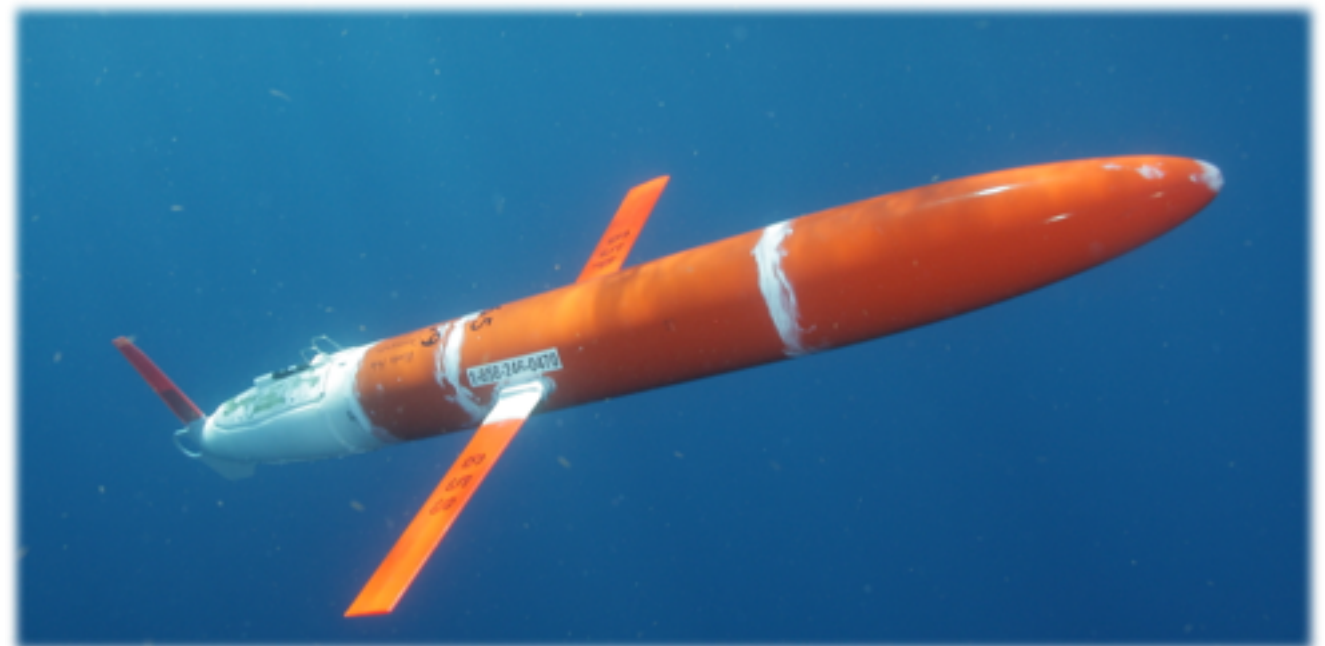


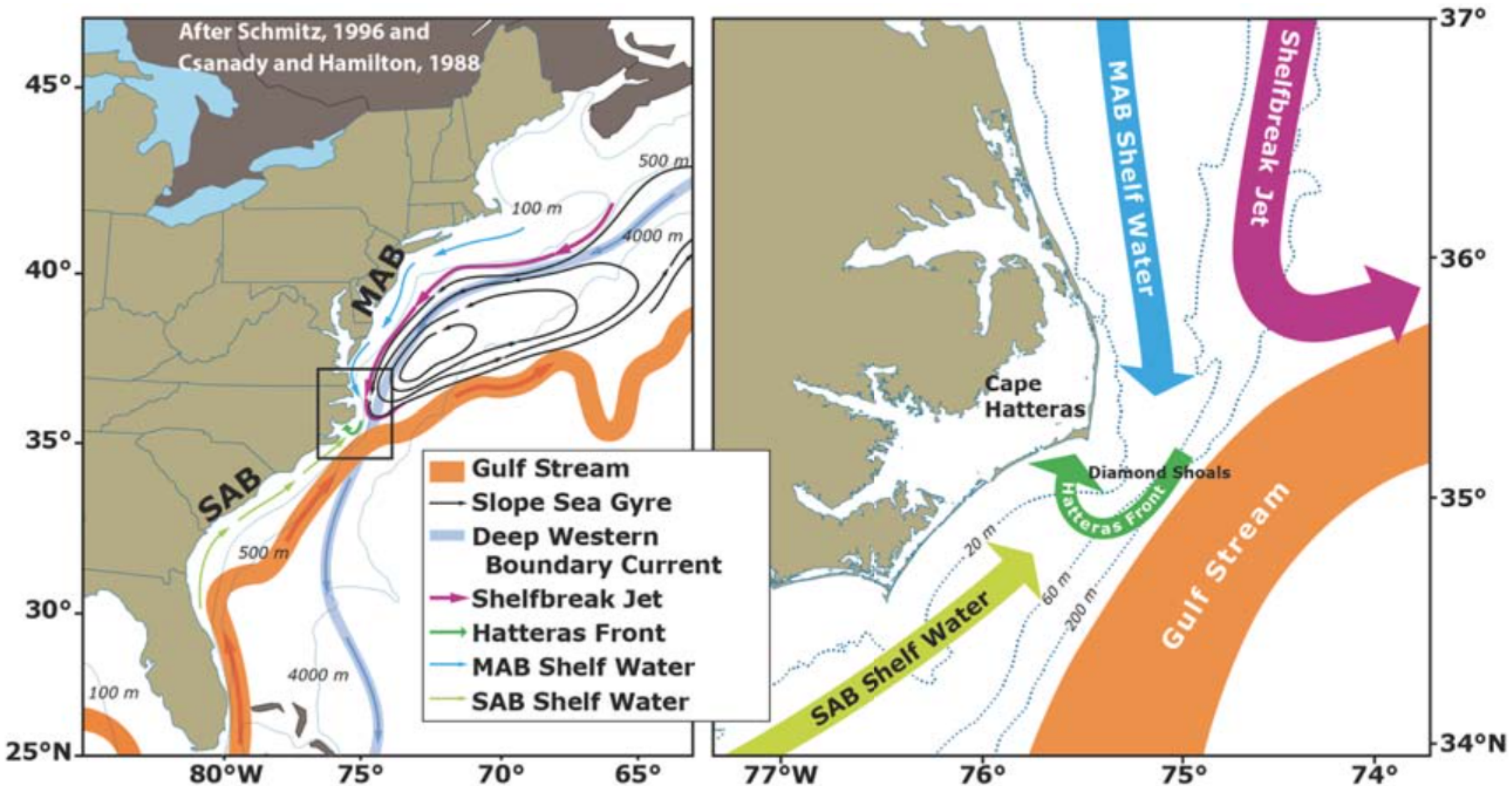
Observations of Shelf-Deep Ocean Exchange at Cape Hatteras



