

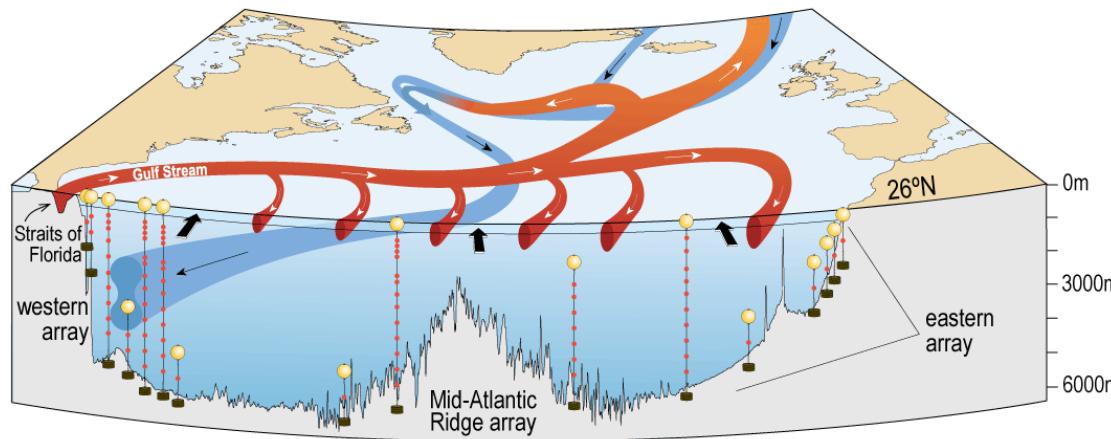
Oceanic fluxes of freshwater and heat at 26°N in the Atlantic

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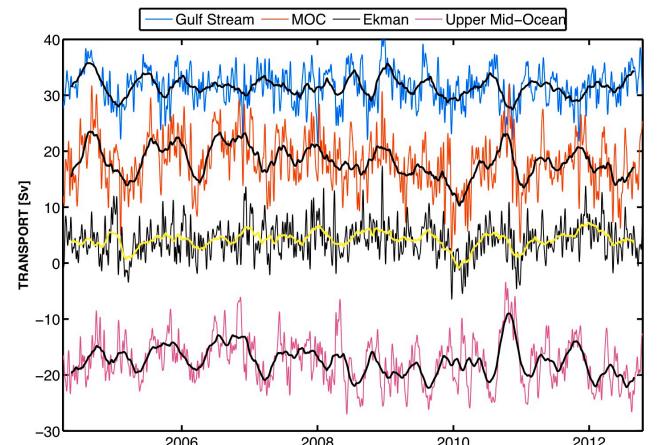
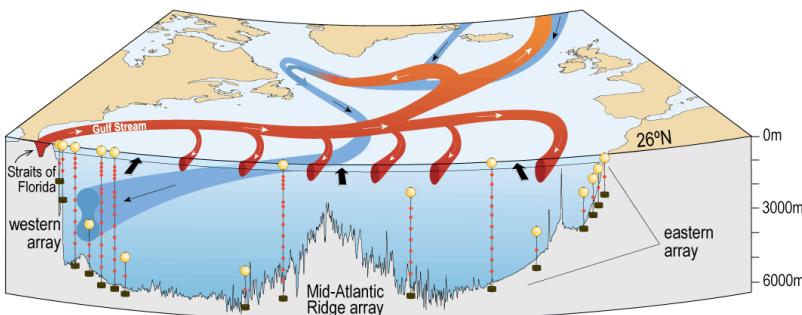
NERC's RAPID-WATCH program (MONACO)



Brian King, Harry Bryden, Peggy Courtois, Stuart Cunningham, Zoltan Szuts (MPI), Chris Atkinson

