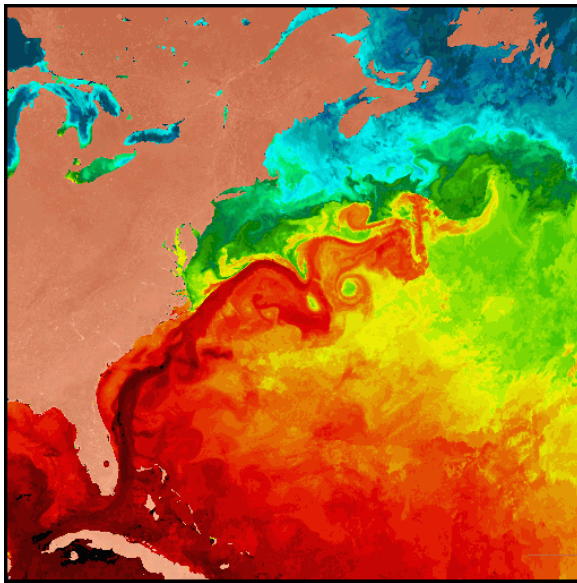
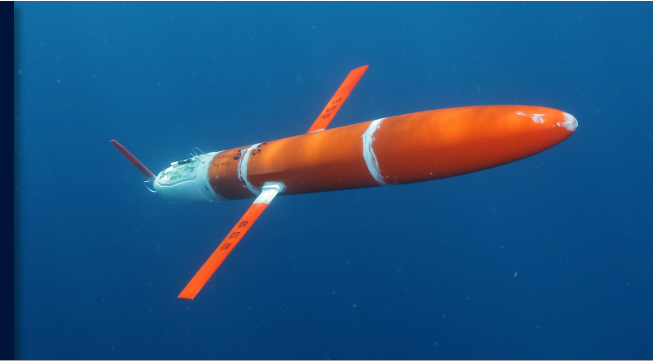


Along-Stream Evolution of Gulf Stream Transport



[<https://marine.coastal.edu/gulfstream/gs6.gif>]