Robert E. Todd
Woods Hole Oceanographic Institution

Circulation near Cape Hatteras

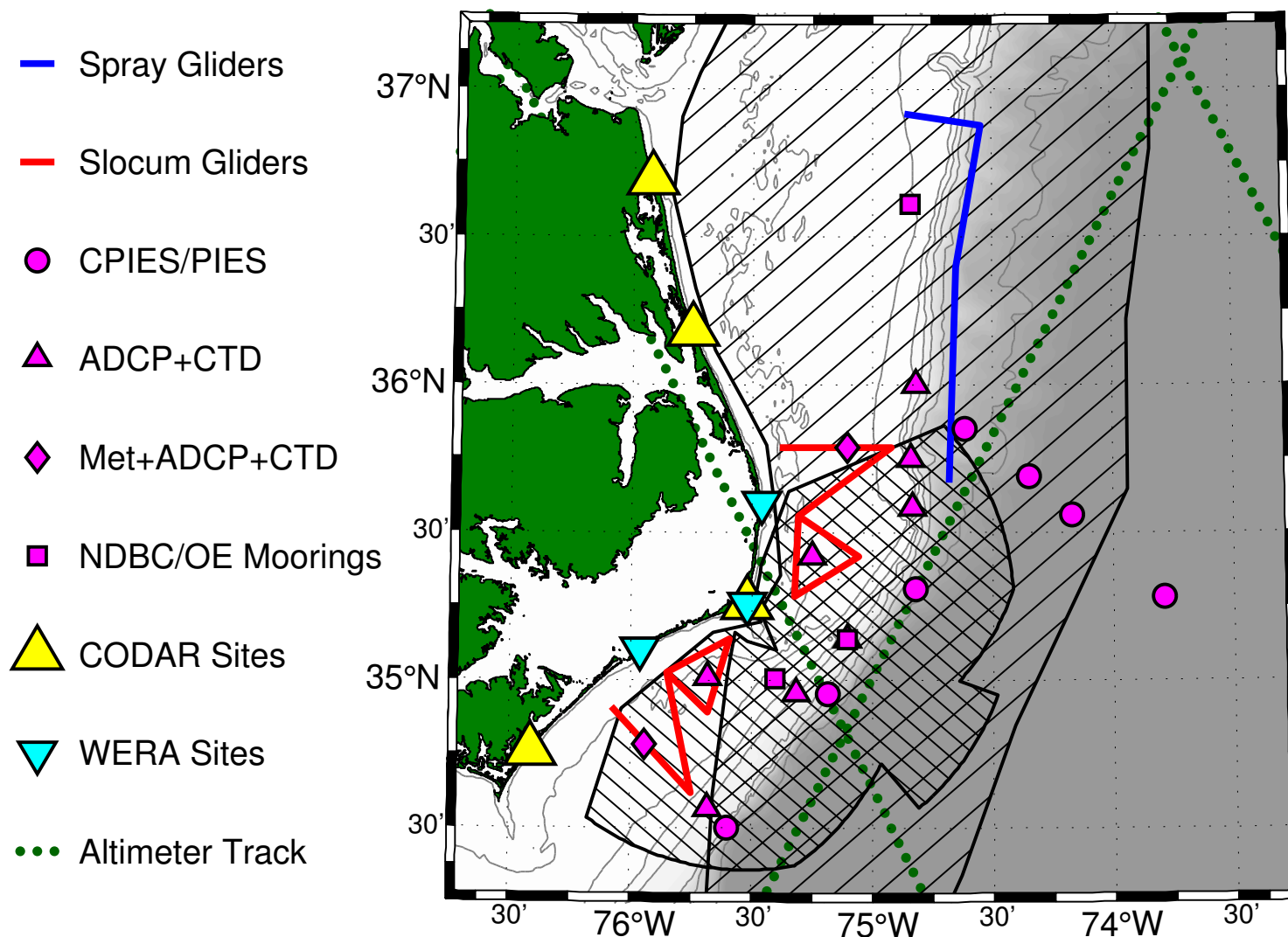
- Convergent shelf flows → Net export
- Gulf Stream and winds as forcing agents → Large variability



Processes driving Exchange At Cape Hatteras

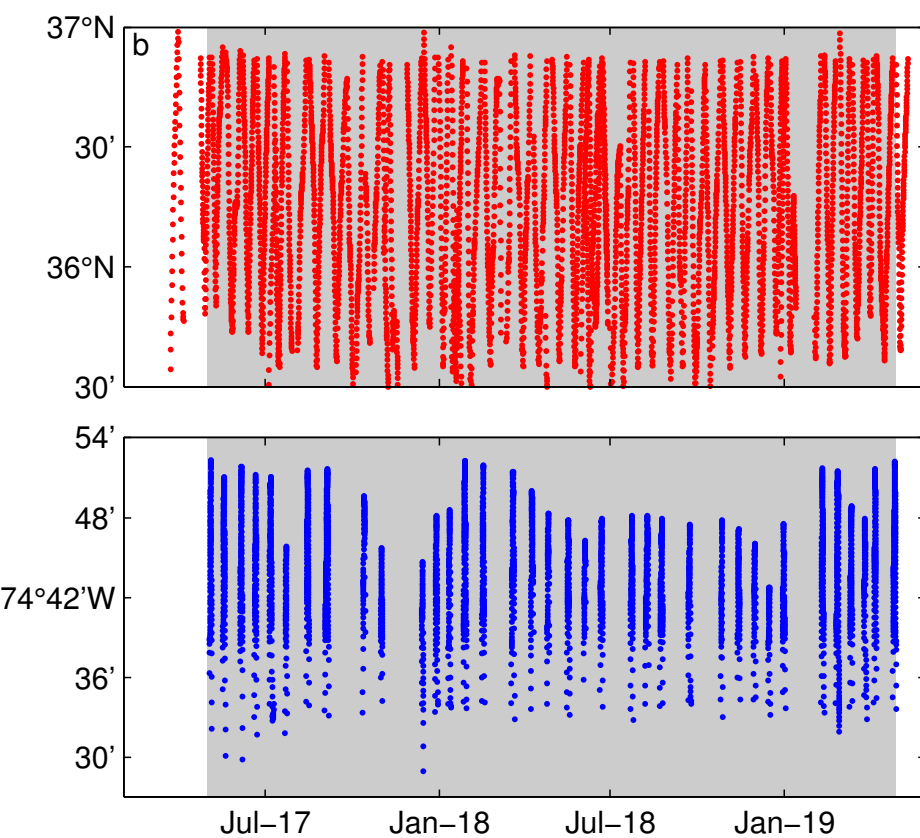
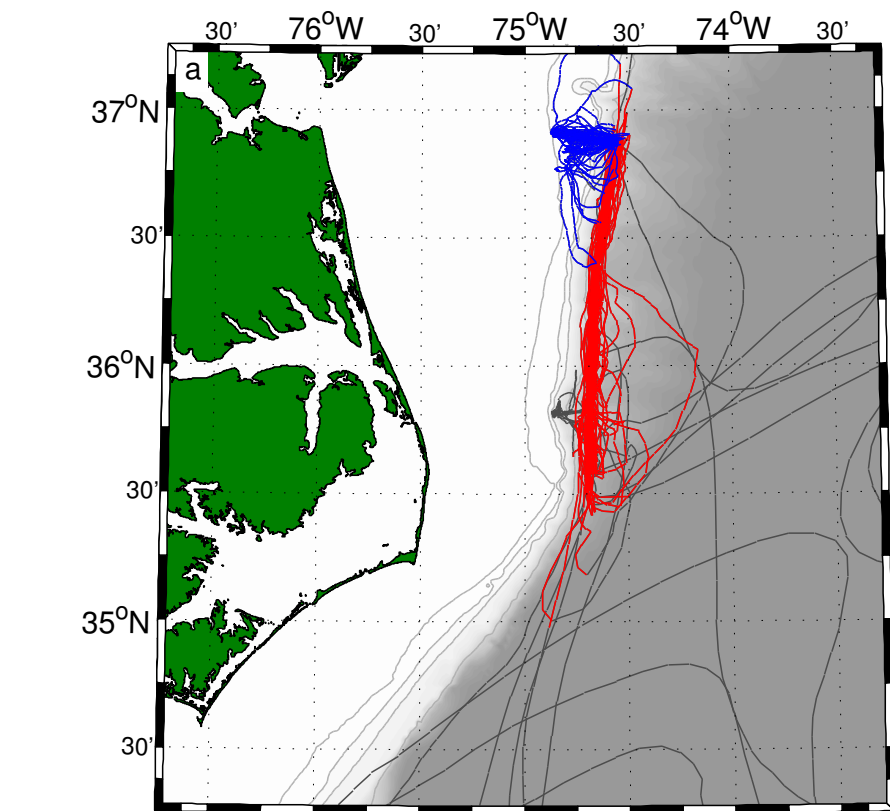
Overarching Question:

