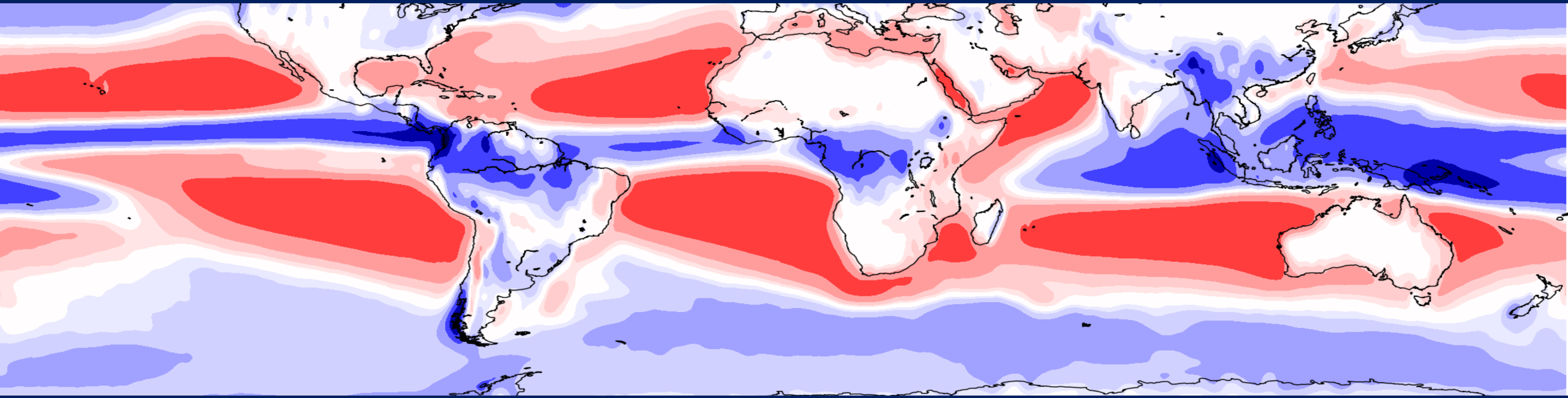
THE CONTRAST BETWEEN ATLANTIC AND PACIFIC SURFACE WATER FLUXES



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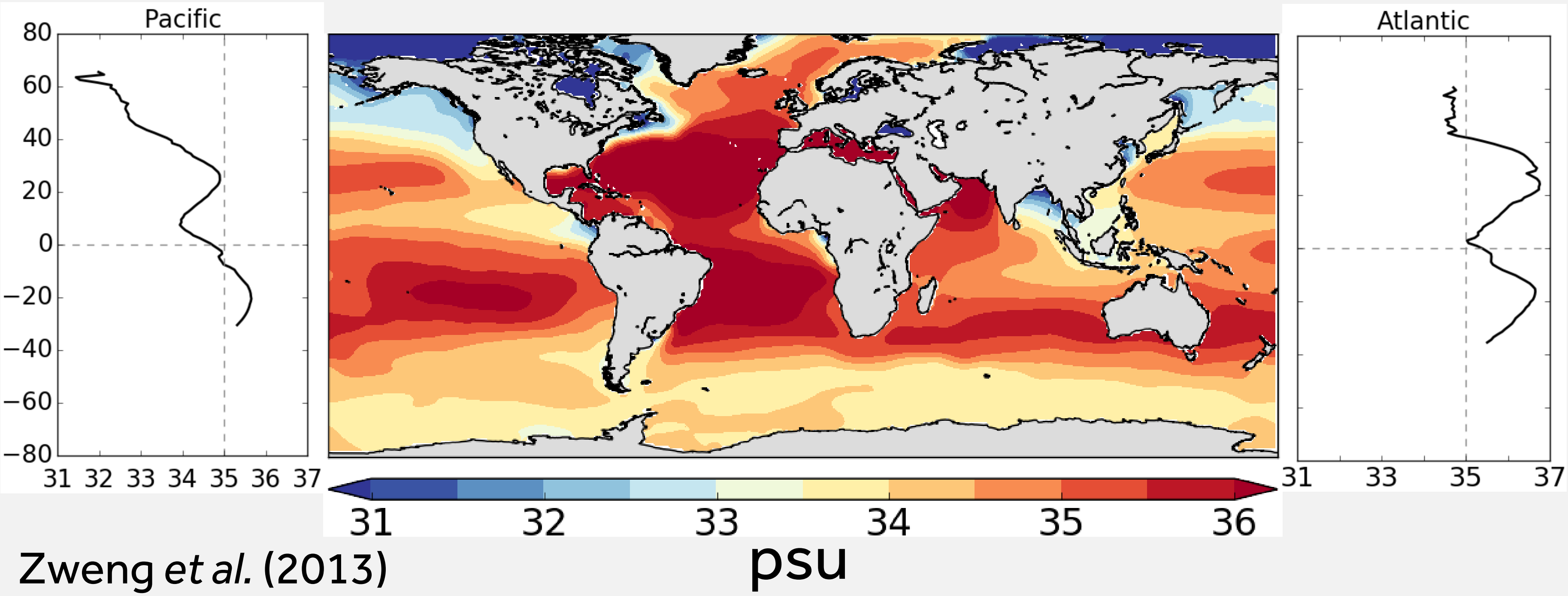
Sea surface salinity