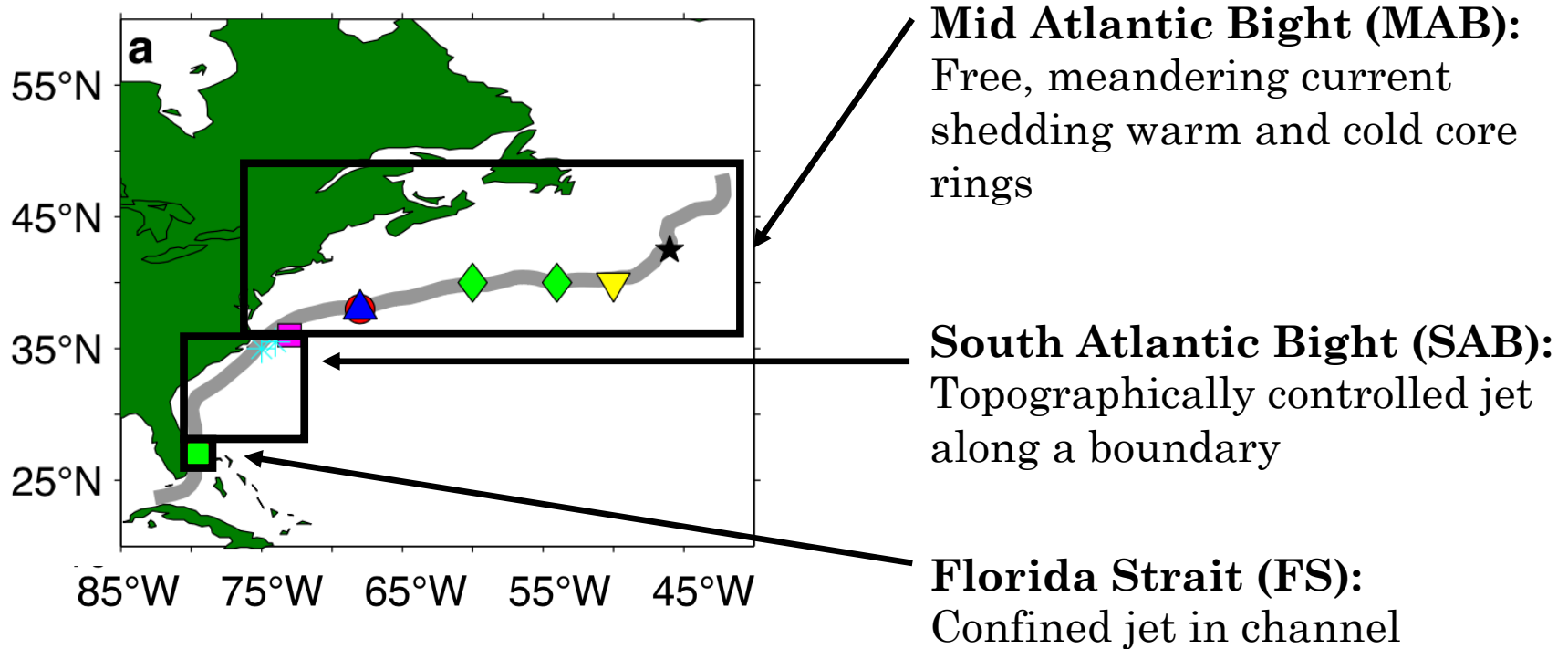
Joleen Heiderich^{1,2}

Robert E. Todd¹

¹ Woods Hole Oceanographic Institution

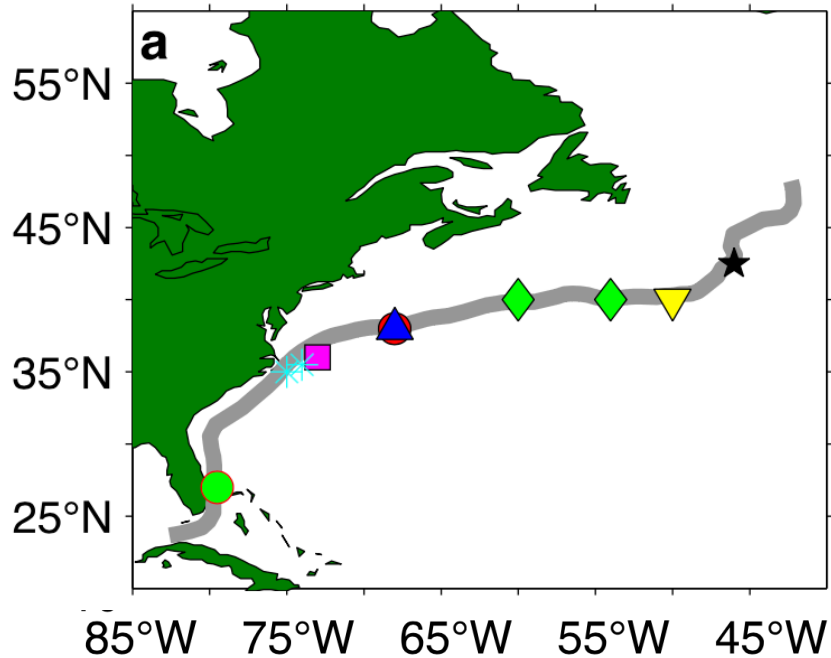
² Massachusetts Institute of Technology

The Gulf Stream Encounters Different Dynamical Regimes Along the US East Coast

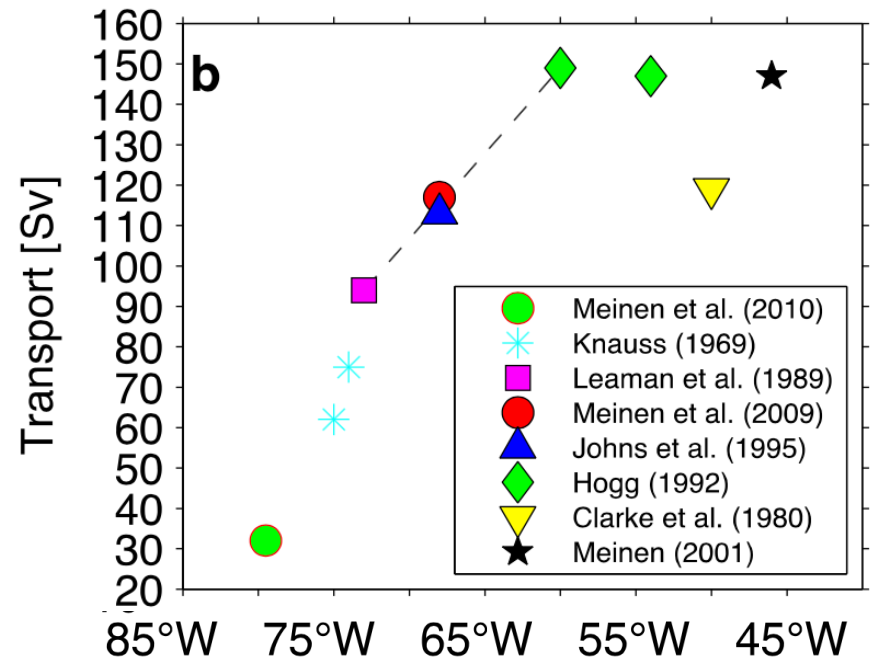


[Meinen and Luther, 2016, *DSR*]

The Along-Stream Evolution of Gulf Stream Transports from Isolated Experiments

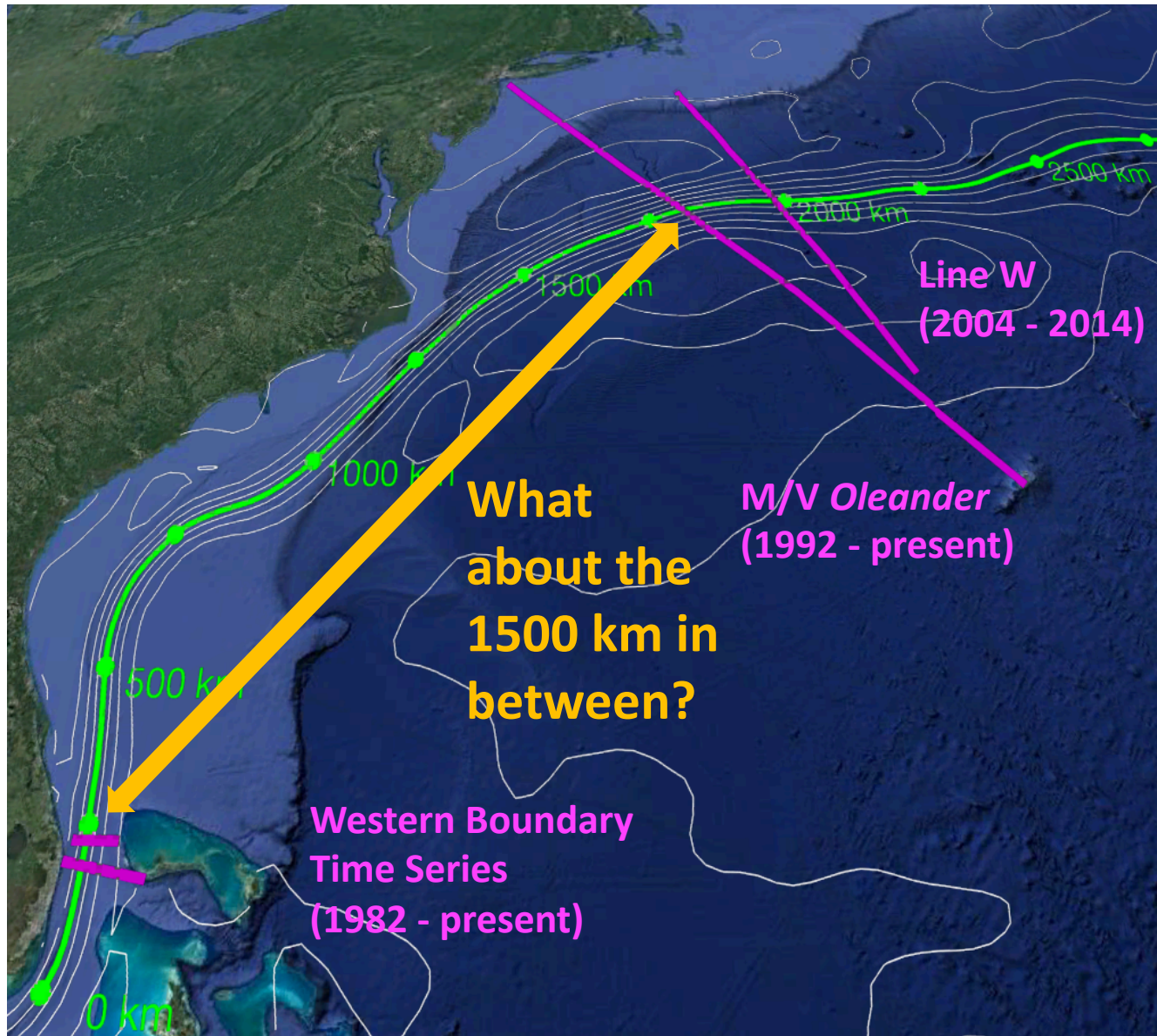


[Meinen and Luther, 2016, *DSR*]