What are the dynamics controlling exchange between the shelf and deep ocean?



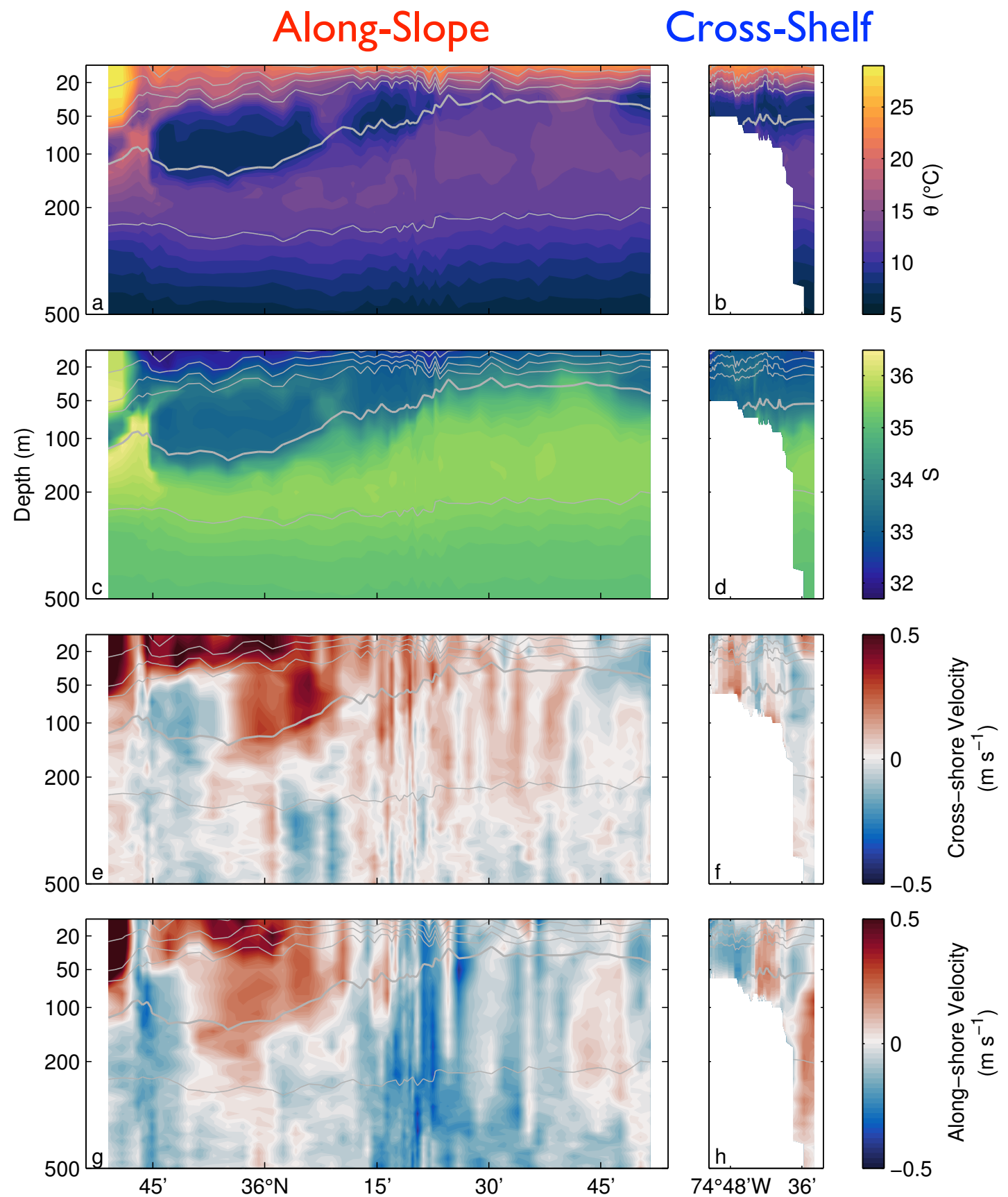
- Observations:
 - Multi-platform
 - Multi-scale
 - 18-24 months (2017-2019)
- Numerical Modeling
 - Idealized
 - Realistic, nested, assimilating