Zweng *et al.* (2013)

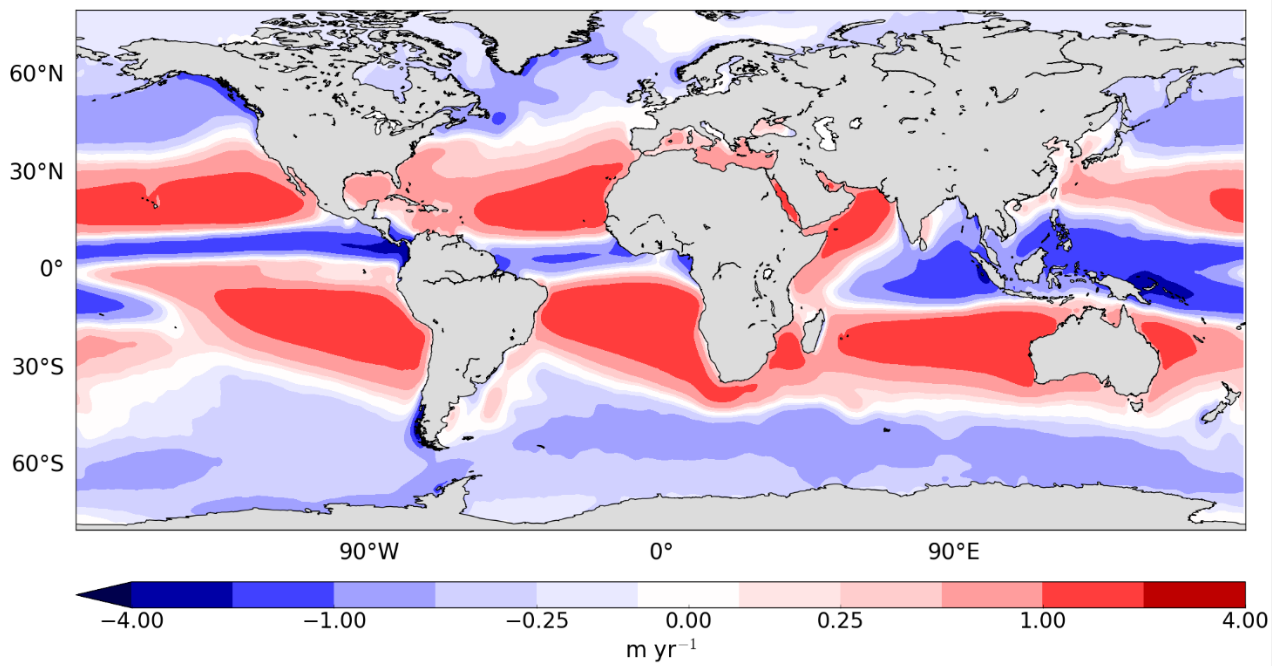
- Sea surface salinity (SSS) greater at all latitudes in Atlantic than Pacific
- Asymmetry linked to Atlantic Meridional Overturning Circulation (AMOC)
- Asymmetry is increasing (Durack & Wijffels, 2010)