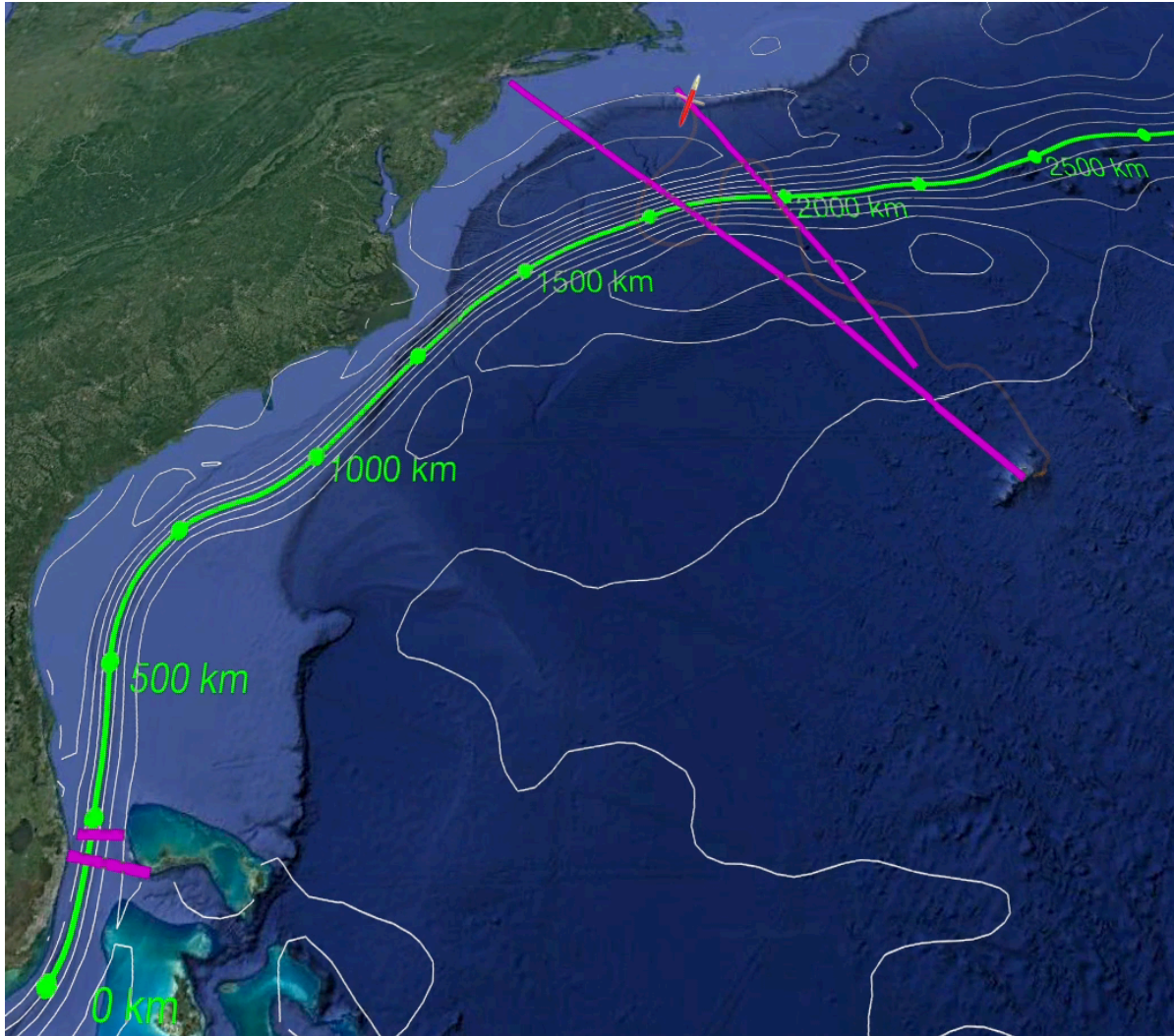


←————→
> 4000 km

Locations of Long-term Gulf Stream Transport Monitoring



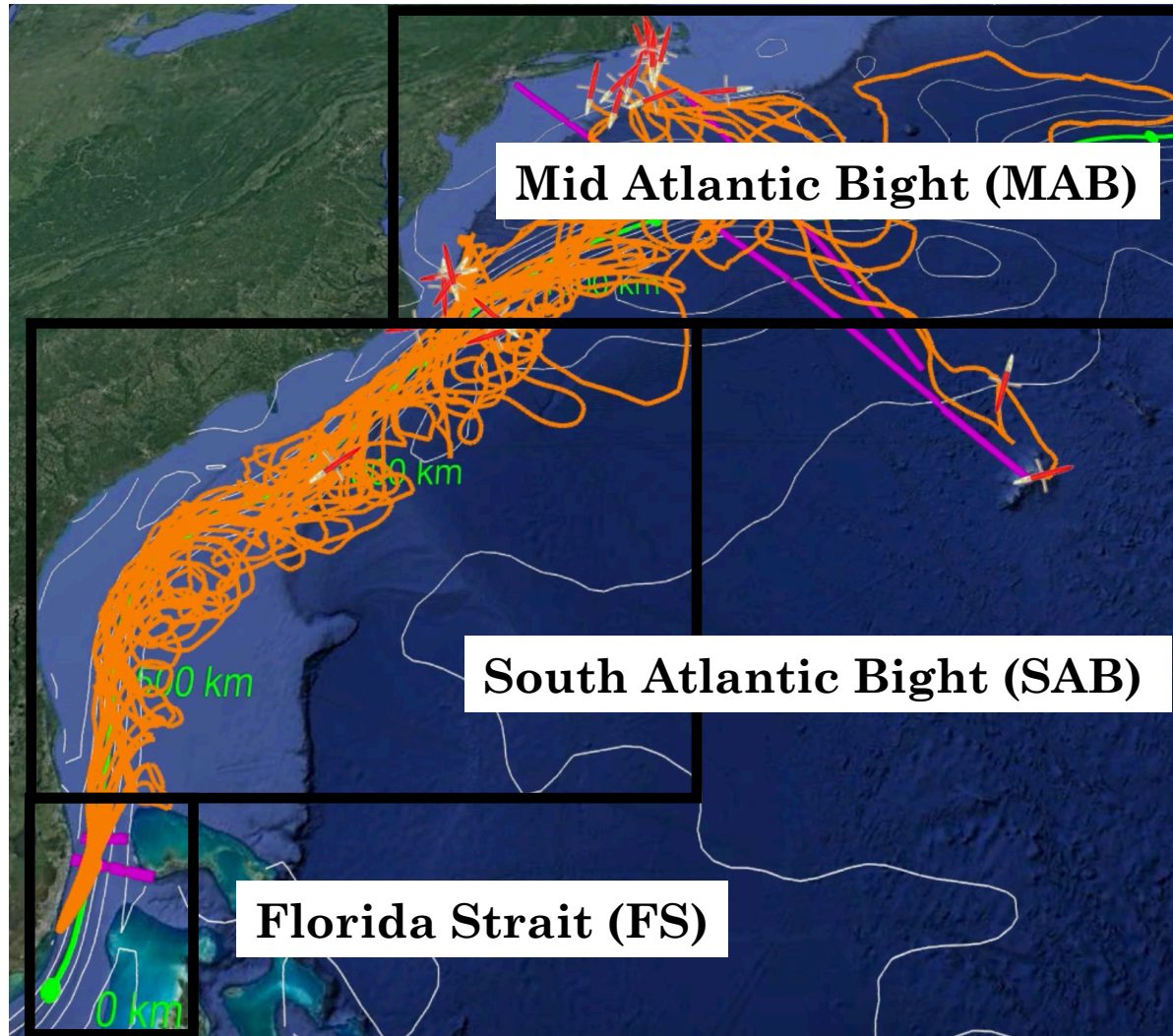
Gliders Fill Gap in Subsurface Gulf Stream Observations



Statistics:

- 2004 – present
- 22 complete missions, 2 underway
