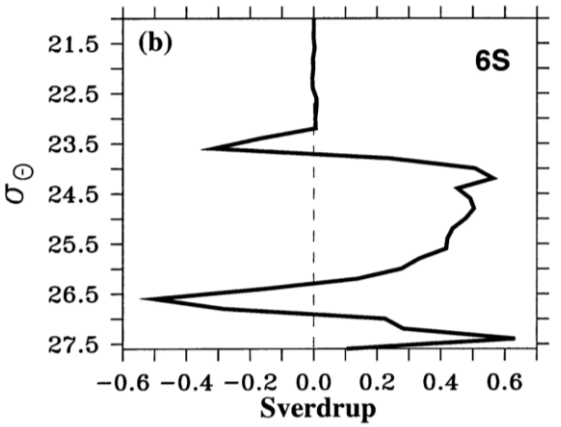
Mean transport



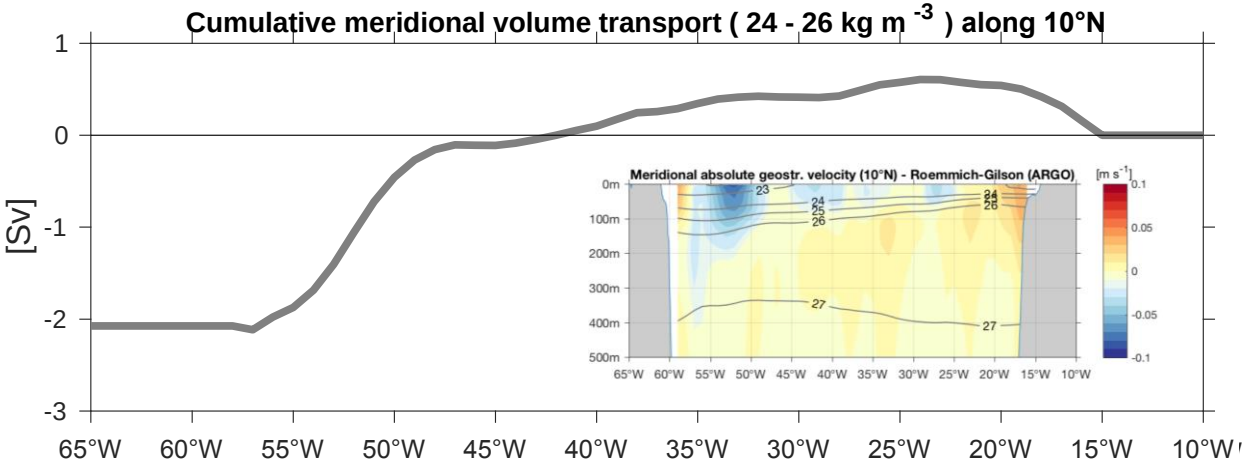


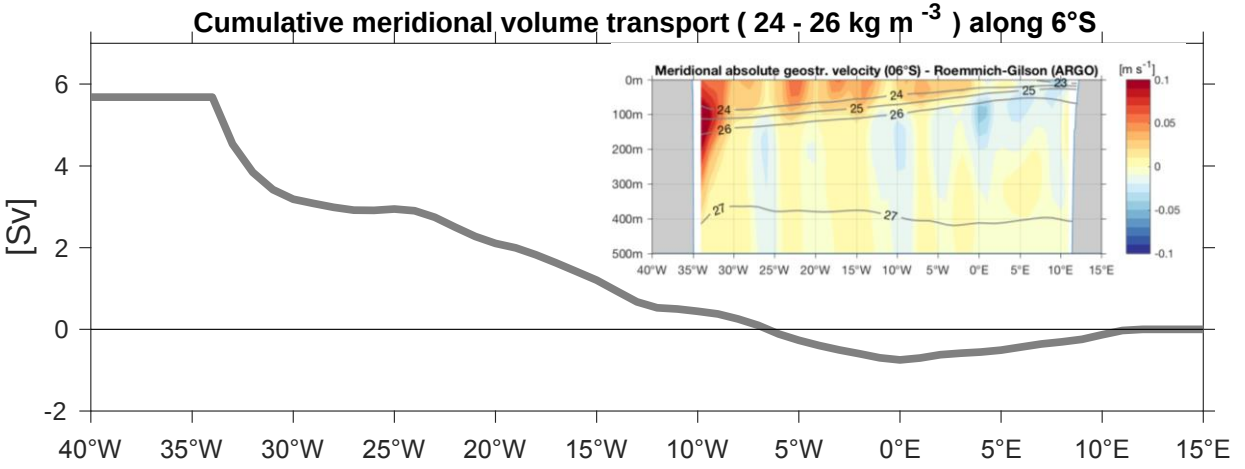


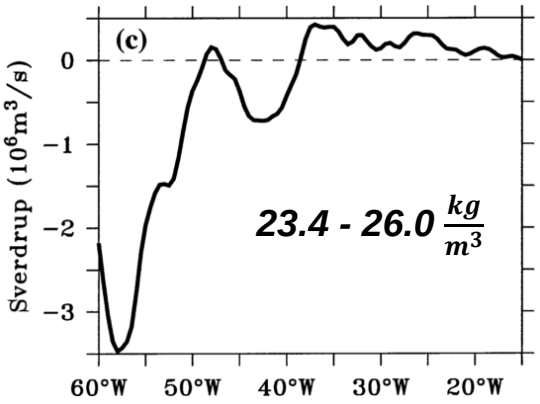
Zhang et al. (2003)