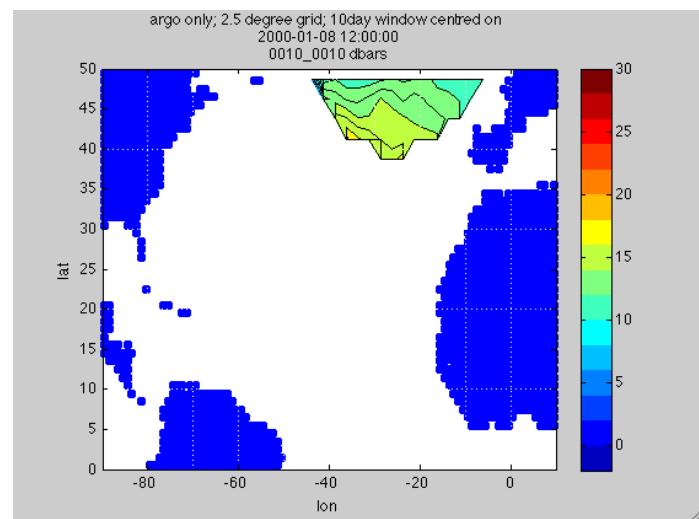
Observations

- Transport time series from the Rapid array



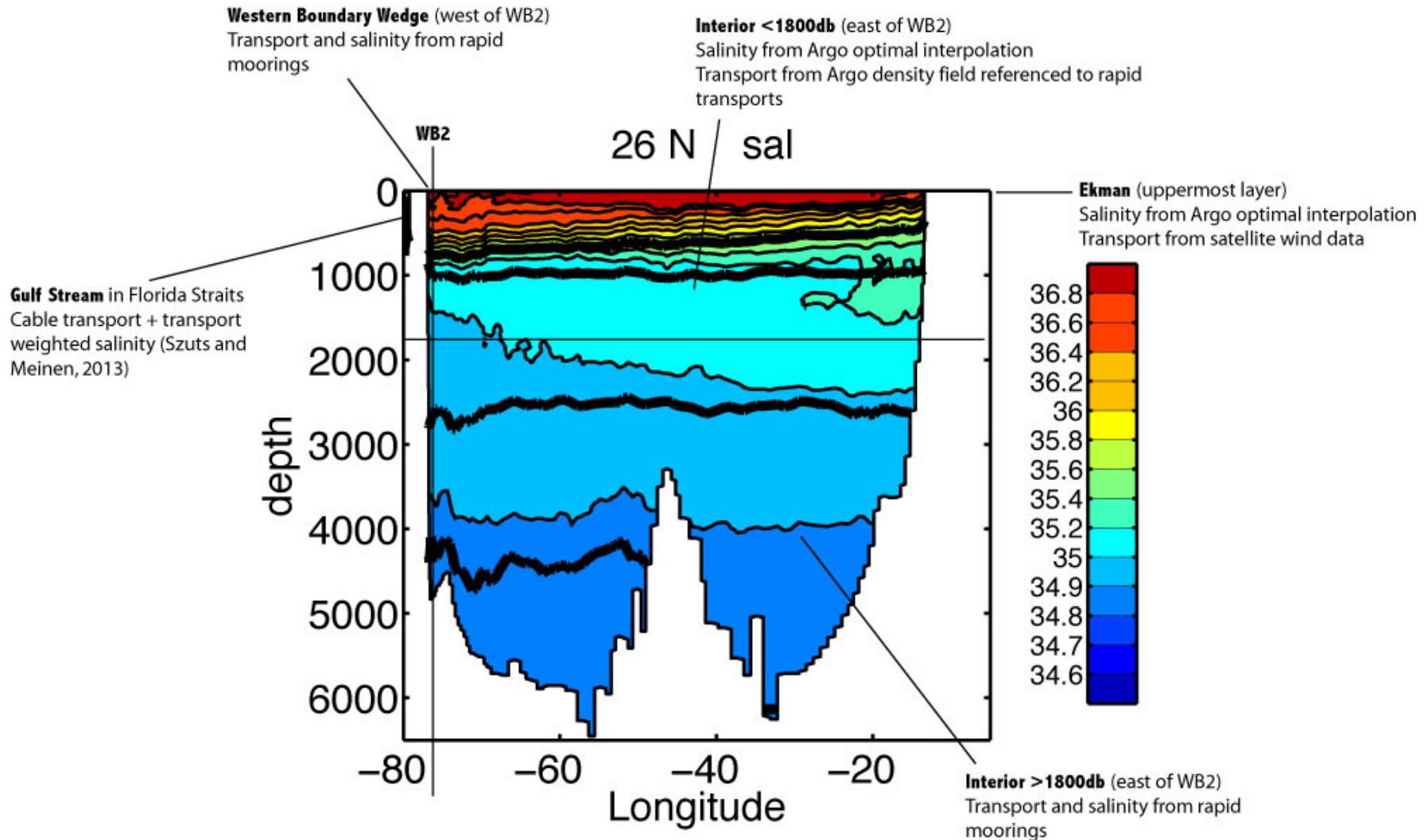
www.noc.soton.ac.uk/rpdmoc

- Temperature and salinity data from the Rapid array



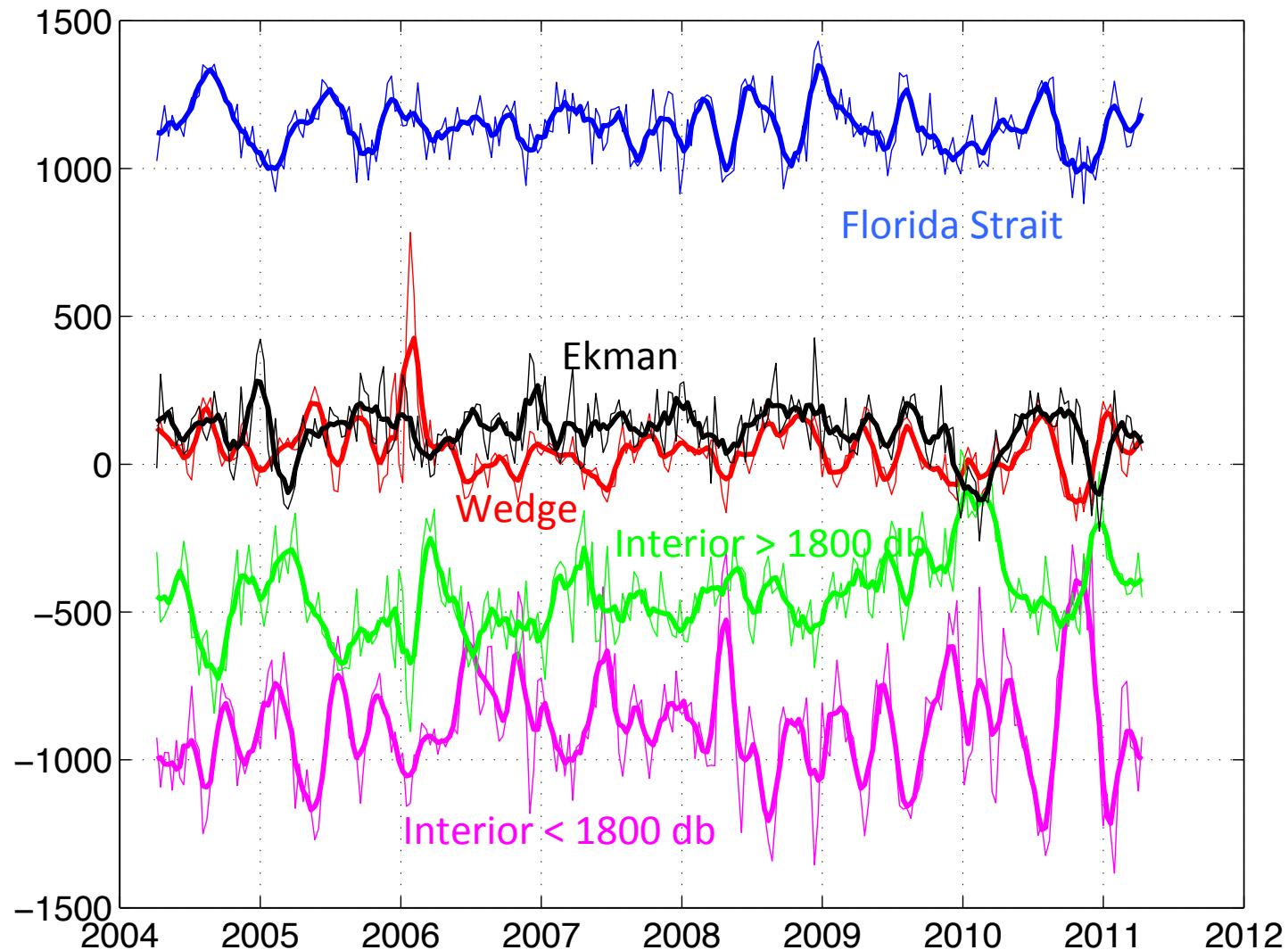
- Optimally interpolated Argo data

How do we calculate it?



- Estimate of temperature, salinity and velocity field every ten days

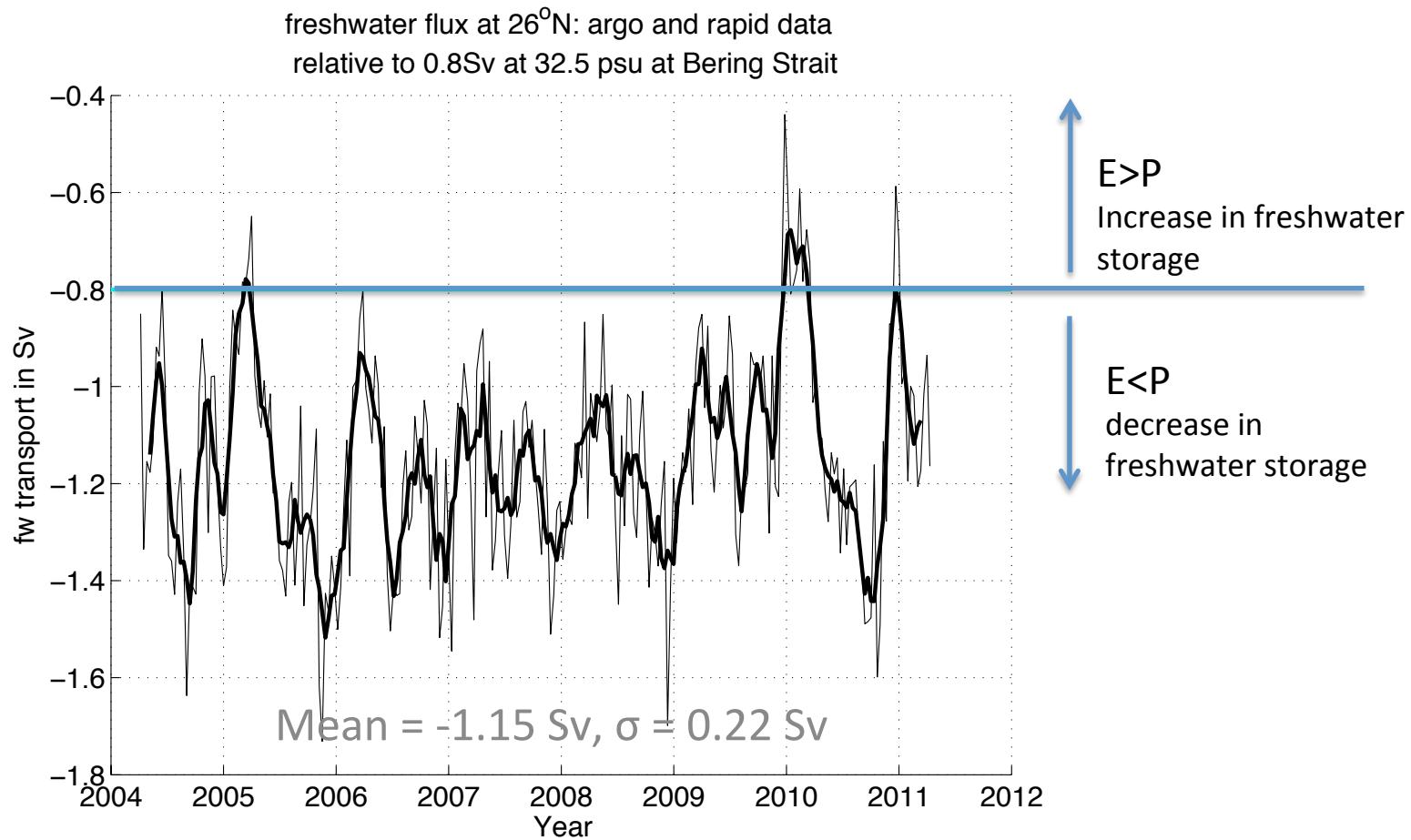
How do we calculate freshwater flux?