- 156 crossings (138 with AD2CP)
- ~ 14,000 profiles
- > 1,700 glider-days
- ~ 65,000 km over ground

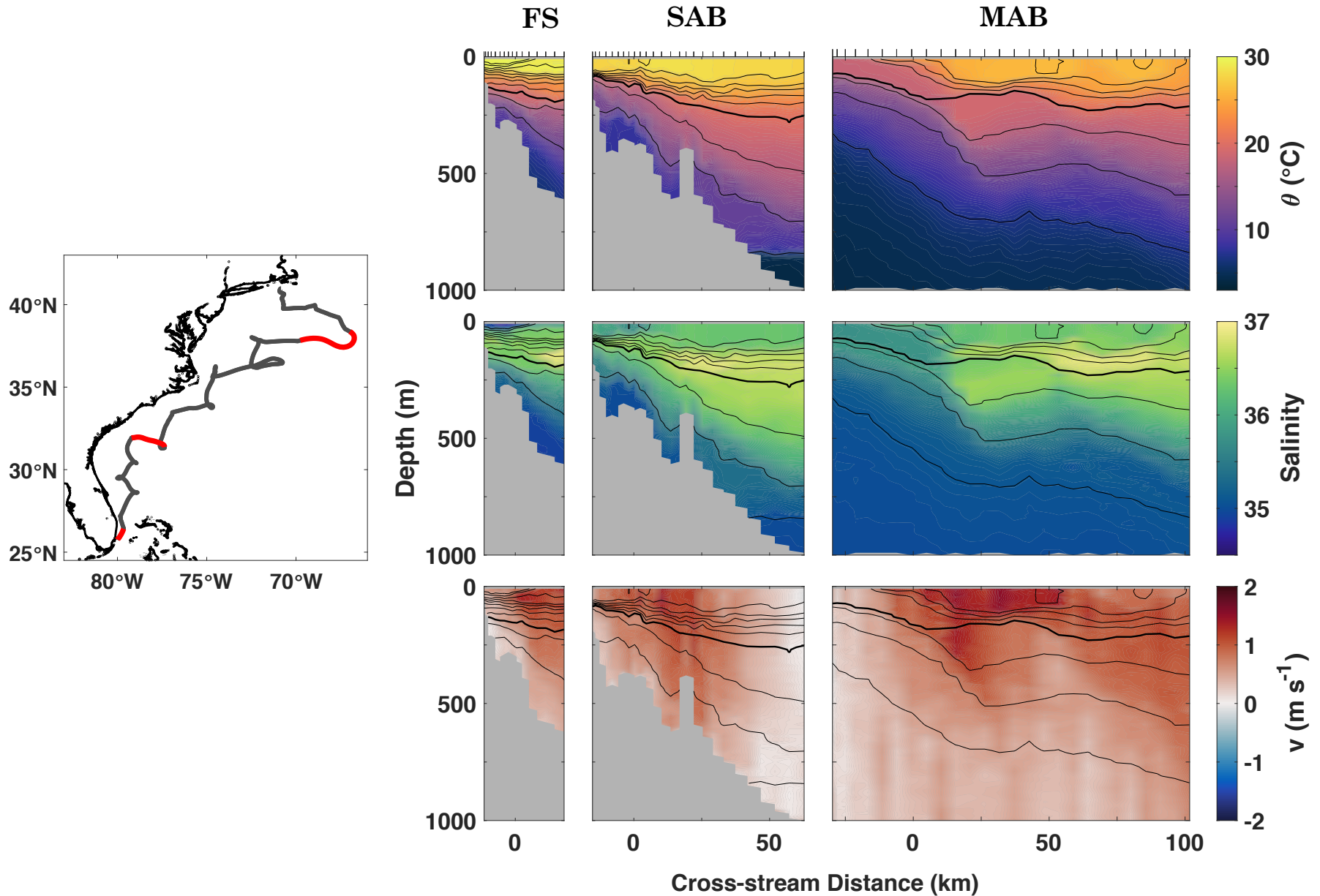
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Observations: Example Glider Cross-Gulf Stream Transects