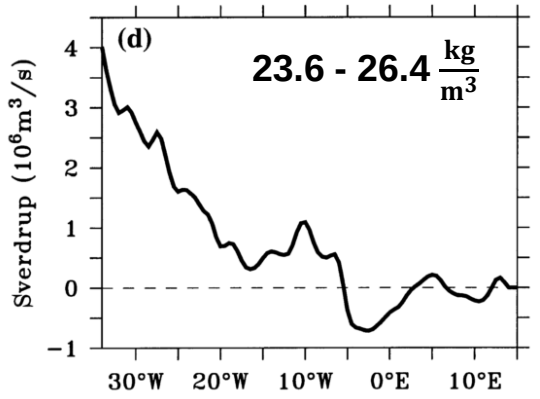
Zonally accumulated transport



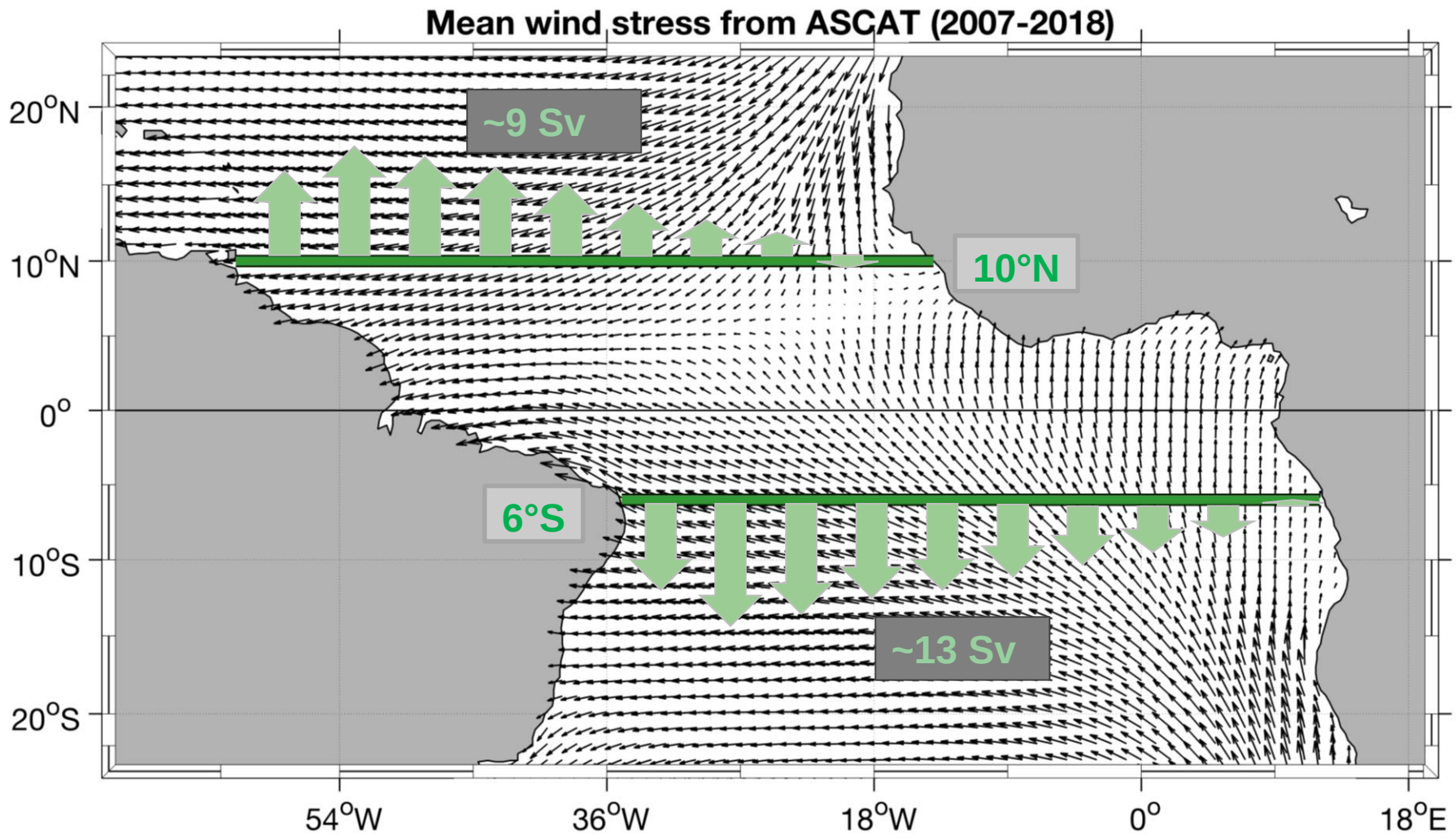




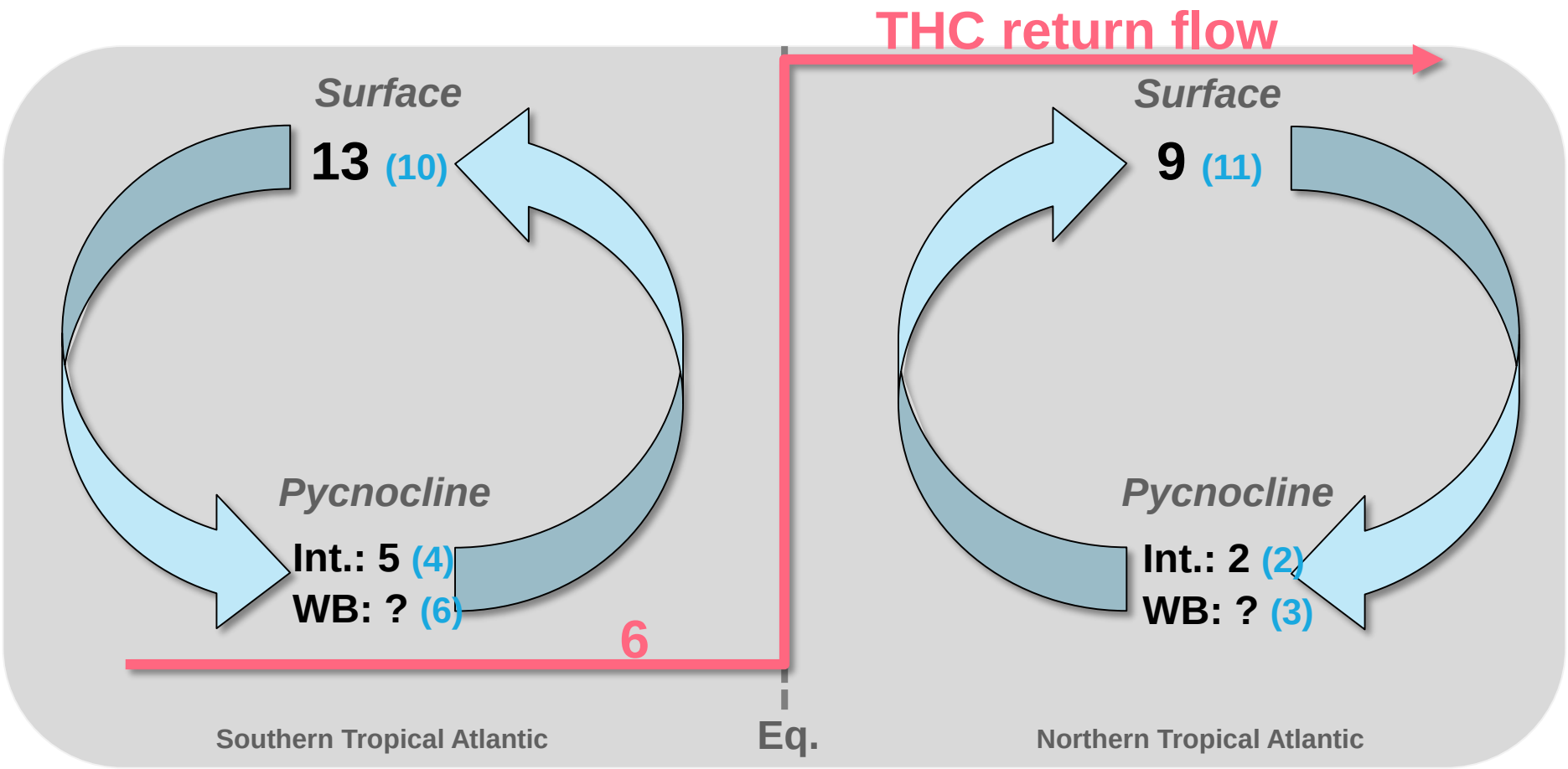