How do we calculate freshwater flux?

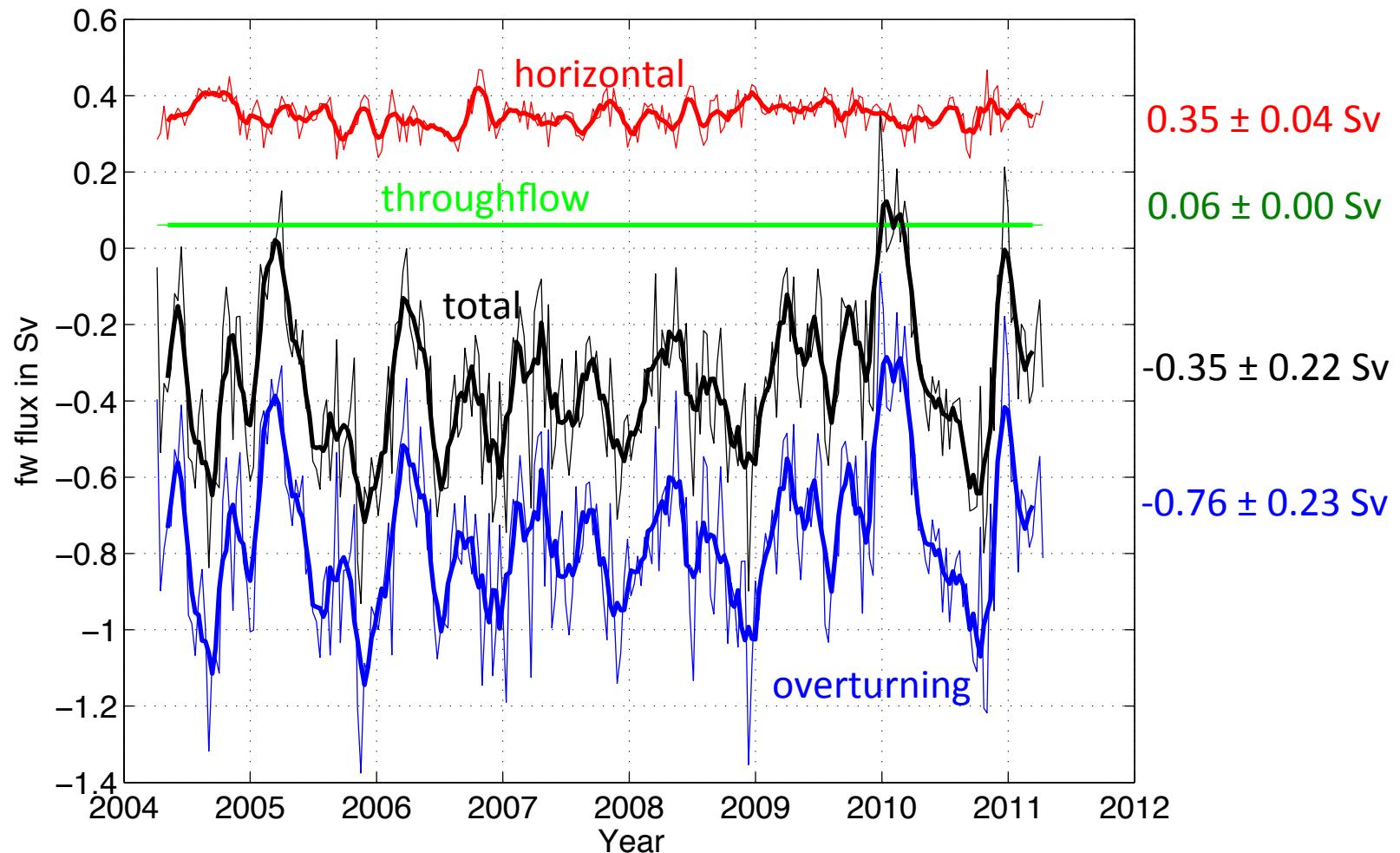
- Constrain the salinity flux at each timestep to be -26 Svpsu (salinity flux at Bering Strait) by adding a volume flux at the section average salinity.
- The net volume flux across the section is the freshwater flux.