Outline

- Estimates of $E - P - R$
- Comparison of ERA-Interim Atlantic/Pacific E & P
- Implications for Moisture transport

- Special issue of Tellus A: *The Atlantic Meridional Overturning Circulation in a Global Perspective*

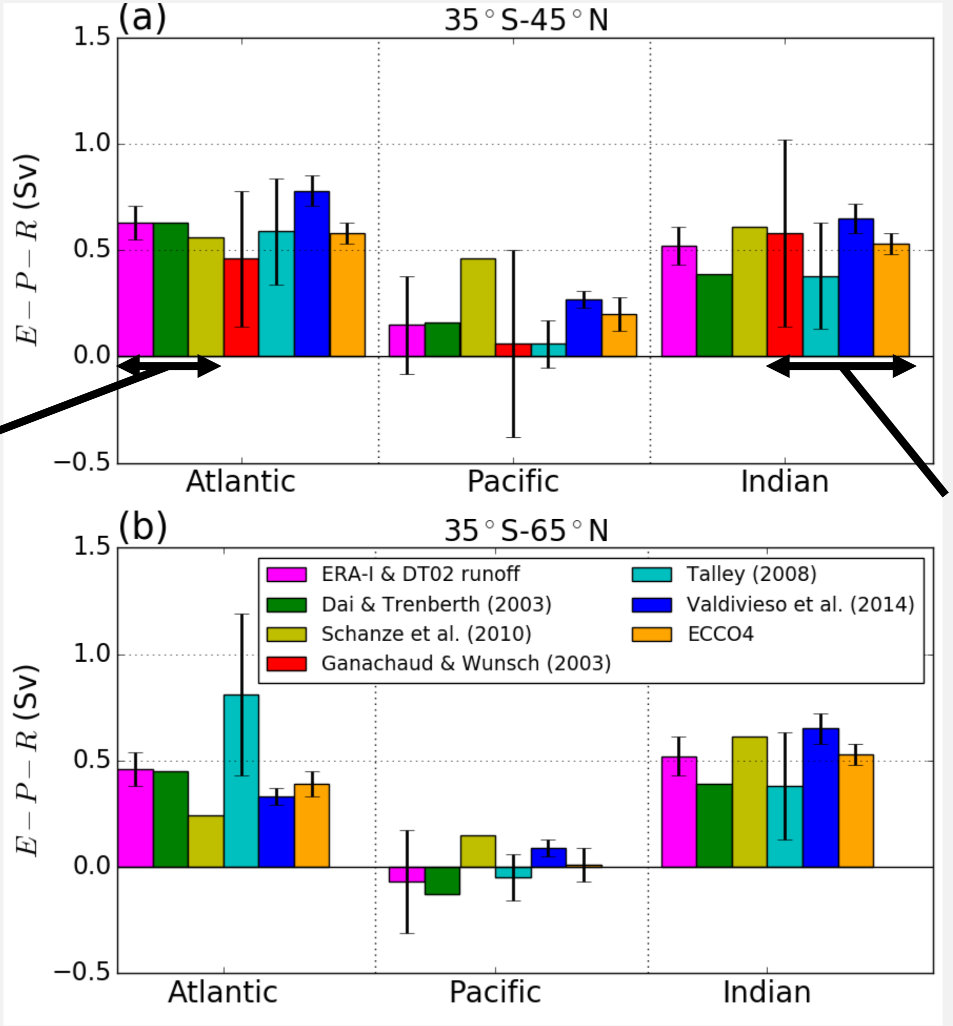
Evaporation minus precipitation



- ERA-Interim 1979-2014 annual mean vertically integrated moisture flux divergence
- Net evaporation corresponds to high salinity
- Net precipitation corresponds to lower salinity