Two Years of Spray Glider Sampling

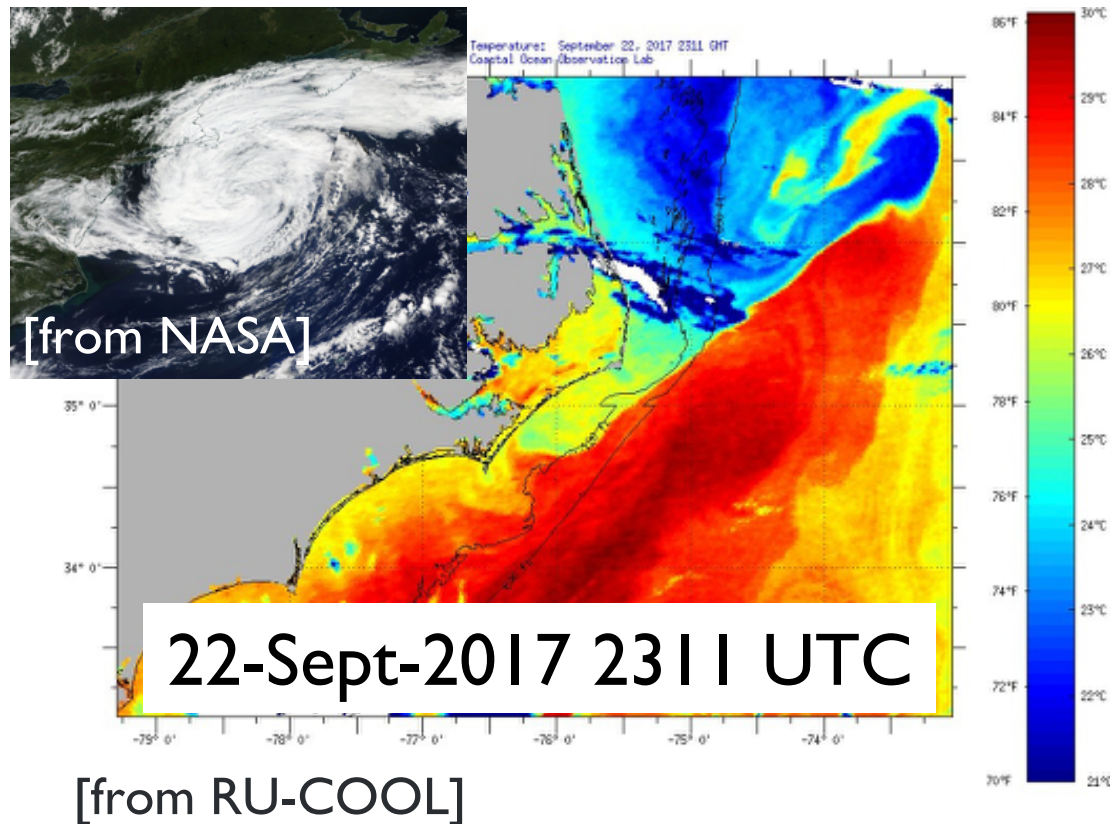


107
transects

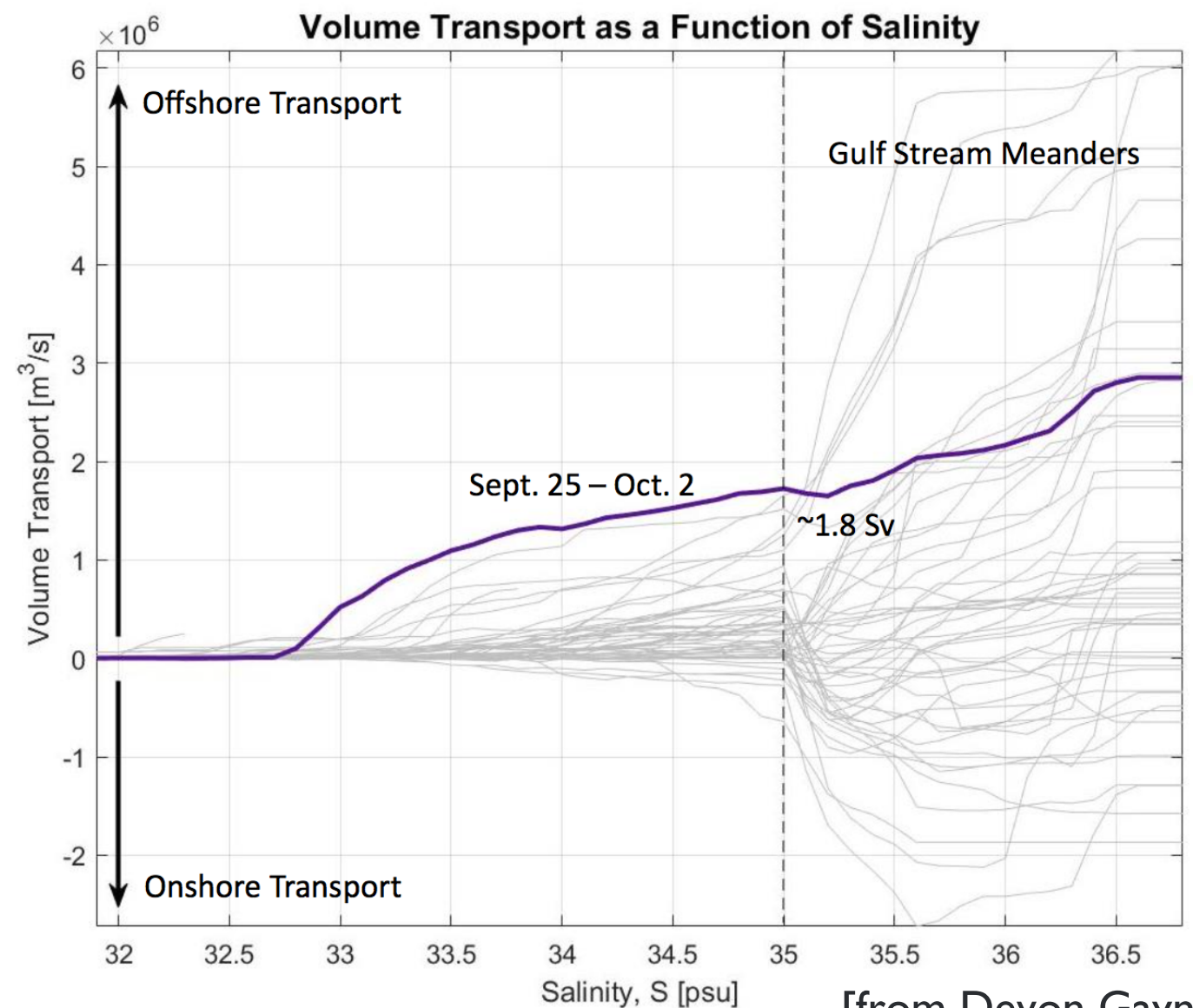
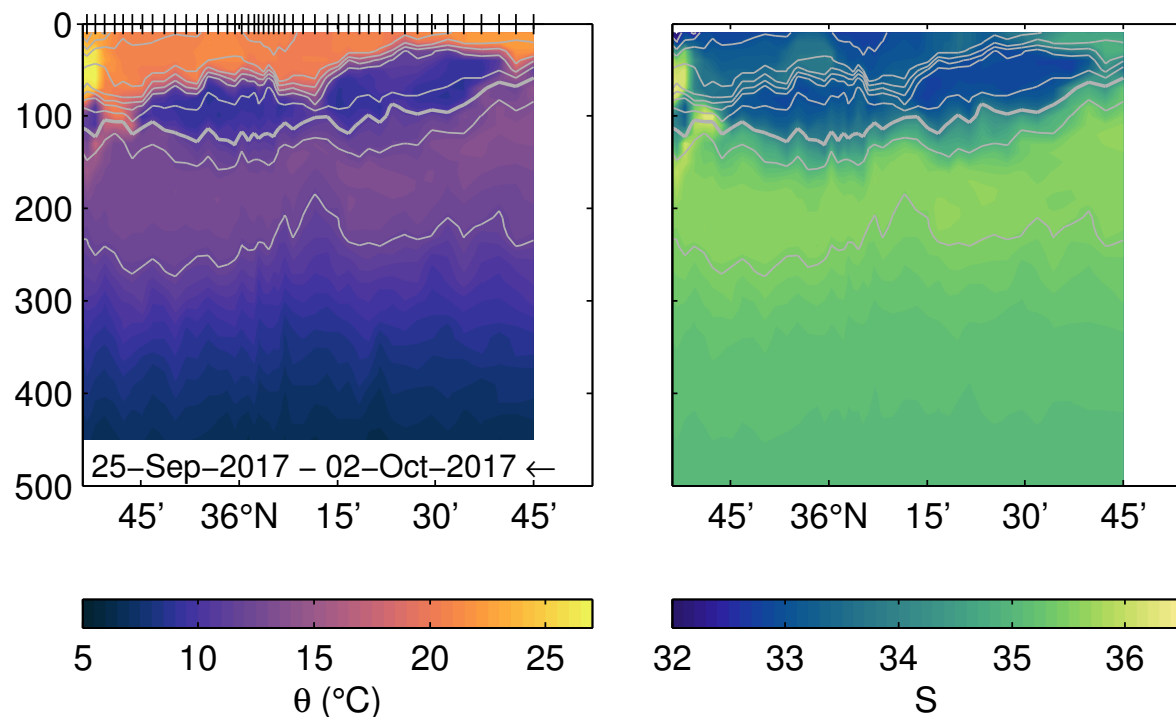
74
transects