Freshwater Flux at 26°N



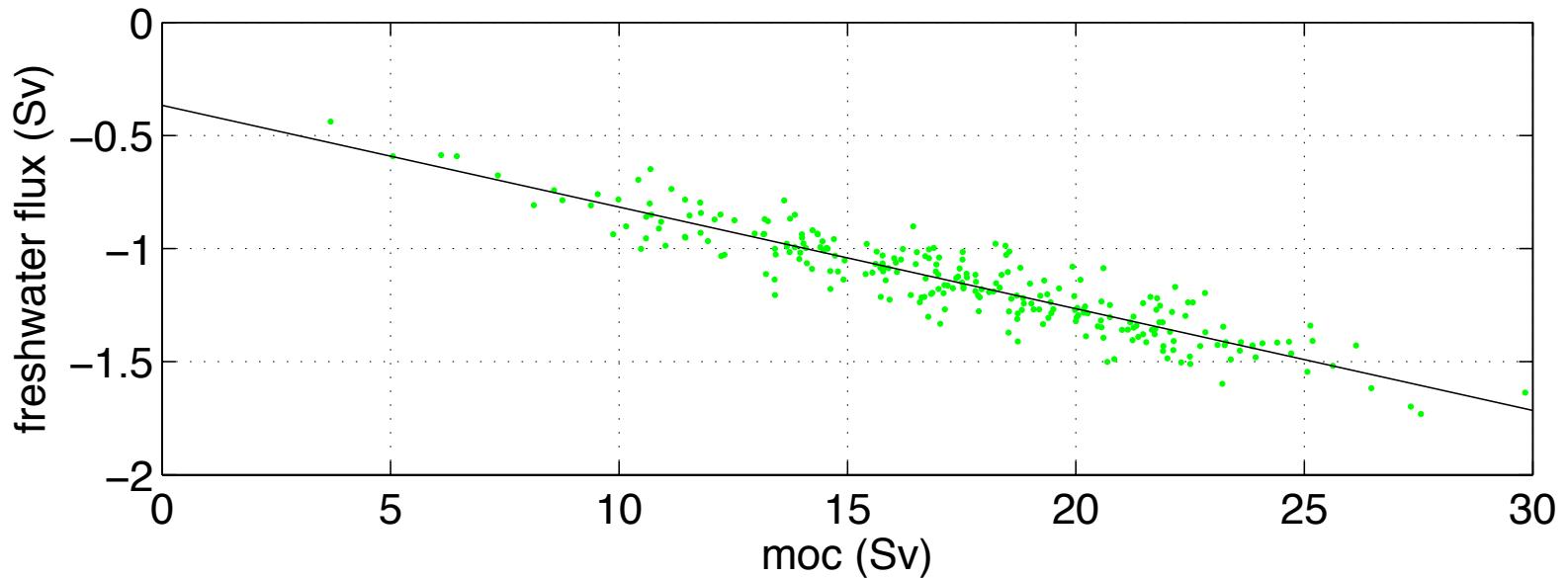
- Mass flux across the section
- Based on oceanic salinity conservation
- Difference in volume flux across Bering Strait and 26°N (freshwater divergence) includes air-sea fluxes (Evaporation, precipitation), runoff, ice melt/formation, oceanic salinity storage/freshening

Components of the equivalent freshwater flux



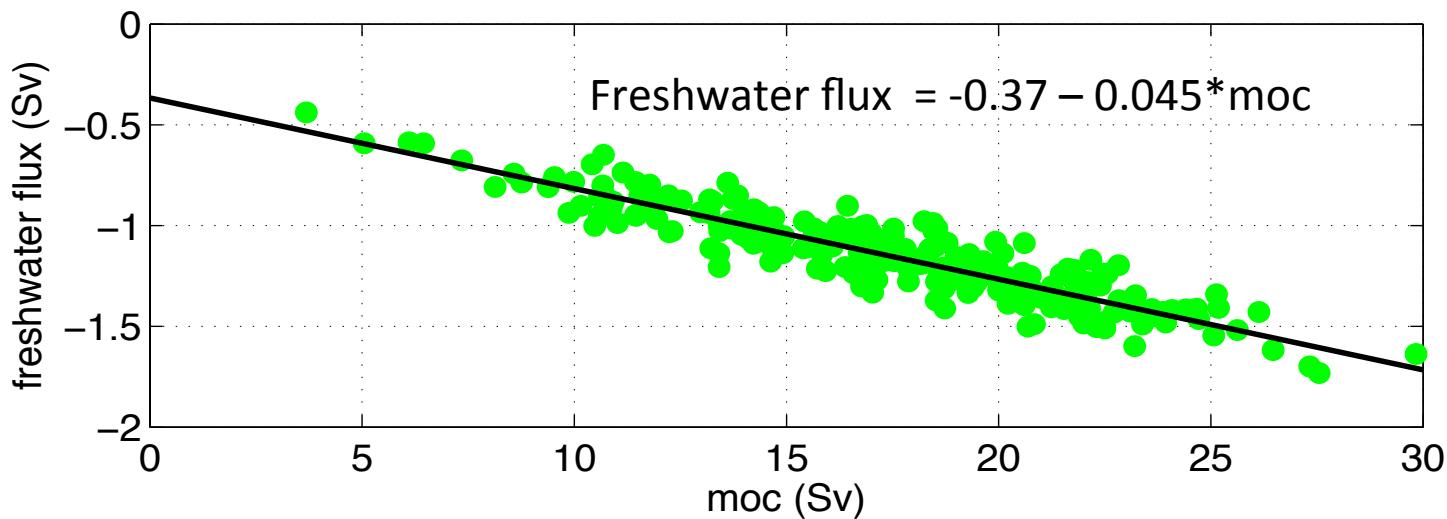
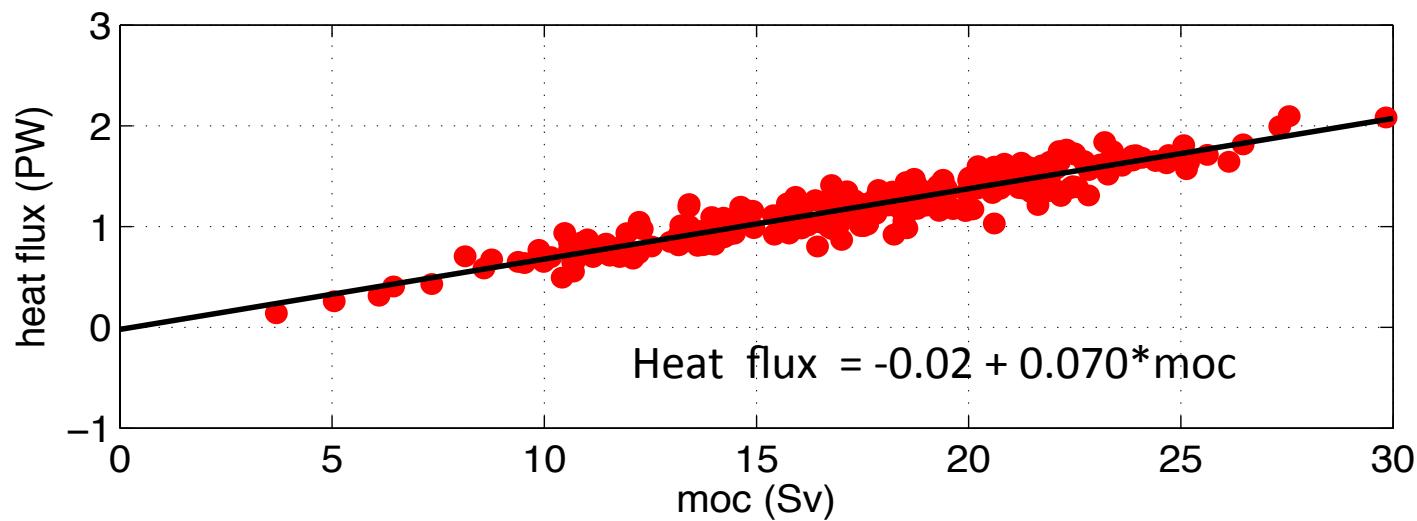
The overturning circulation transports freshwater southwards