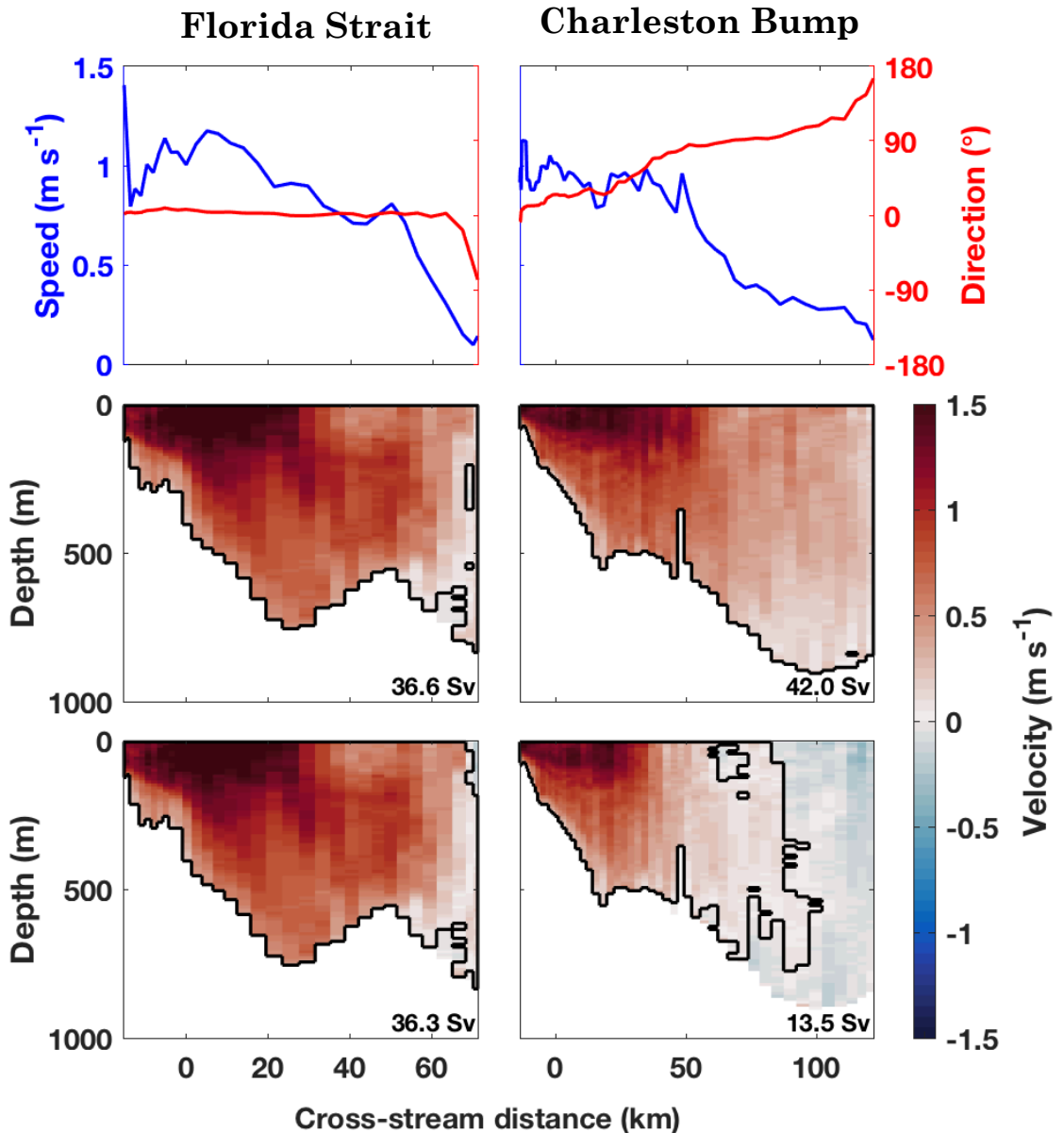


Challenges in Estimating Transports

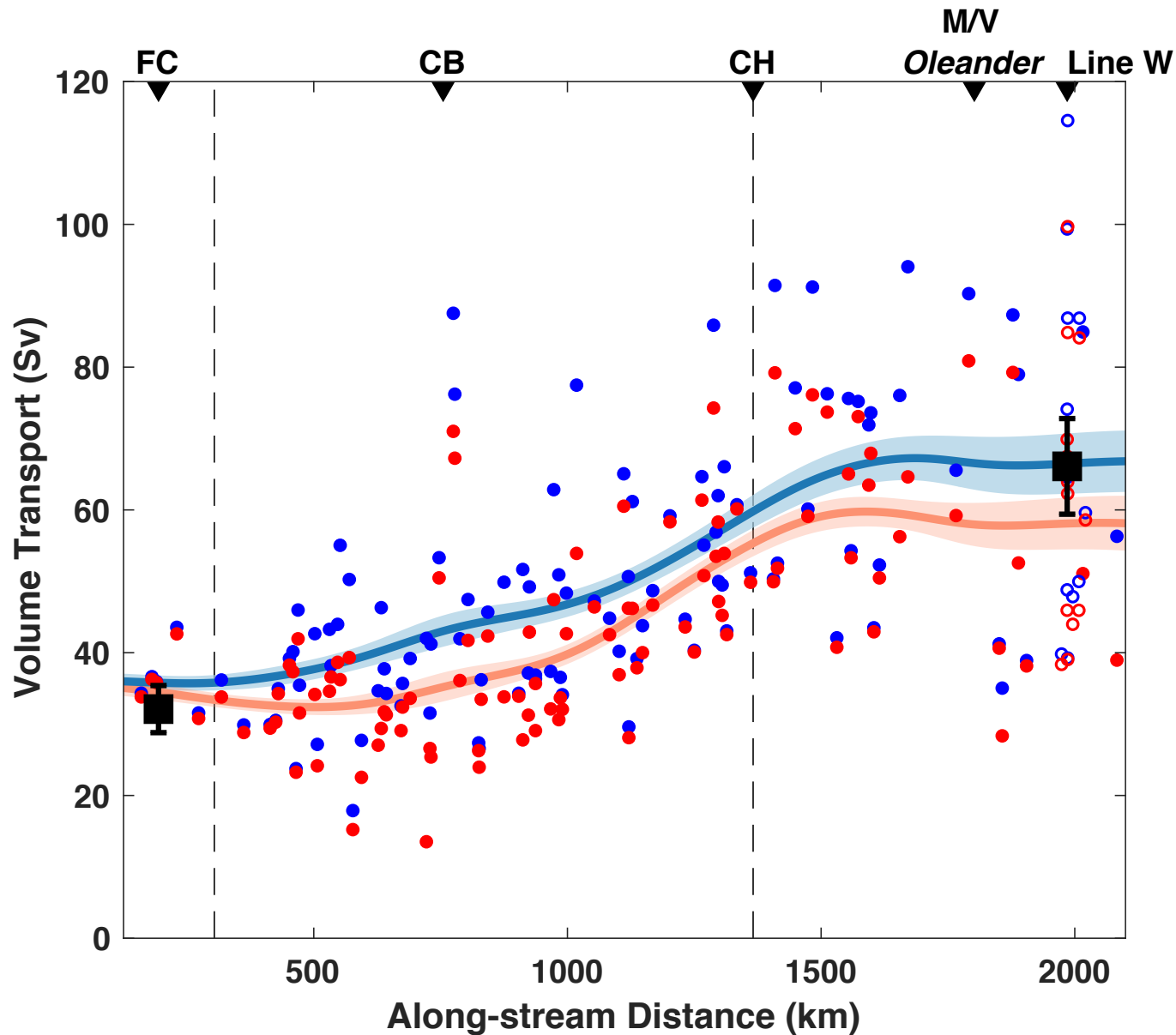
$$T = \iint_A v_{\perp} dA$$

↑ ↖