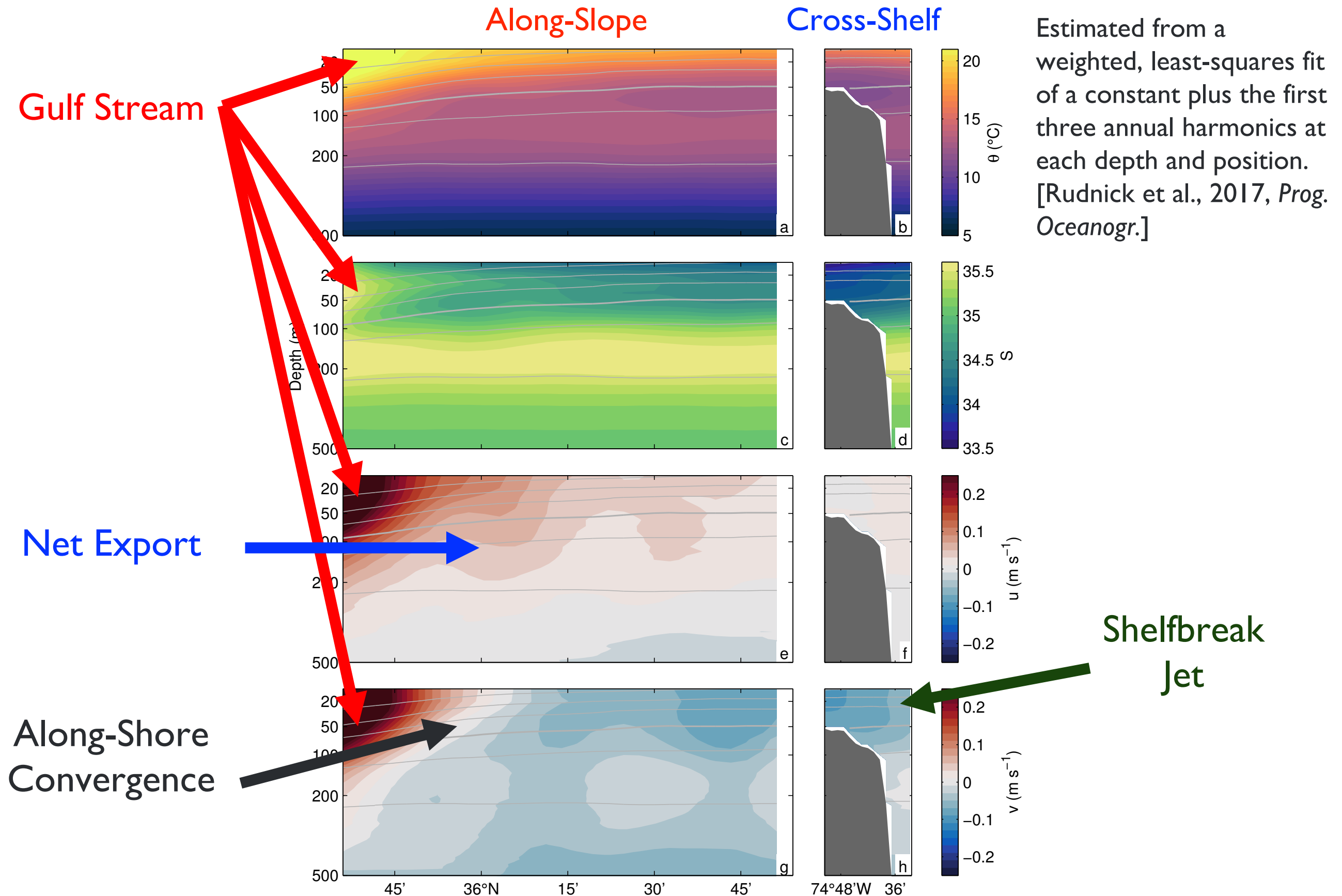
Hurricane-Driven Export



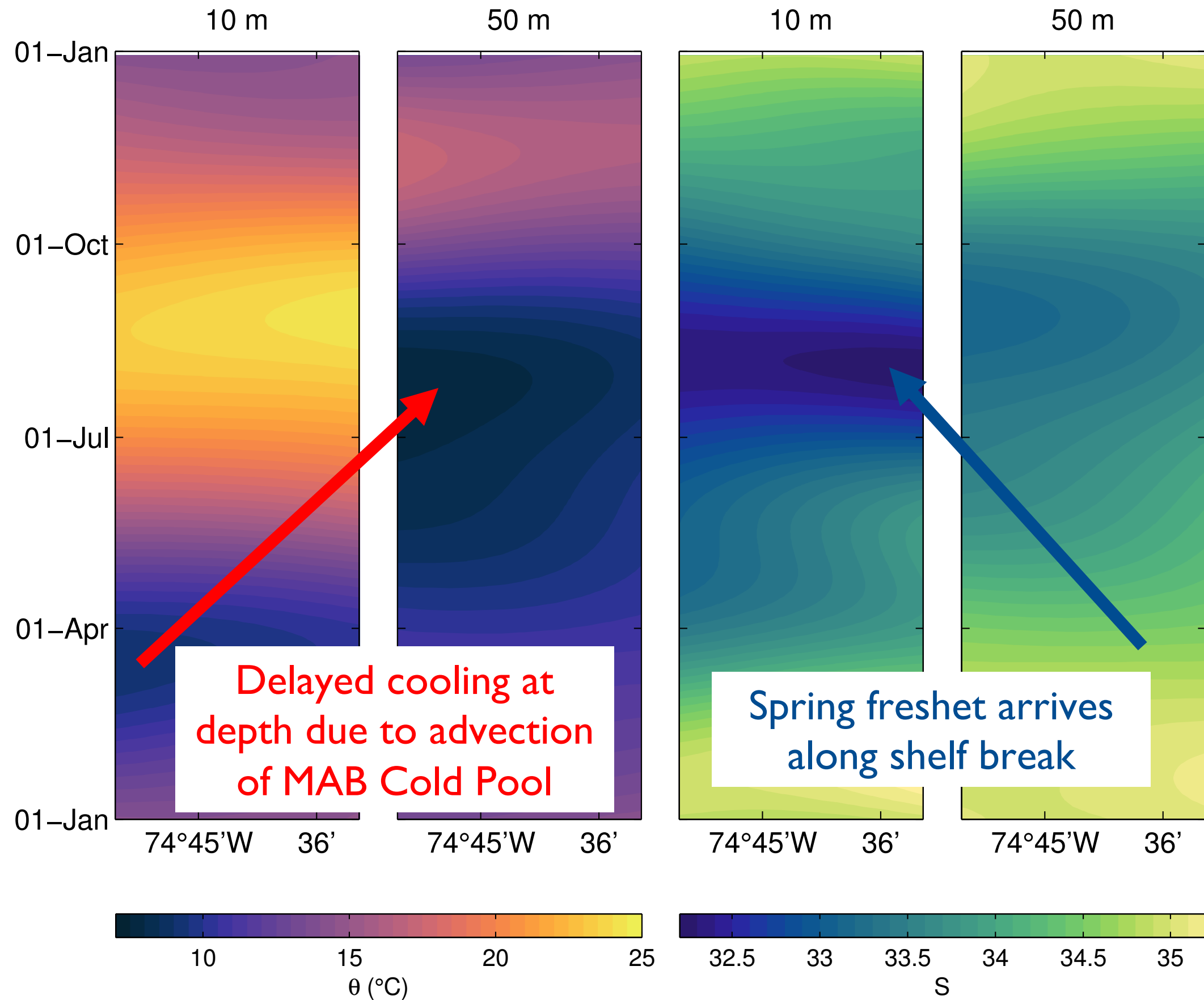
- Hurricane/TS Jose produced northerly winds over shelf for several days
- Major export event captured by persistent glider sampling



