

# Variability of the Florida Current Transport at 27°N

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# Report Documentation Page

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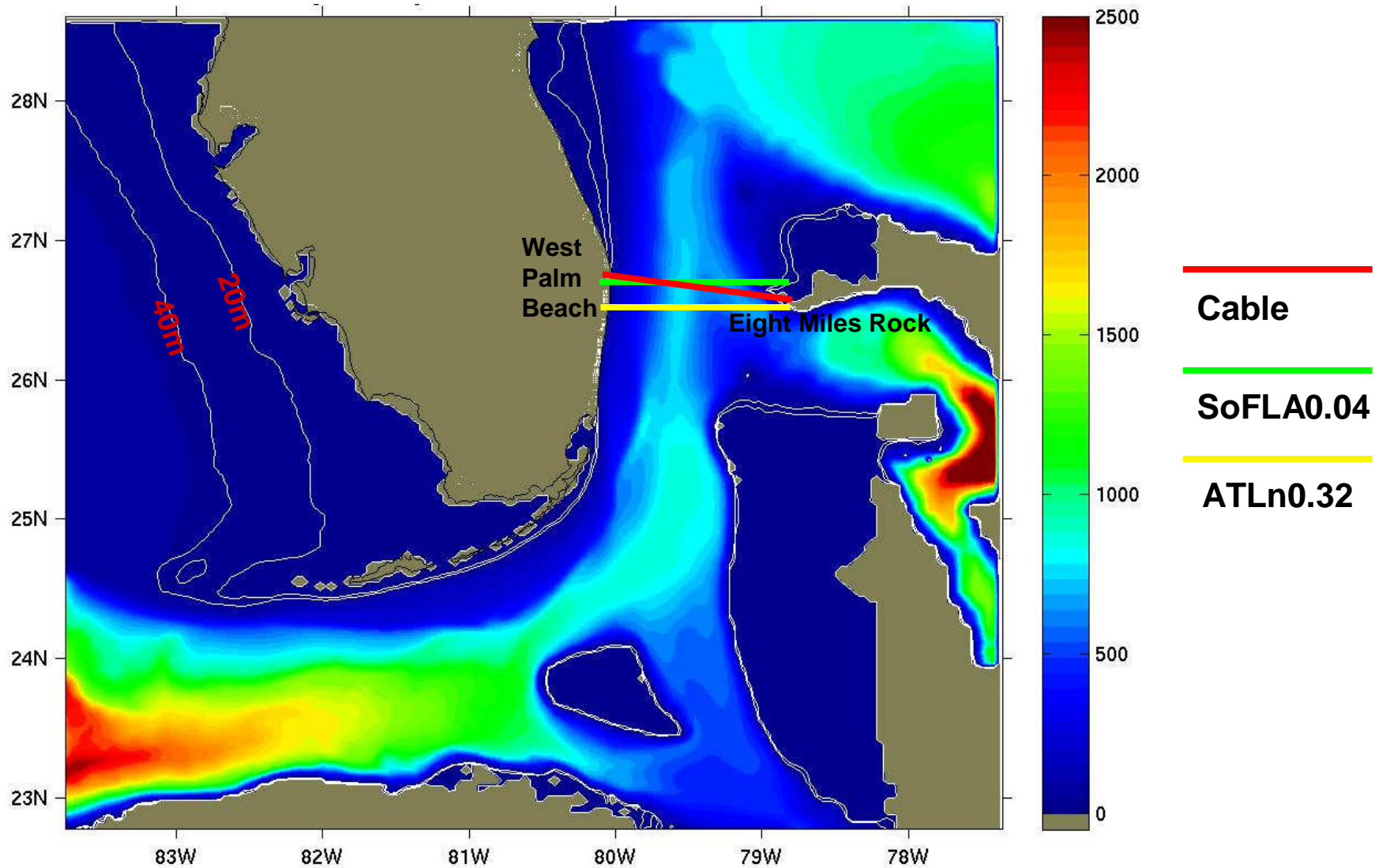
## **Outline**

- **Seasonal variability from observations (1982-2005)**
- **Impact of boundary conditions – using HYCOM  
GODAE products in the HYCOM-SoFLA domain (2004)**
- **Inter-annual and decadal variability from model results  
(1950-2003)**
- **Summary**
- **Acknowledgement**

## **Data outline:**

- **Daily Florida Current transport derived from the submarine telephone cable voltage measurements from 1982 to 2005**
- **Shipboard velocity measurements using the Dropsonde float from 1991-2005 (total 157 dropsonde section transport estimates)**