Zhang et al. (2003)



Ekman transport at the surface

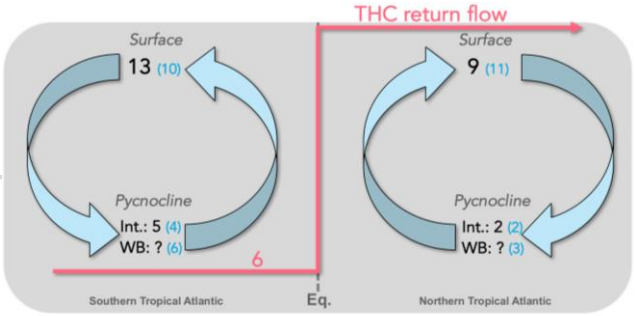


STC schematic

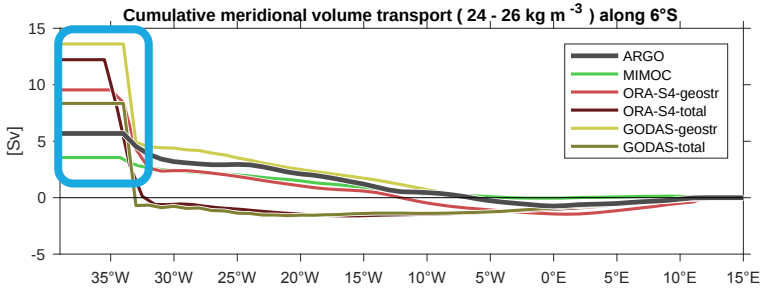


Conclusions

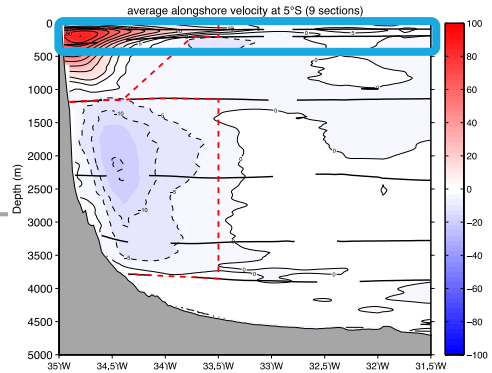
- Calculation of pycnocline transports associated with the Atlantic Subtropical Cells based on ARGO data.