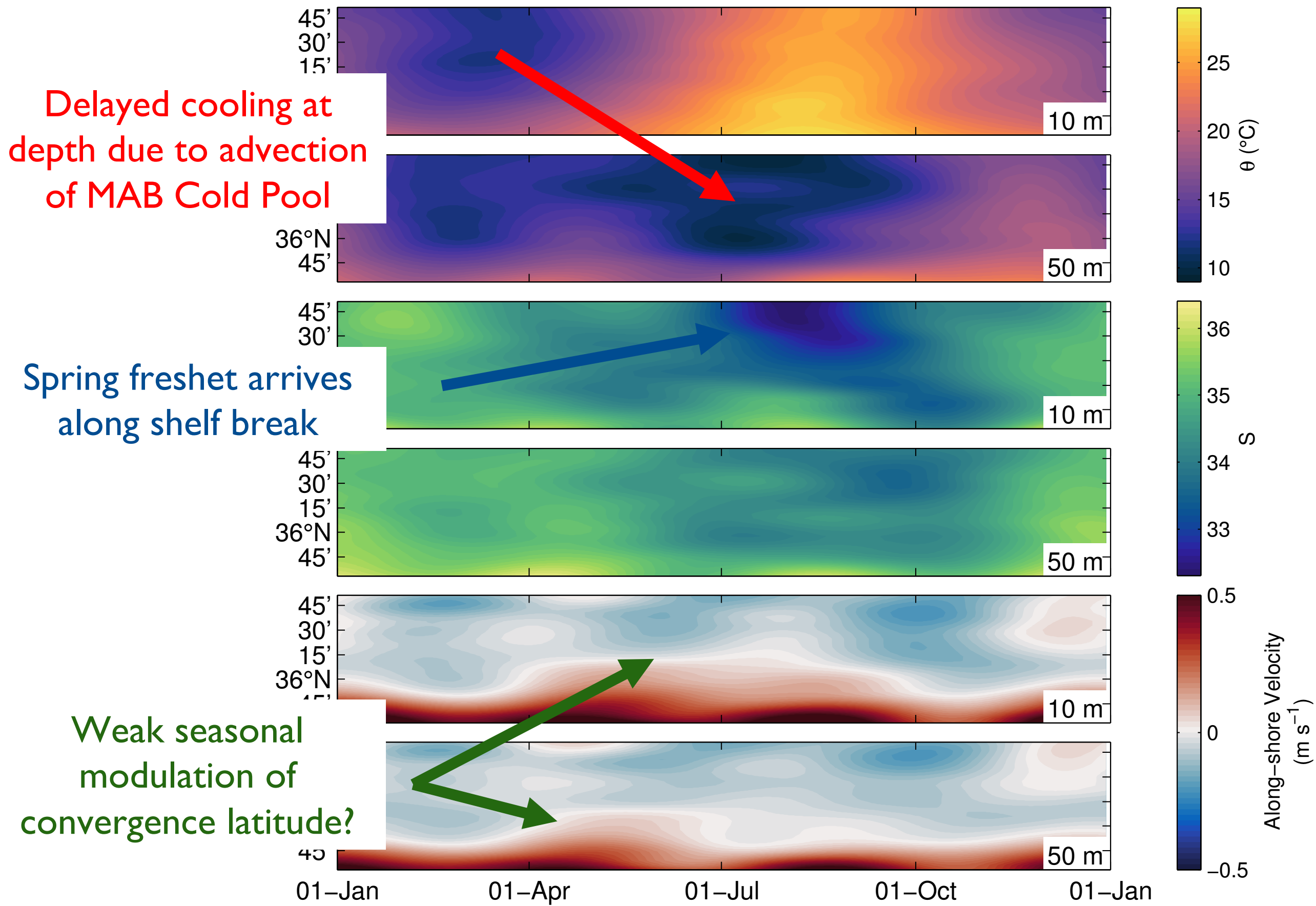
Time-average Hydrography and Circulation