(2) (1)

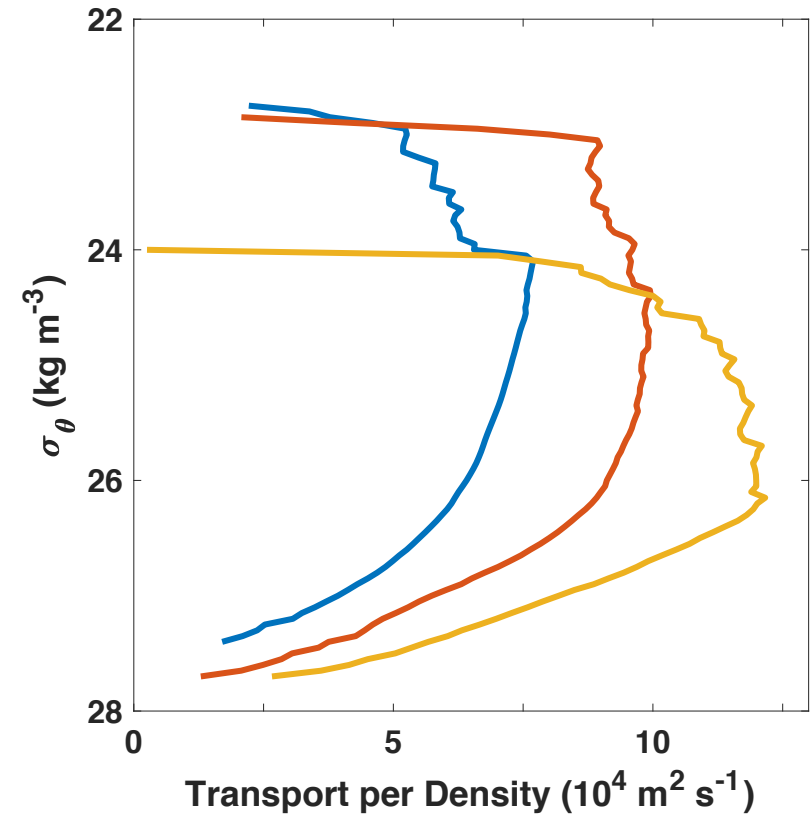
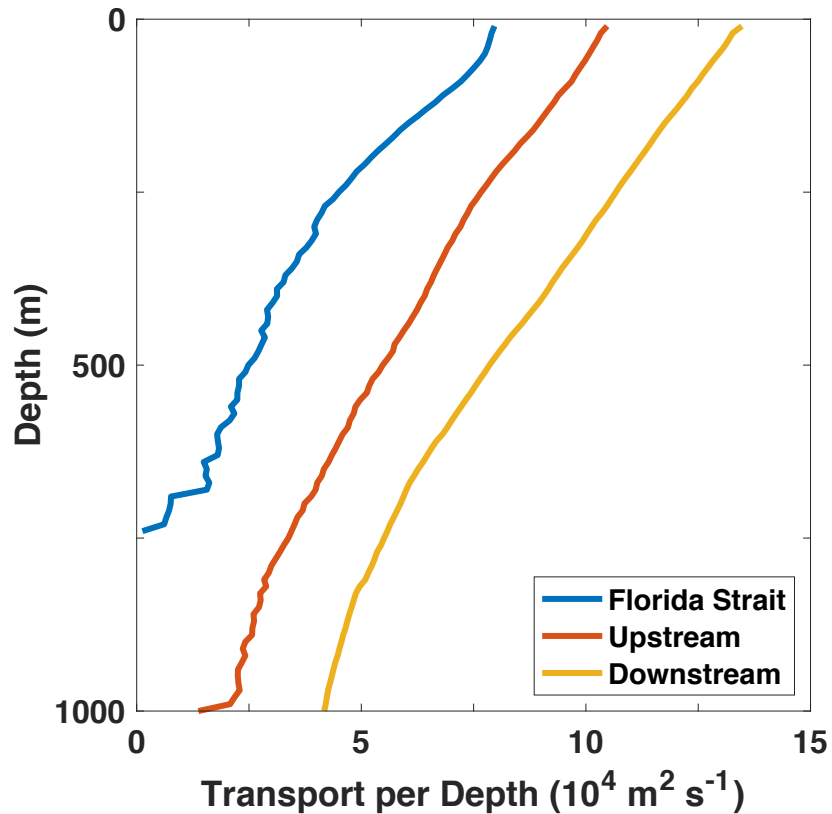
- ①. Defining downstream direction
- ②. Defining integration area