$E - P - R$ estimates

$1\ \text{Sv} \equiv 10^6\ \text{m}^3\text{s}^{-1}$

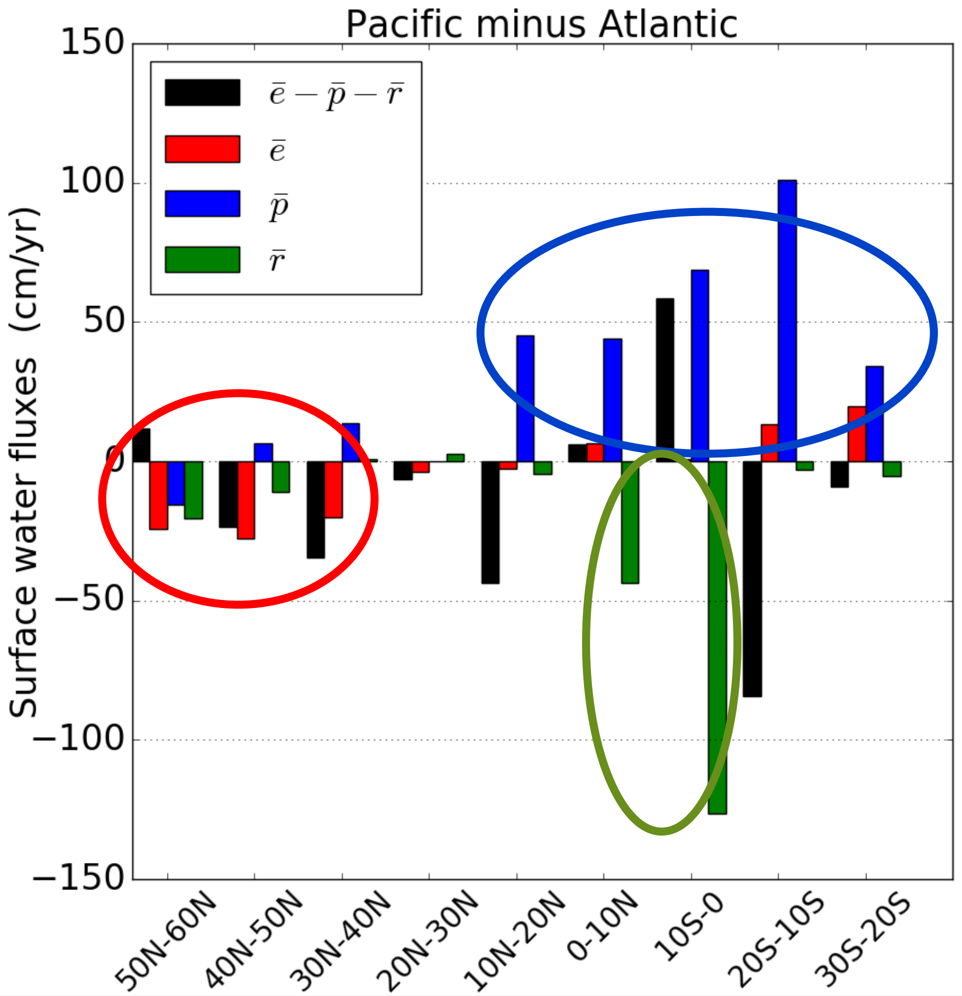


Atmospheric data

Oceanographic data

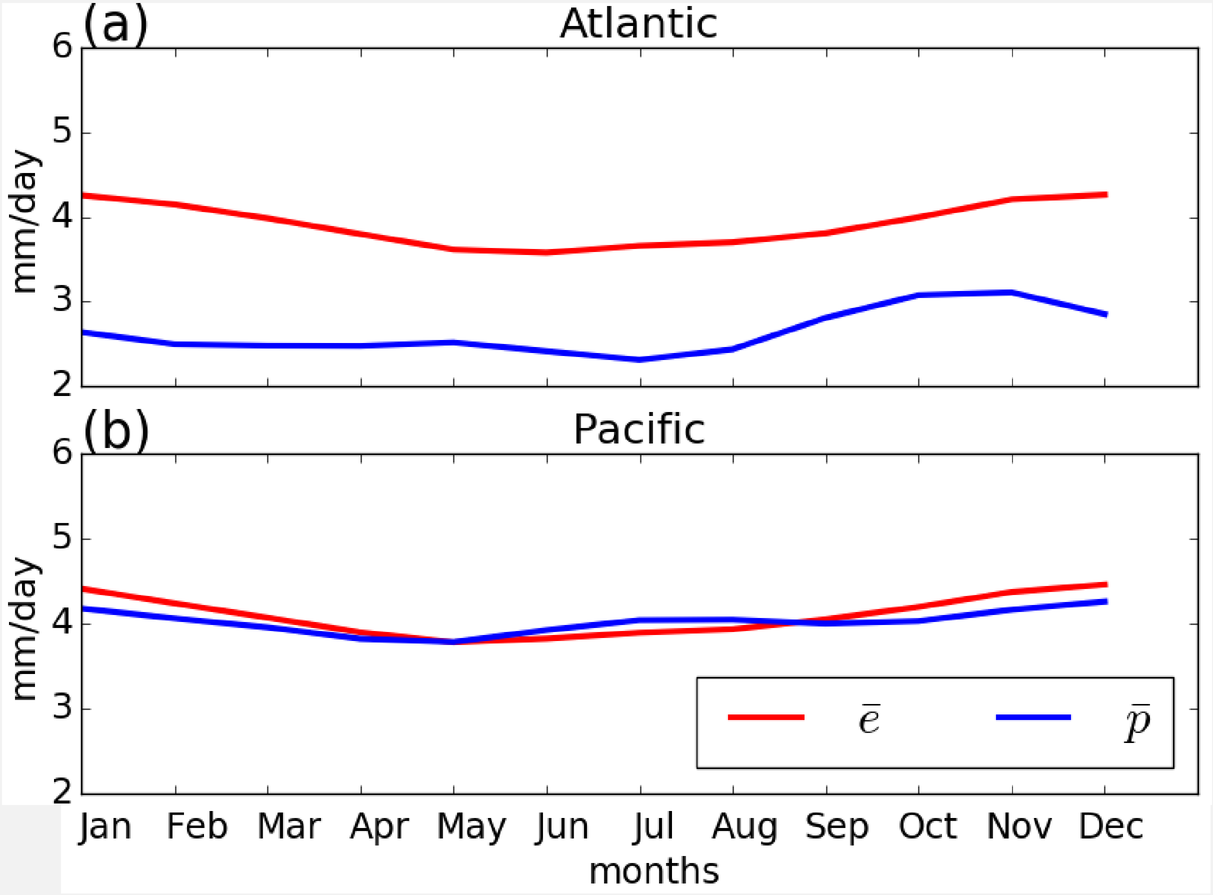
ERA-Interim $\bar{e}$ and $\bar{p}$

- $\bar{e}$, $\bar{p}$ and $\bar{r}$ are area averages
- Evaporation more important at high latitudes
  - Higher SSTs due to AMOC (Warren, 1983; Czaja, 2009)
- South of 20°N precipitation is more important
  - Stationary eddies (Wills & Schneider, 2015)
- Runoff dominant in tropical Atlantic due to Amazon & Congo
  - SSS asymmetry still holds!