Relationship between moc and freshwater flux

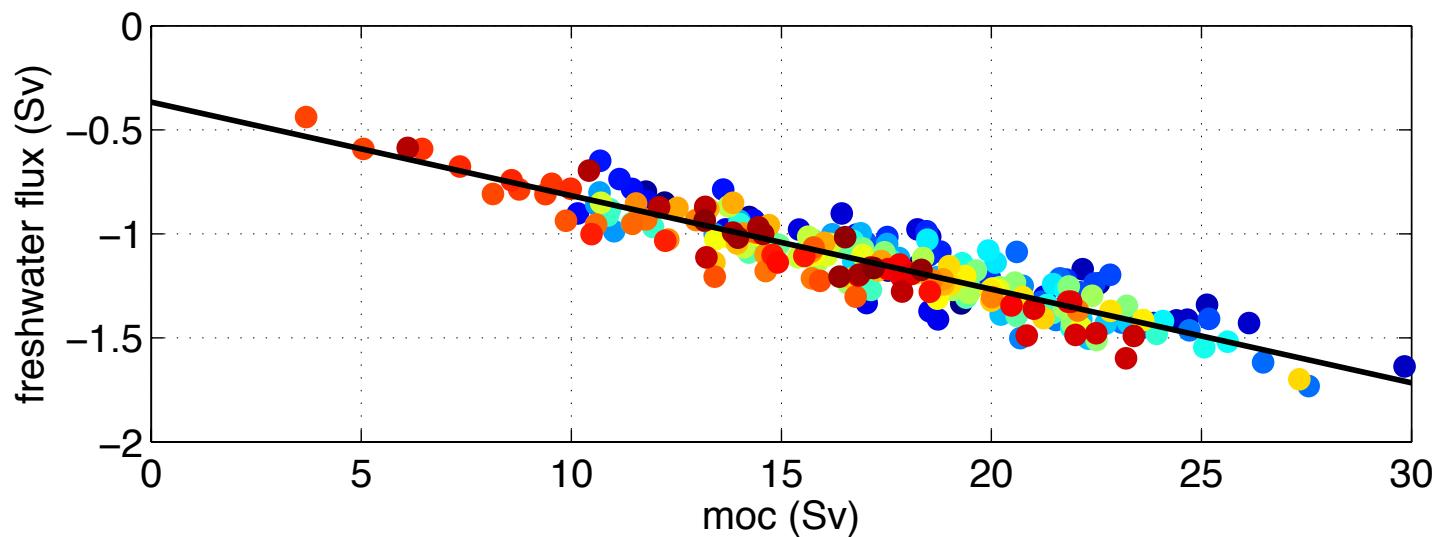
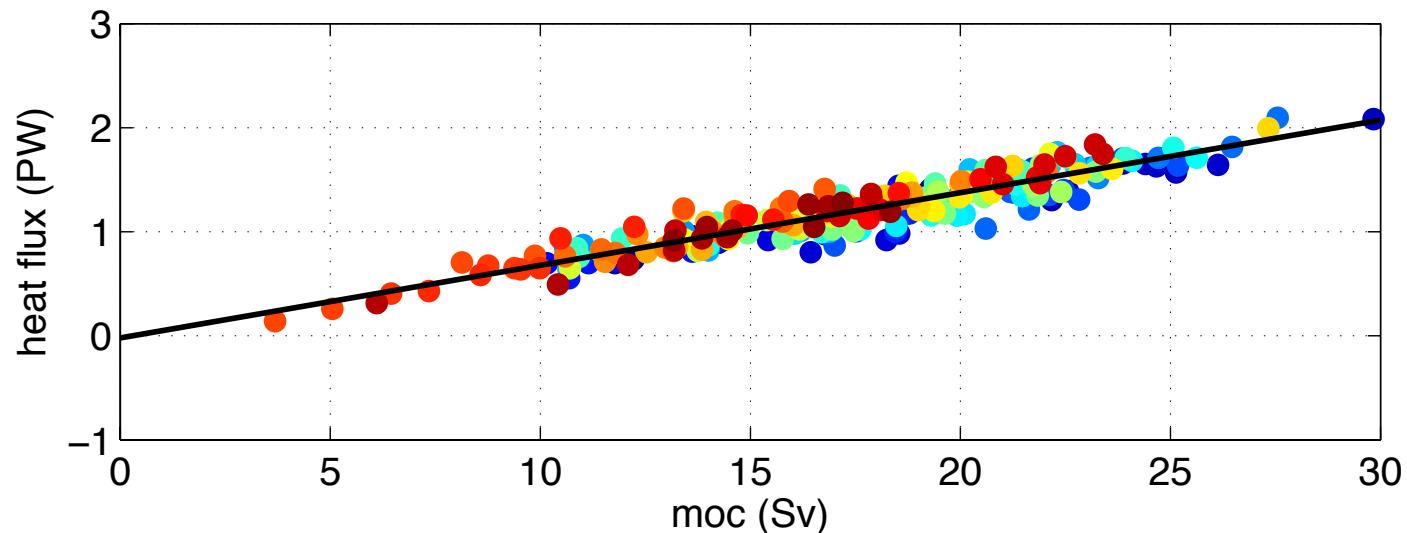


$$\text{Freshwater flux} = -0.37 - 0.045 * \text{moc}$$

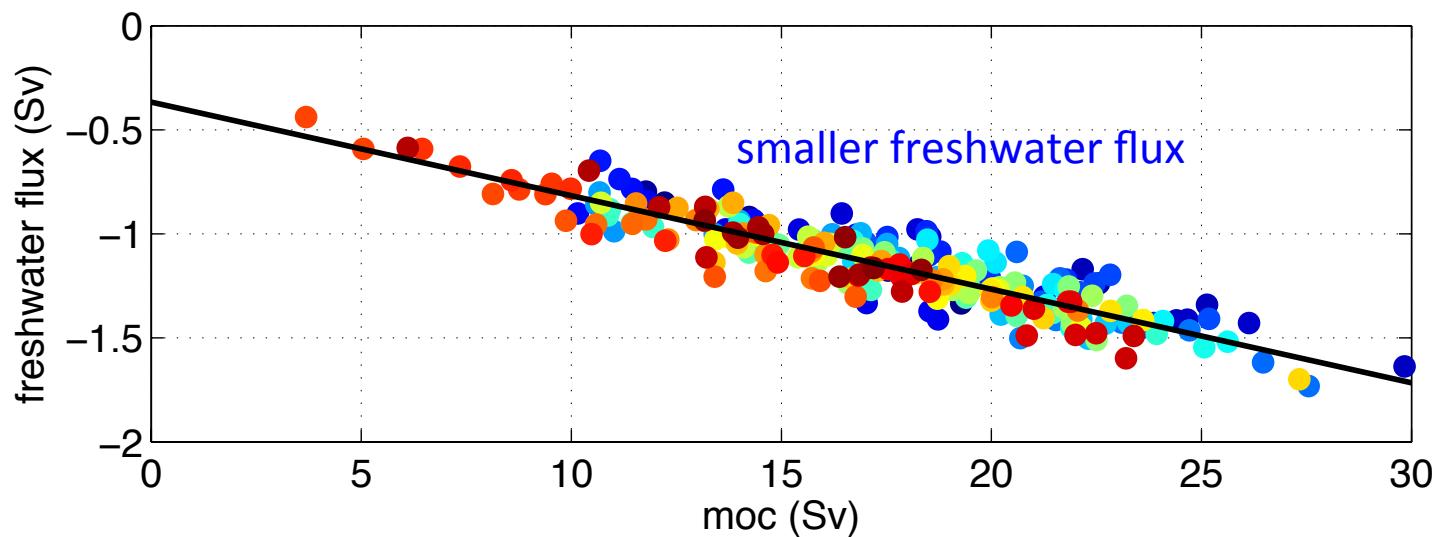
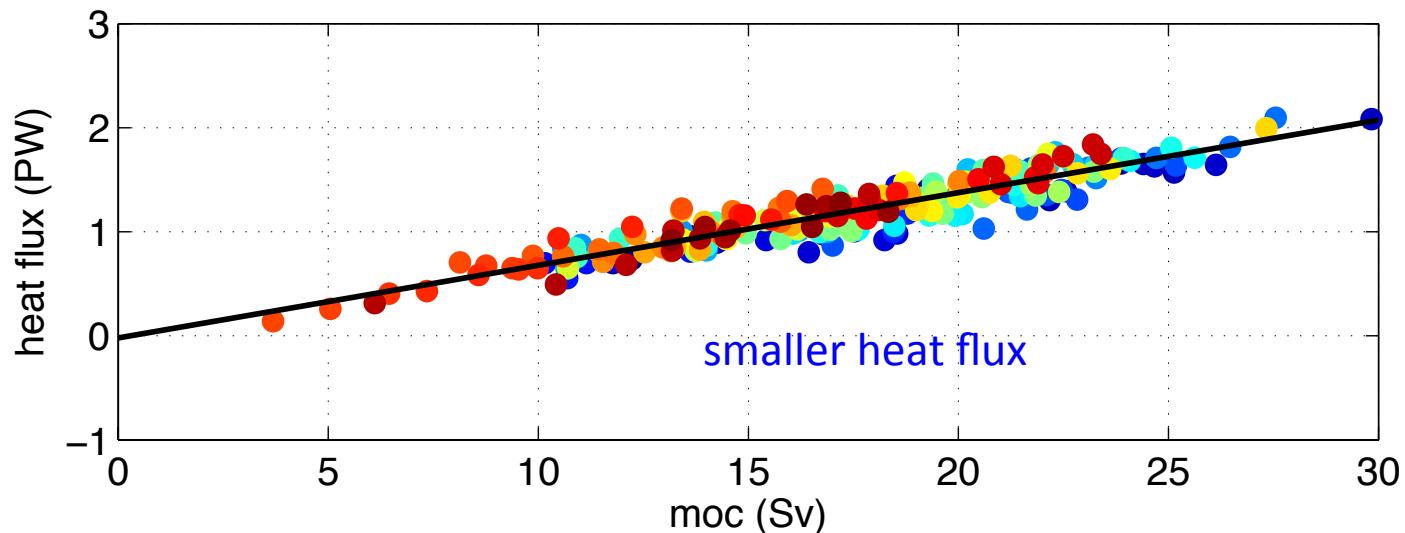
84% of variance in the freshwater flux can be explained by variability in moc