Along-Stream Increase of Volume Transports

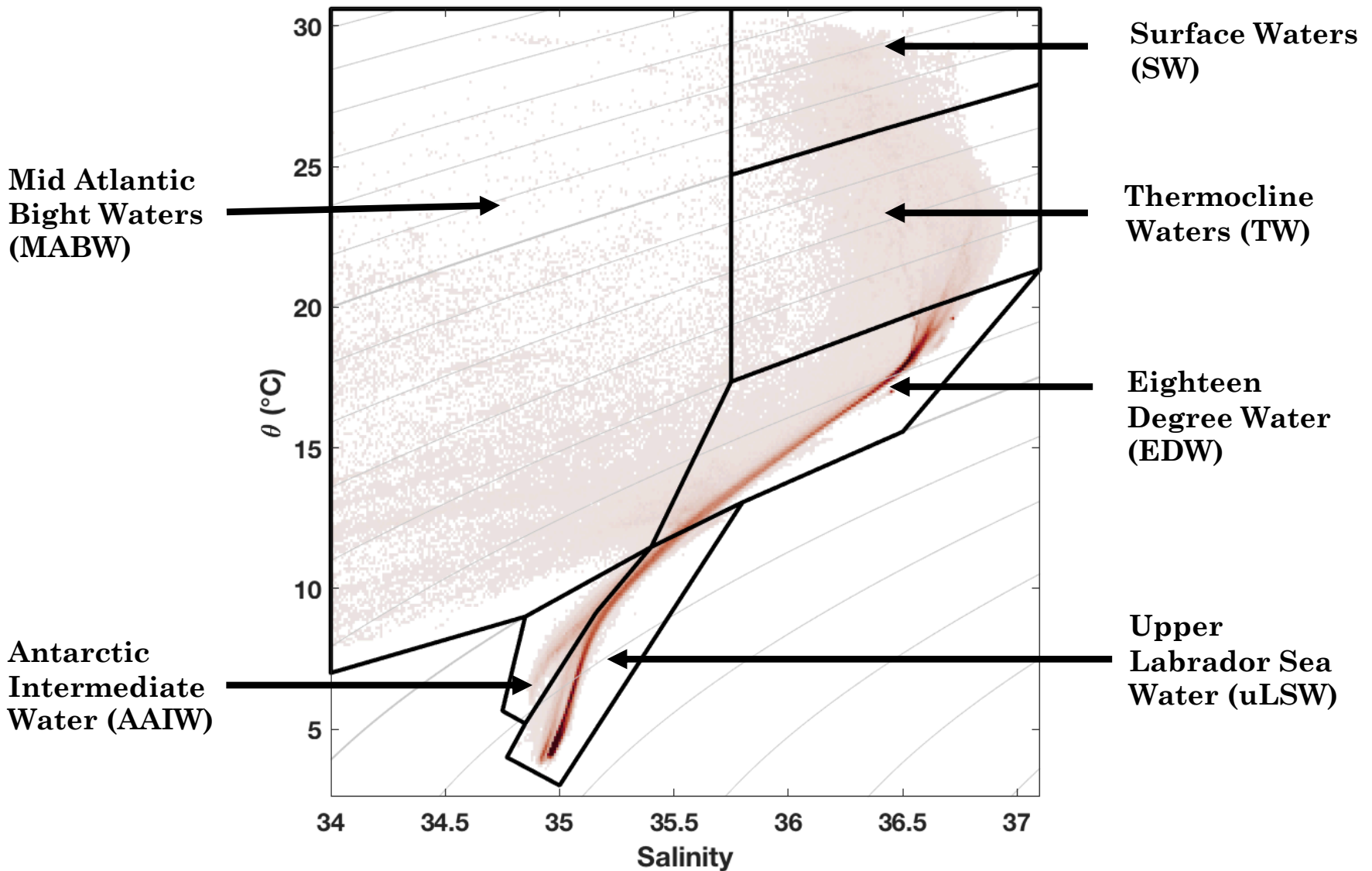


Vertical Structure of Volume Transports

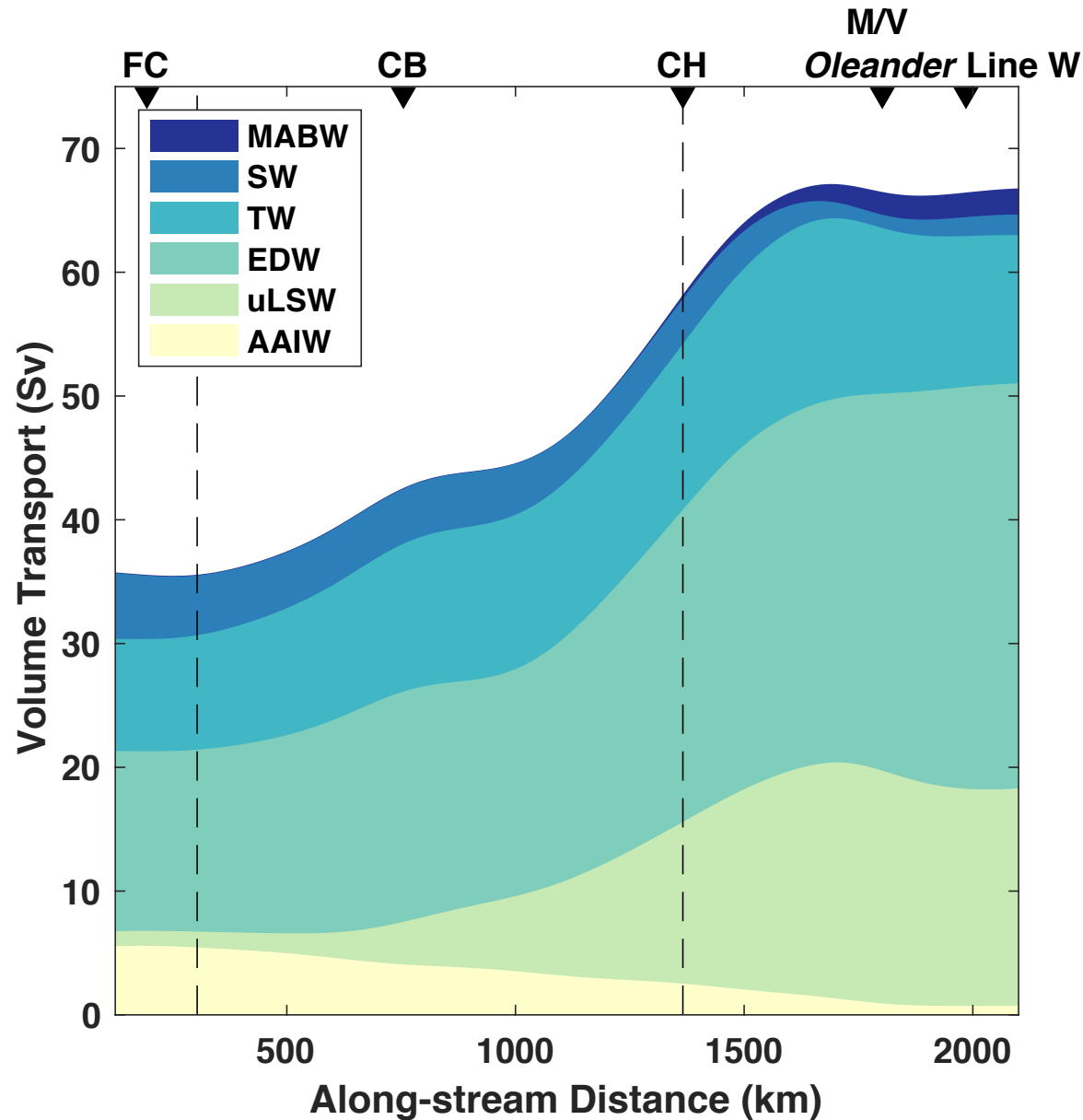


Transport increases barotropically downstream as the surface waters cool

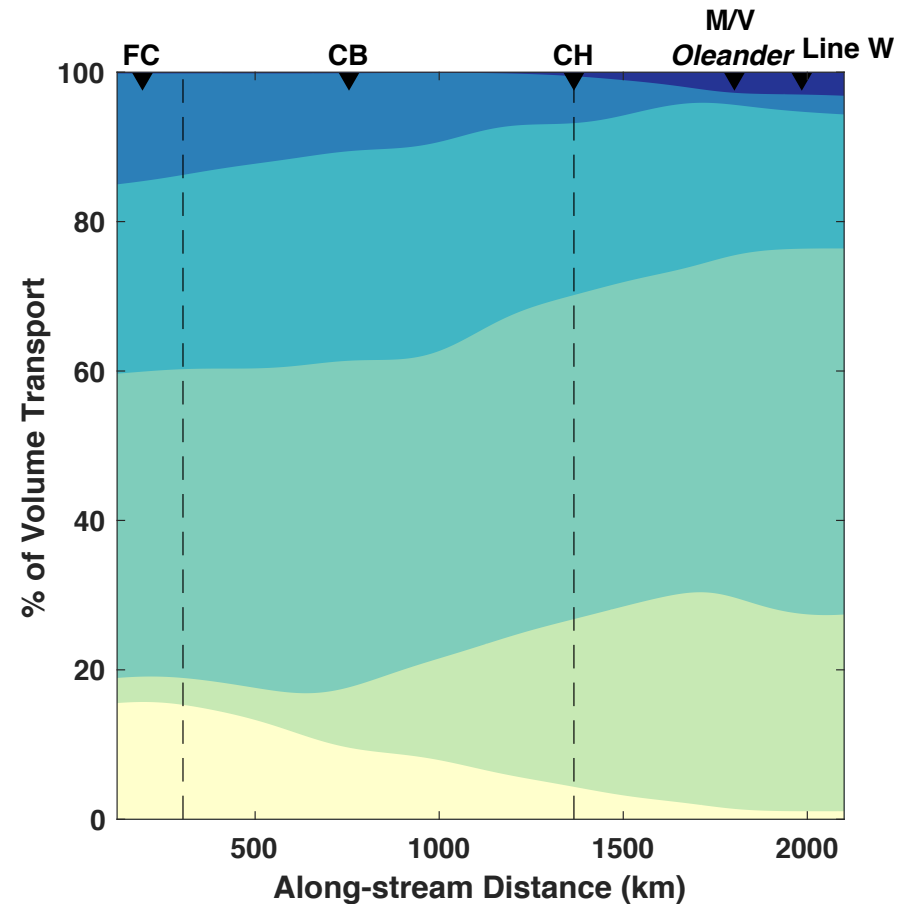
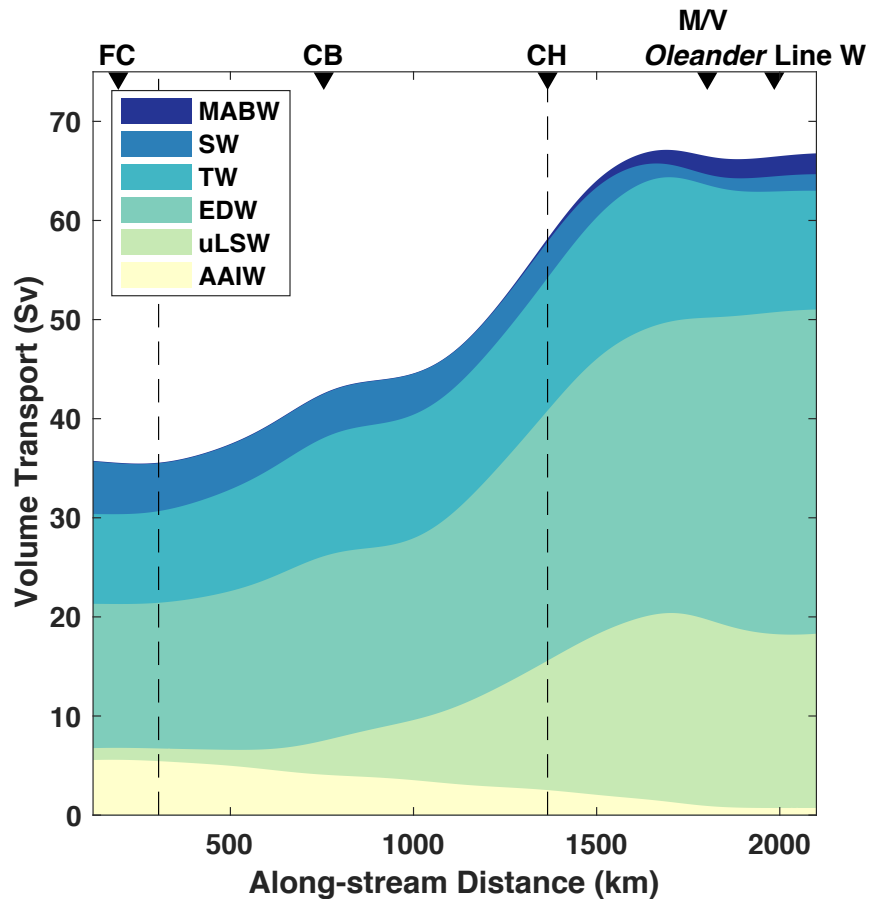
Which waters contribute to the transport increase?



Which waters contribute to the transport increase?



Which waters contribute to the transport increase?



Summary

- Gliders provide multi-year, high-resolution observations to fill a gap in sustained subsurface Gulf Stream monitoring
- Resolve details of the along-stream increase in Gulf Stream volume transport along the US East Coast
- Entrainment of sub-thermocline waters (e.g., upper Labrador Sea Water, Eighteen Degree Water) is the primary source of the transport increase