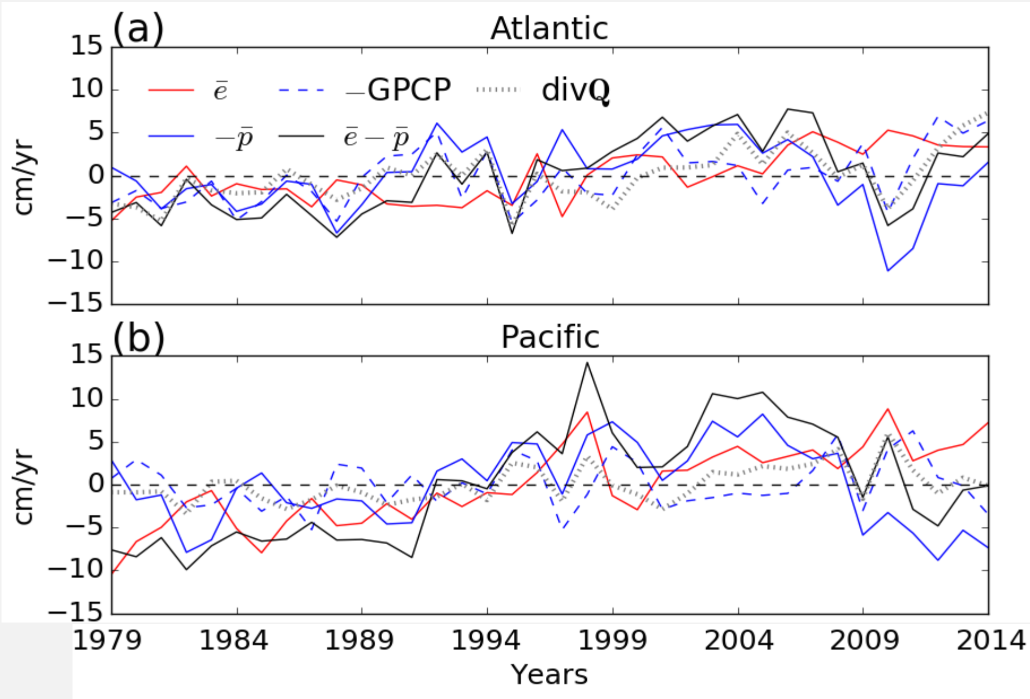


ERA-Interim $\bar{e}$ and $\bar{p}$

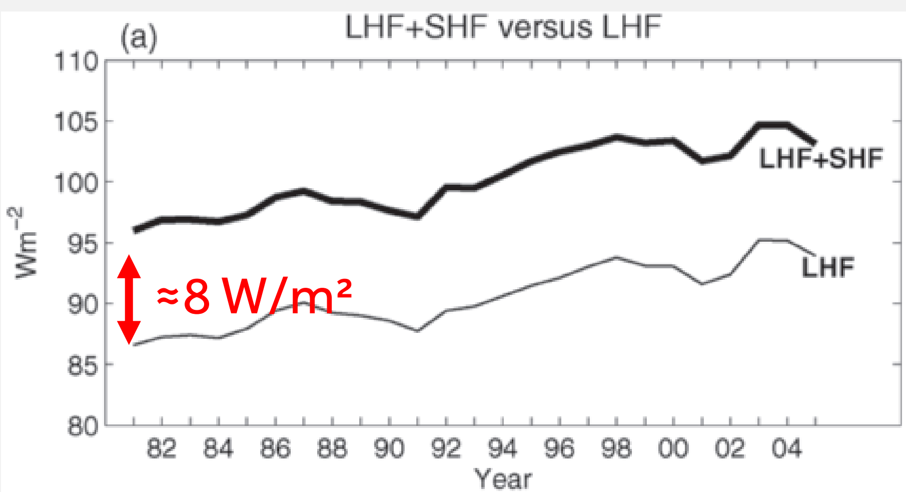
- Averaged across 30°S-60°N
- Pacific $\bar{e}$ and $\bar{p}$ approximately equal all year round
- Atlantic $\bar{e}$ exceeds $\bar{p}$ all year round
- Precipitation is therefore greater over the Pacific than the Atlantic