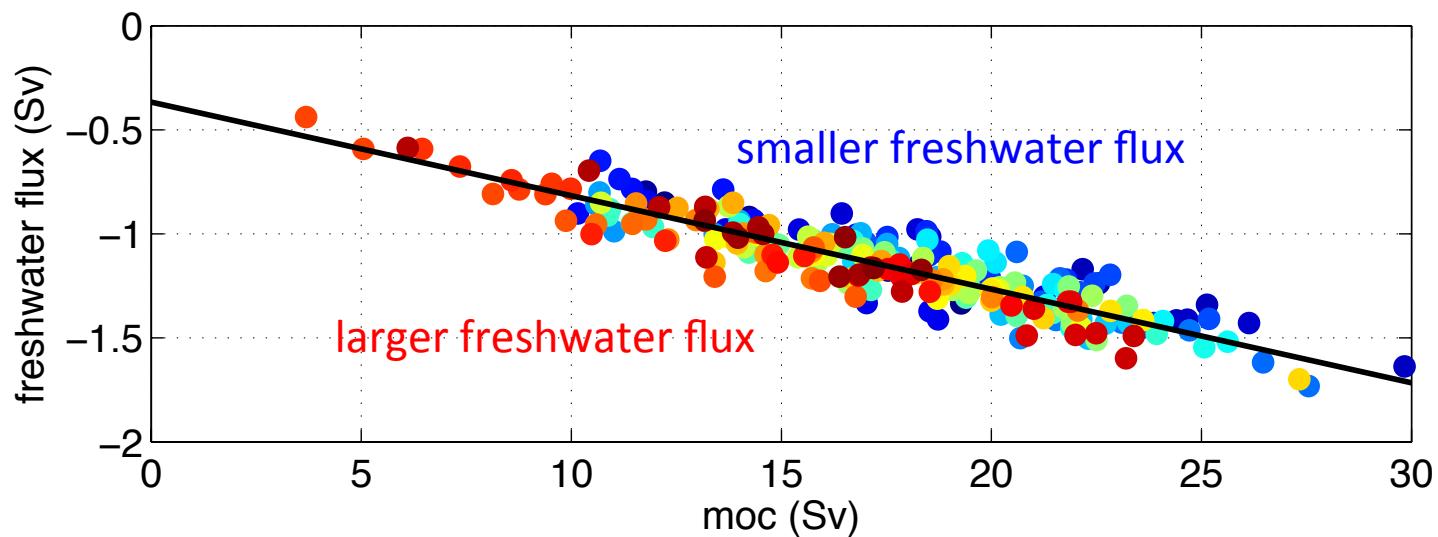
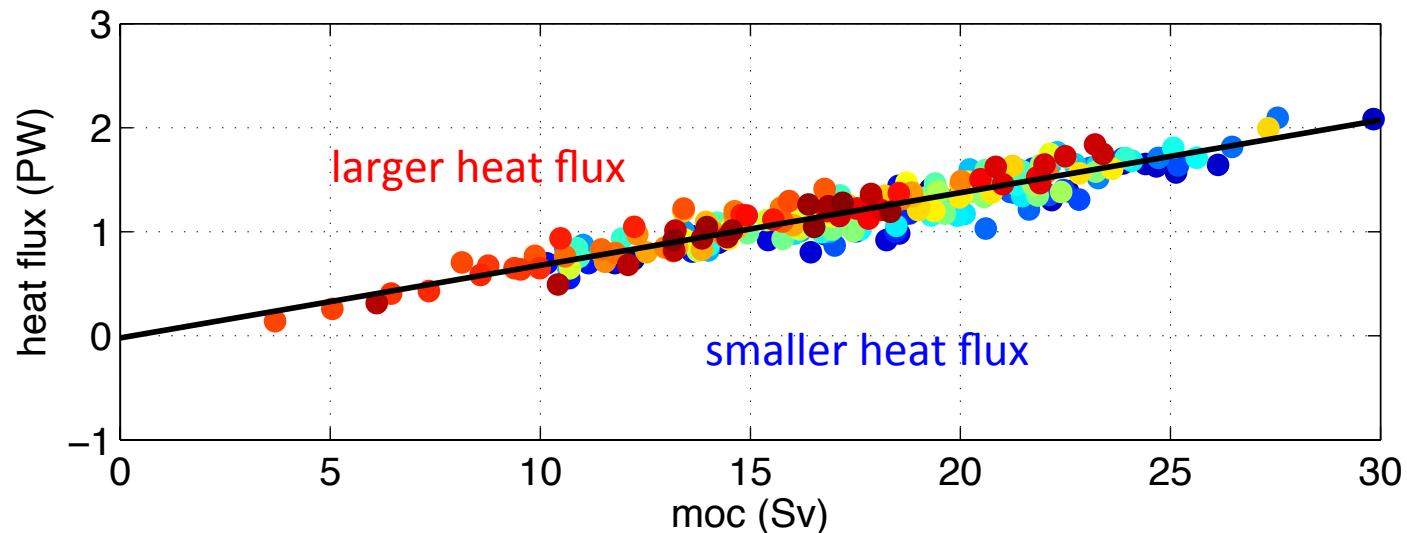
2004 to 2011