- Equatorward transports largely depend on representation and coverage of the western boundary in the data set.

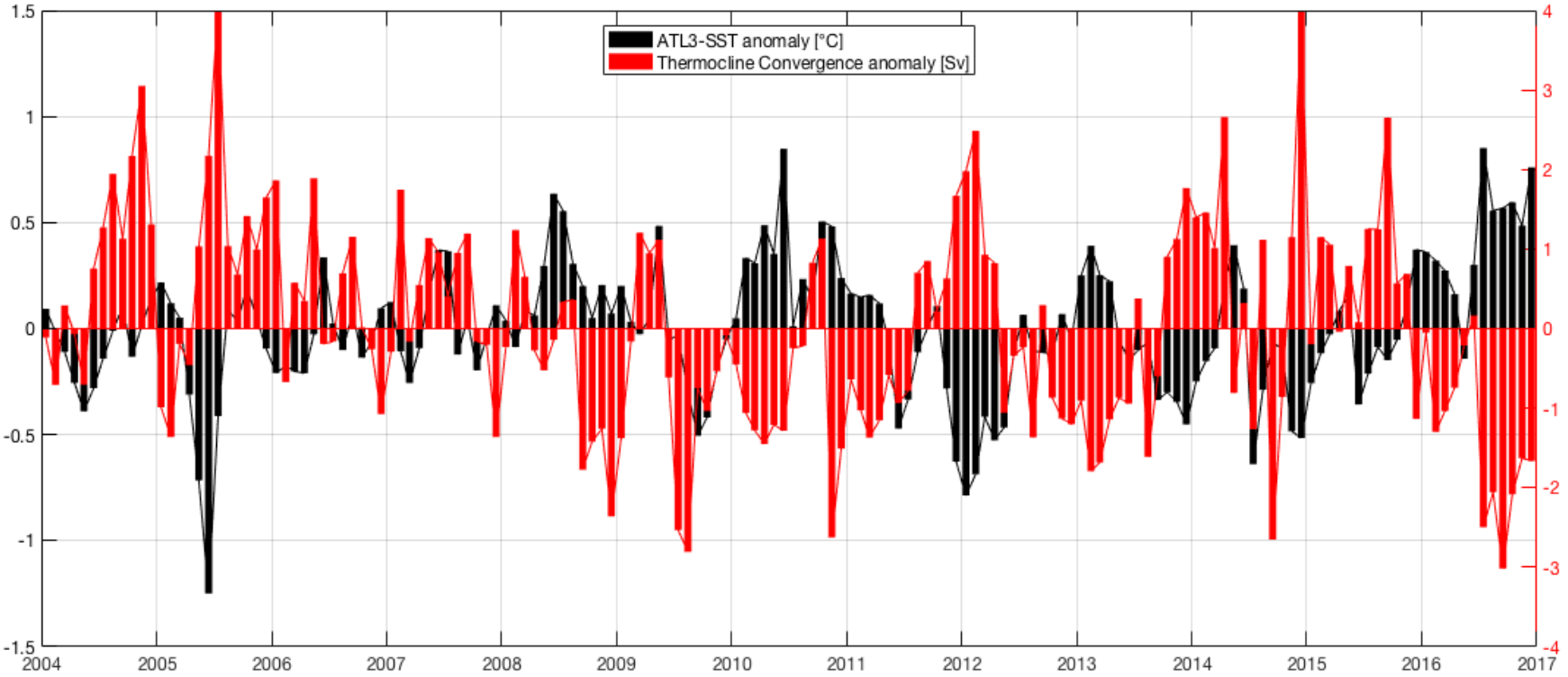


- Inclusion of mooring data at the western boundary (5°S / 11°S).



Courtesy of Rebecca Hummels

Outlook: time series analysis



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