ERA-Interim $\bar{e}$ and $\bar{p}$



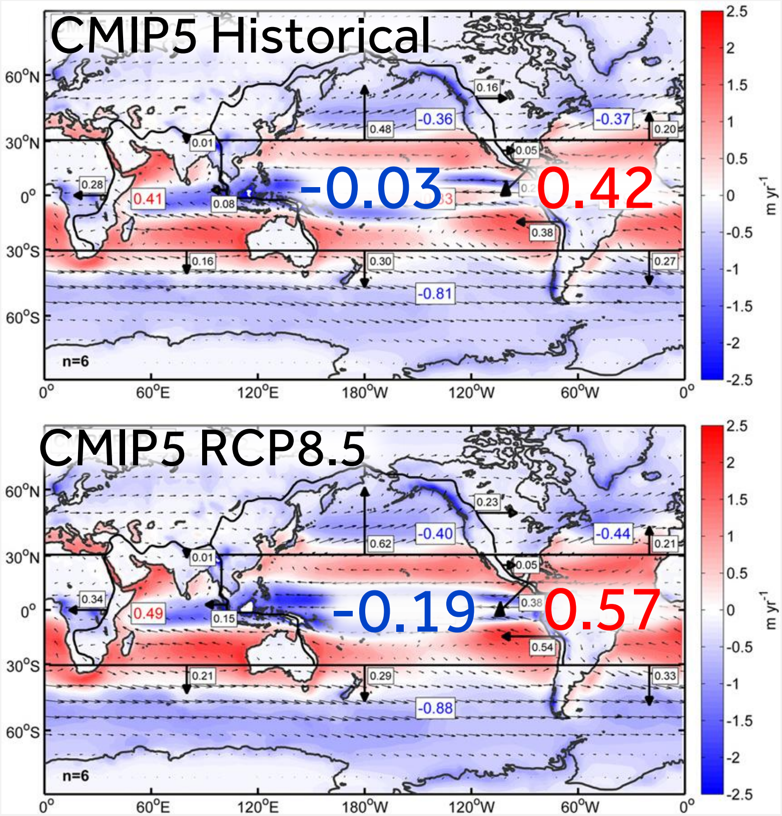
- 2002-06 precip. variability is not robust due to DA problems (Dee *et al.*, 2011)
- ERA-Interim does capture 97-98 El Niño and 2010 NAO
- Evaporation trends are consistent with SST increases, comparable to other estimates (Yu & Weller, 2007; Iwasaki *et al.*, 2014; Su & Feng, 2015)



Yu & Weller (2007)

Moisture transport

- Atlantic loses water to atmosphere – where is it transported to?
  - Pacific: across Central America? (e.g. Broecker, 1991)
- Increasing $E - P$ asymmetry
- Changes in precipitation



Levang & Schmitt (2015)

- Intensifying hydrological cycle (Held & Soden, 2006)
- Increasing SSS asymmetry consistent with intensifying hydrological cycle (Durack & Wijffels, 2010)
  - Positive feedback on AMOC!

Summary and Conclusions

- Estimates of $E - P - R$ are in good agreement
- $E - P - R$ asymmetry dominated by:
  - Evaporation at high latitudes
  - Precipitation south of 20°N
- Precipitation is greater over the Pacific at basin scale
- ERA-Interim precipitation trends/interannual variability not robust
- Evaporation trend consistent with other estimates
- Link between moisture transport and AMOC

Craig, P.M., Ferreira, D. and Methven, J. The contrast between Atlantic and Pacific Surface Water Fluxes, *in revision*, Tellus A