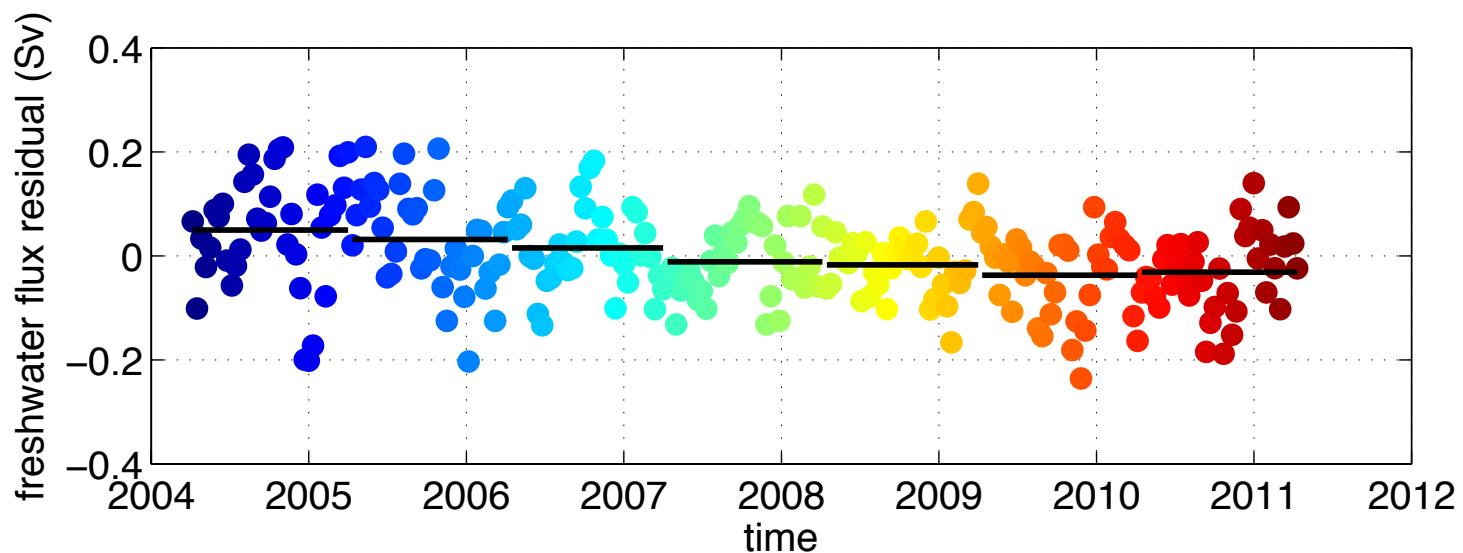
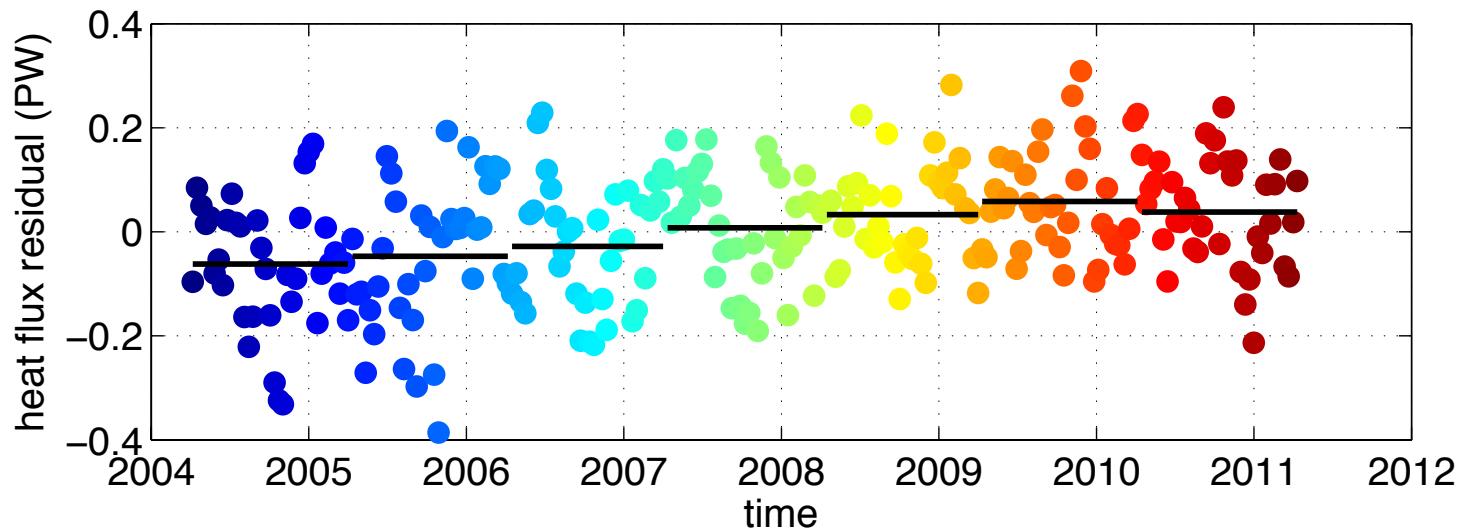
2004 to 2011