Seasonal Variability on Shelf



Seasonal Variability along Slope

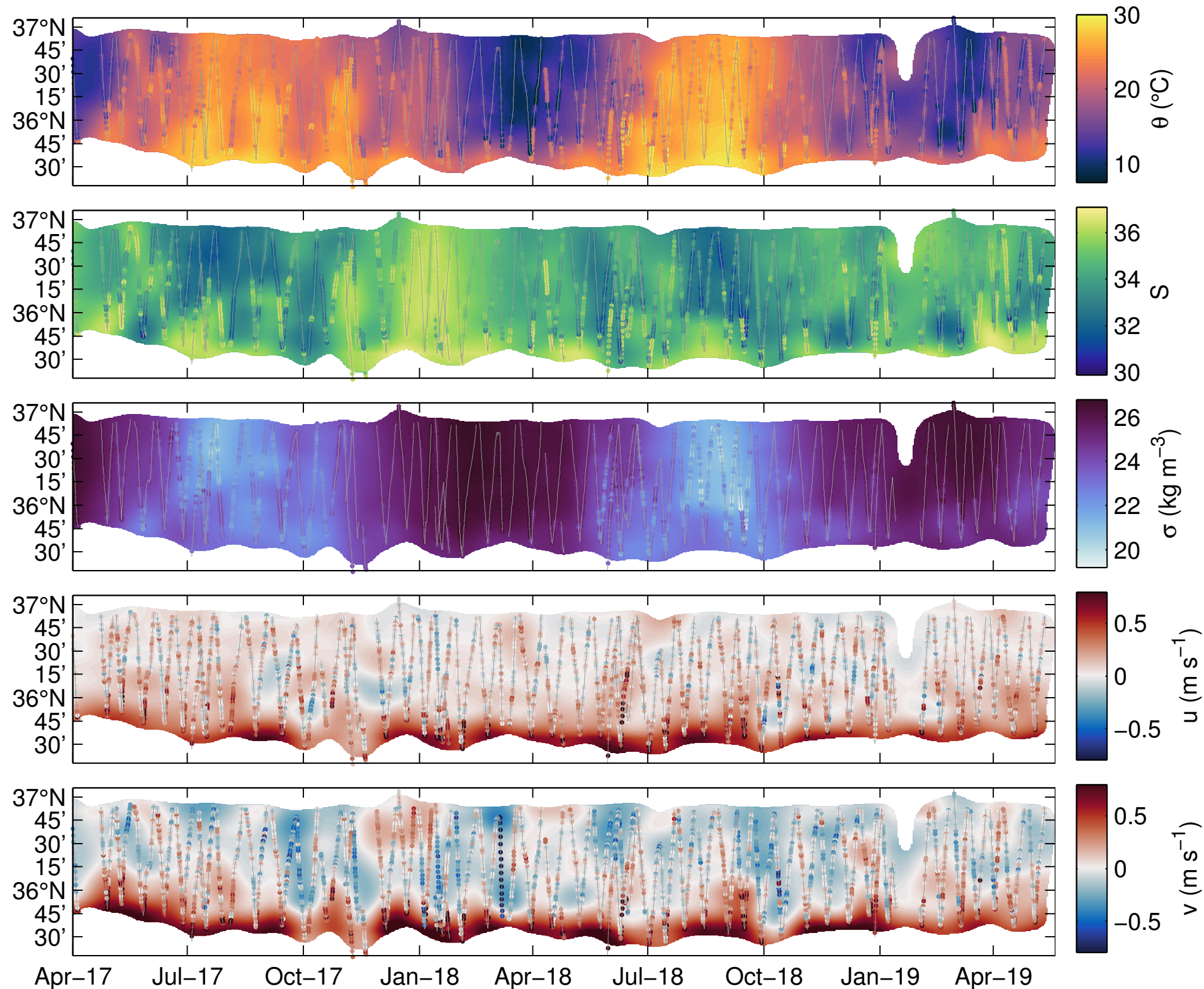


Mapped Time Series

Gridded product:

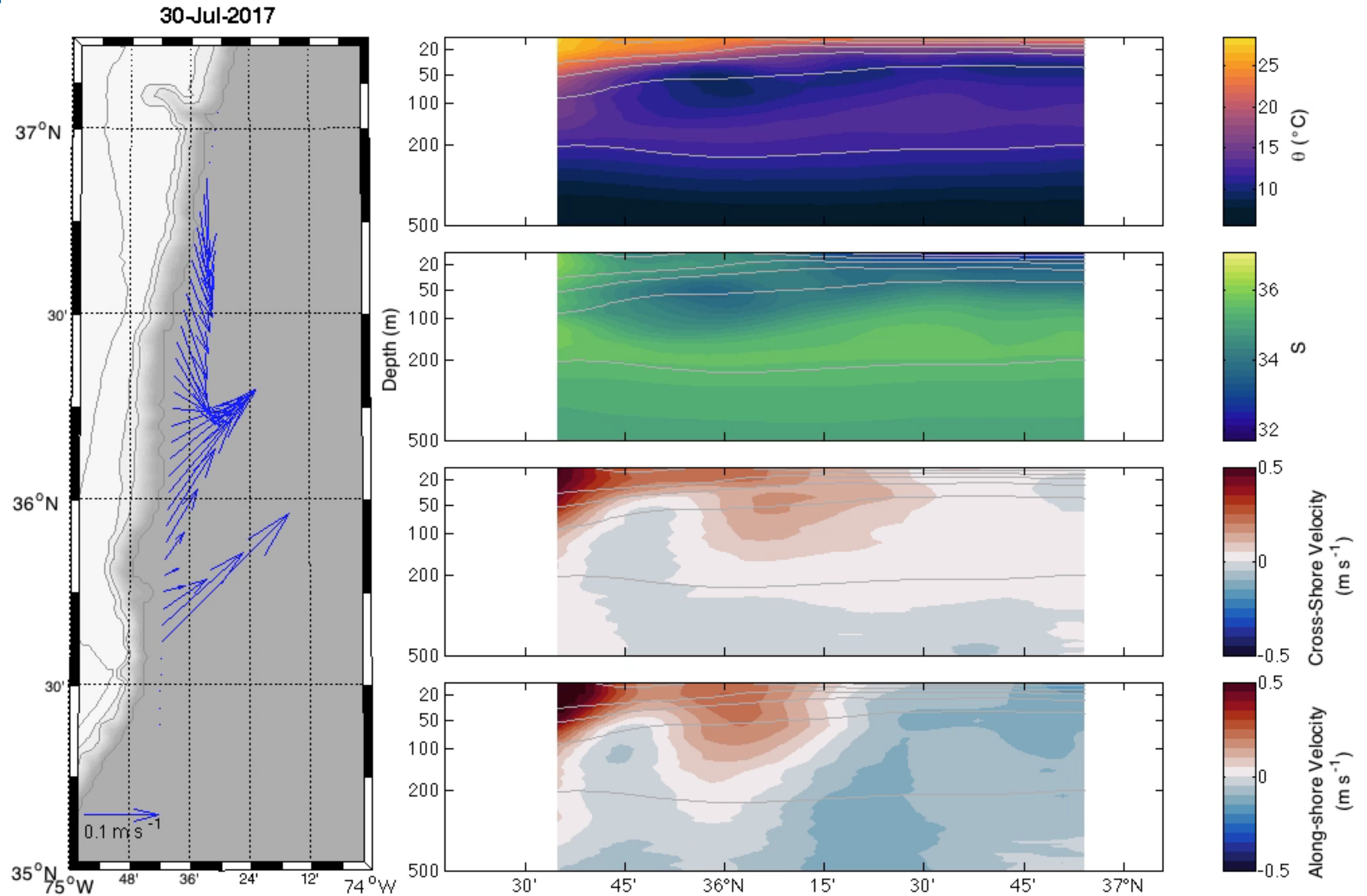
- 5 km x 1 day x 10 m
- Resolves monthly variability over >2 years
- Low-pass filtered version of the observations