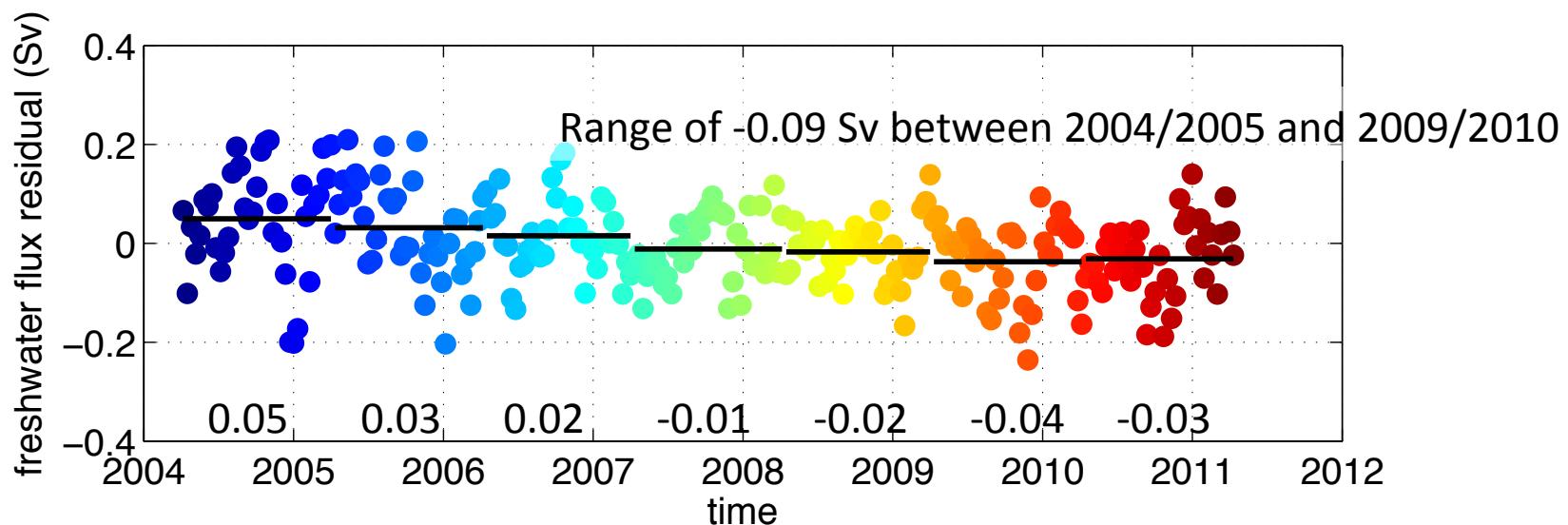
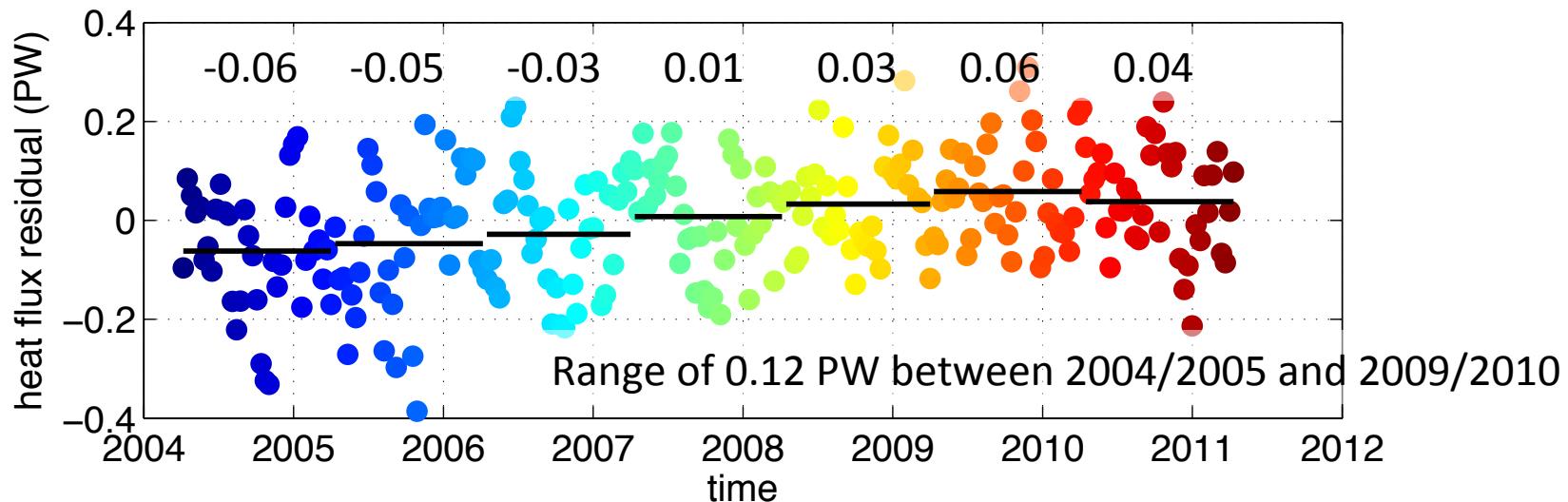
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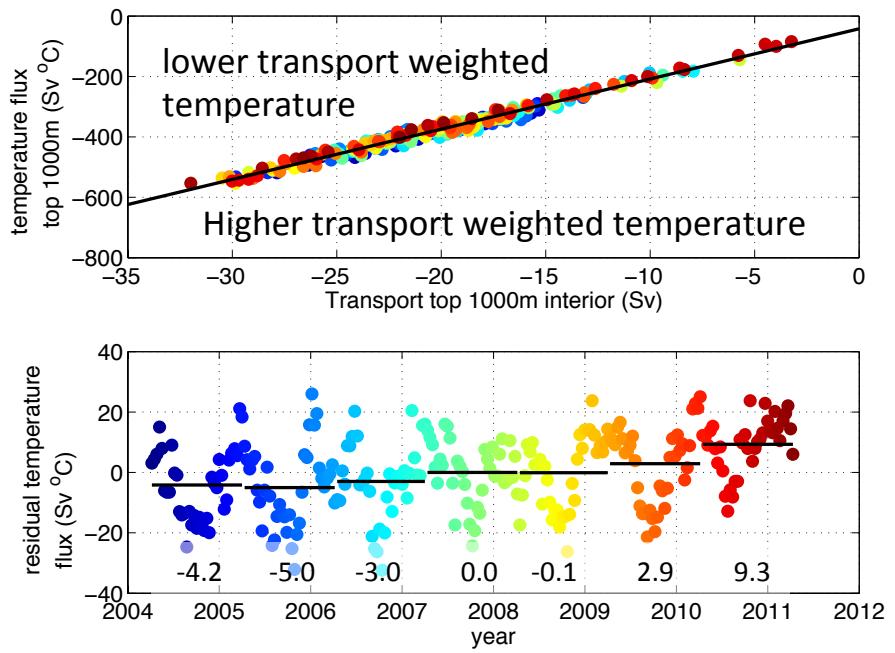
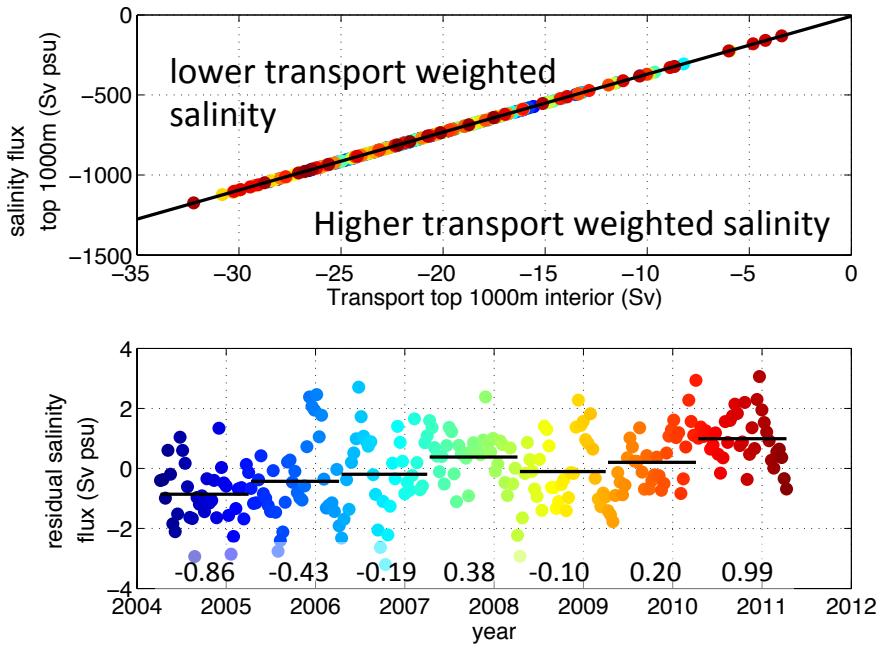
Residual variability over time



Residual variability over time



Interior shallower than 1000 m



- Reduction in the transport weighted salinity with time
- Reduction in the transport weighted temperature with time
- Cooling and freshening of this southward interior flow will be associated with an increase in the northward heat flux and southward freshwater flux

Summary

- Variability in the heat and freshwater fluxes is dominated by variability in the moc.
- There is also systematic variability in addition to this that tends to larger heat fluxes and larger freshwater fluxes between 2004 and 2011.
- Between 2004 and 2011 variability in the transport weighted temperature and salinity is dominated by an interior freshening and cooling in top 1000m.