Example at depth of 10 m



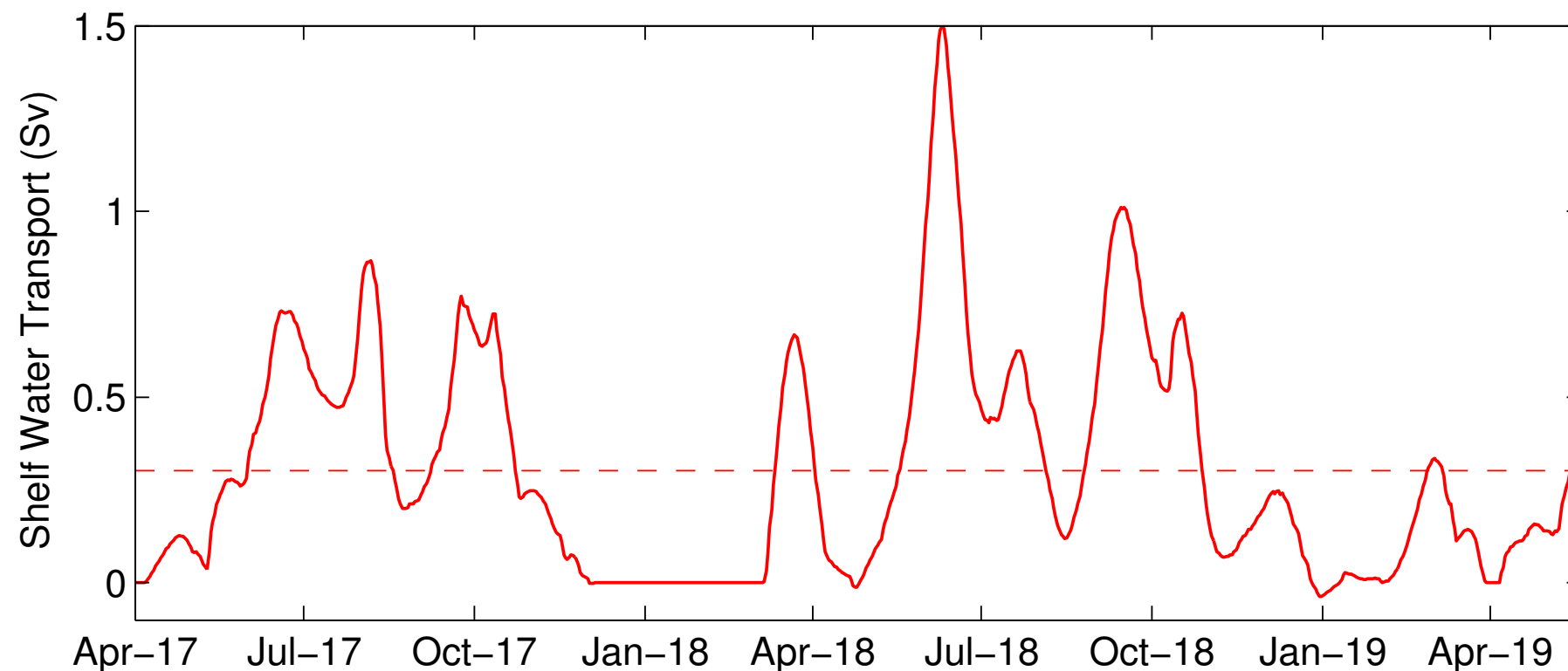
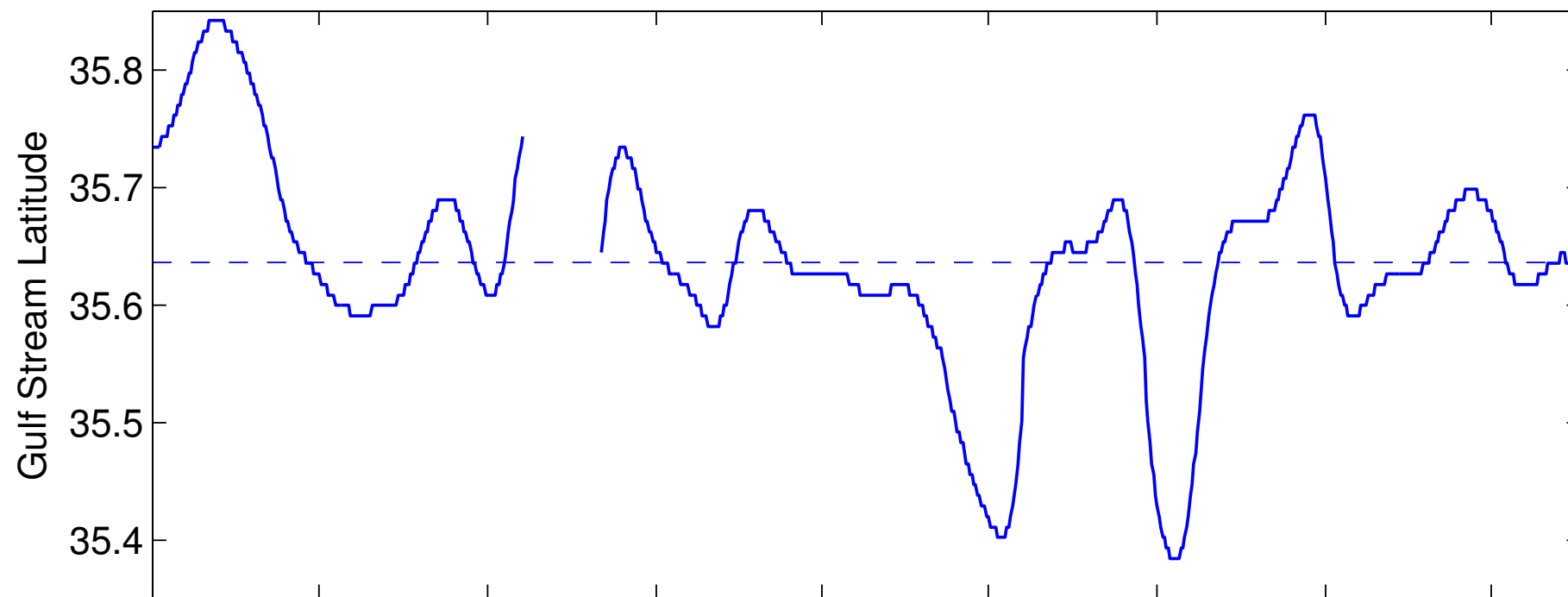
Estimated by 1) subtracting mean and seasonal cycle, 2) objectively mapping anomalies, 3) adding back mean and annual cycle. Gaussian covariance with 30 km and 25 day scales, plus noise. [Rudnick et al., 2017, *Prog. Oceanogr.*]

A Movie



What can we with do with this?

Ex: Is Gulf Stream position related to offshore transport of shelf water?



- **Gulf Stream position index**
(northeastward velocity $> 0.5 \text{ m s}^{-1}$ over upper 200 m)
- **Shelf Water transport index**
(offshore transport with salinity < 34.5)
- **Answer: Maybe?**

Summary

- PEACH focuses on exchange between the shelf and deep ocean near Cape Hatteras.
- Two years of persistent Spray glider sampling along upper slope and across shelf break.
- Mean and seasonal cycle by least-squares, gridded anomalies by objective mapping.
- Analysis coming soon!

Looking for a postdoc position? Talk to me about the WHOI Postdoctoral Scholar program...

Thanks: Patrick Deane, Larry George (WHOI); Instrument Development Group at SIO; Mike Muglia, Trip Taylor, Nick Desimone (UNC-CSI), NSF; the PEACH team; Devon Gaynes.