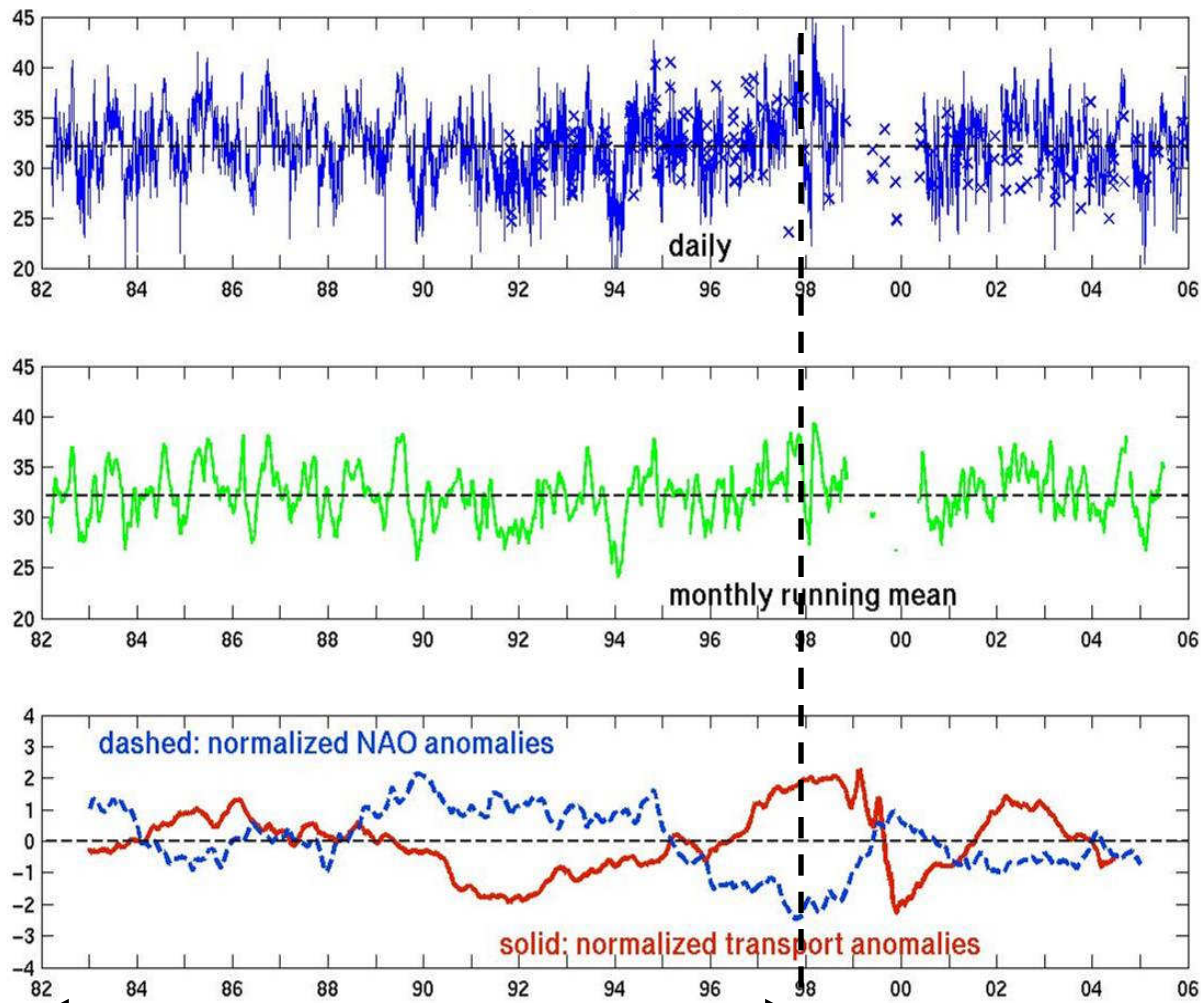
# Locations of the Cable and Model Sections



Bathymetry in SoFLA0.04 Domain

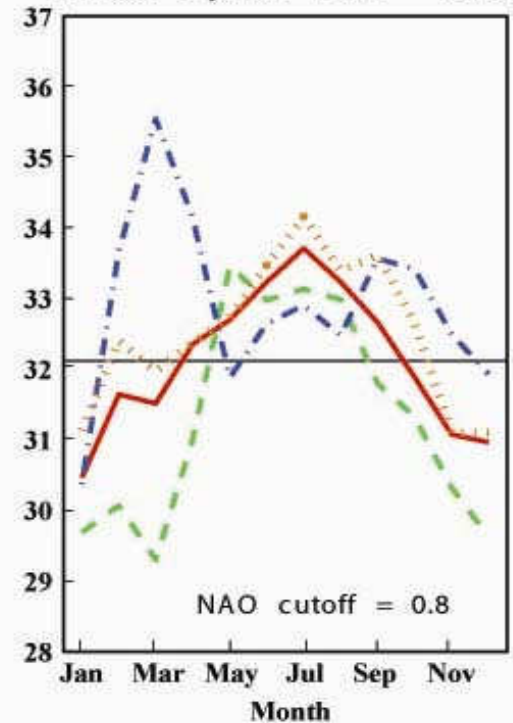
# Florida Current Transport

Cable data 1982 – 2005/Cruise data 1991-2005



Bringer and Larsen, 2001:  
 Good negative correlation  
 between FC transport and NAO.

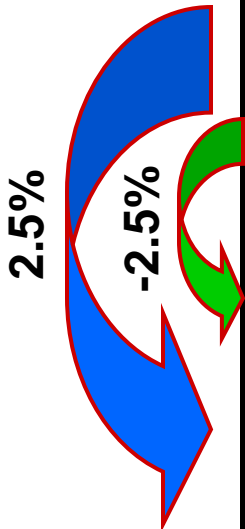
Annual Cycle: 1982 - 2005



**Solid: ALL NAO**  
**Dashed: Strong positive NAO**  
**Dash-dotted: Strong negative NAO**  
**Dotted: Other NAO**

The Cable and cruise data are from  
[www.aoml.noaa.gov/phod/floridacurrent](http://www.aoml.noaa.gov/phod/floridacurrent)

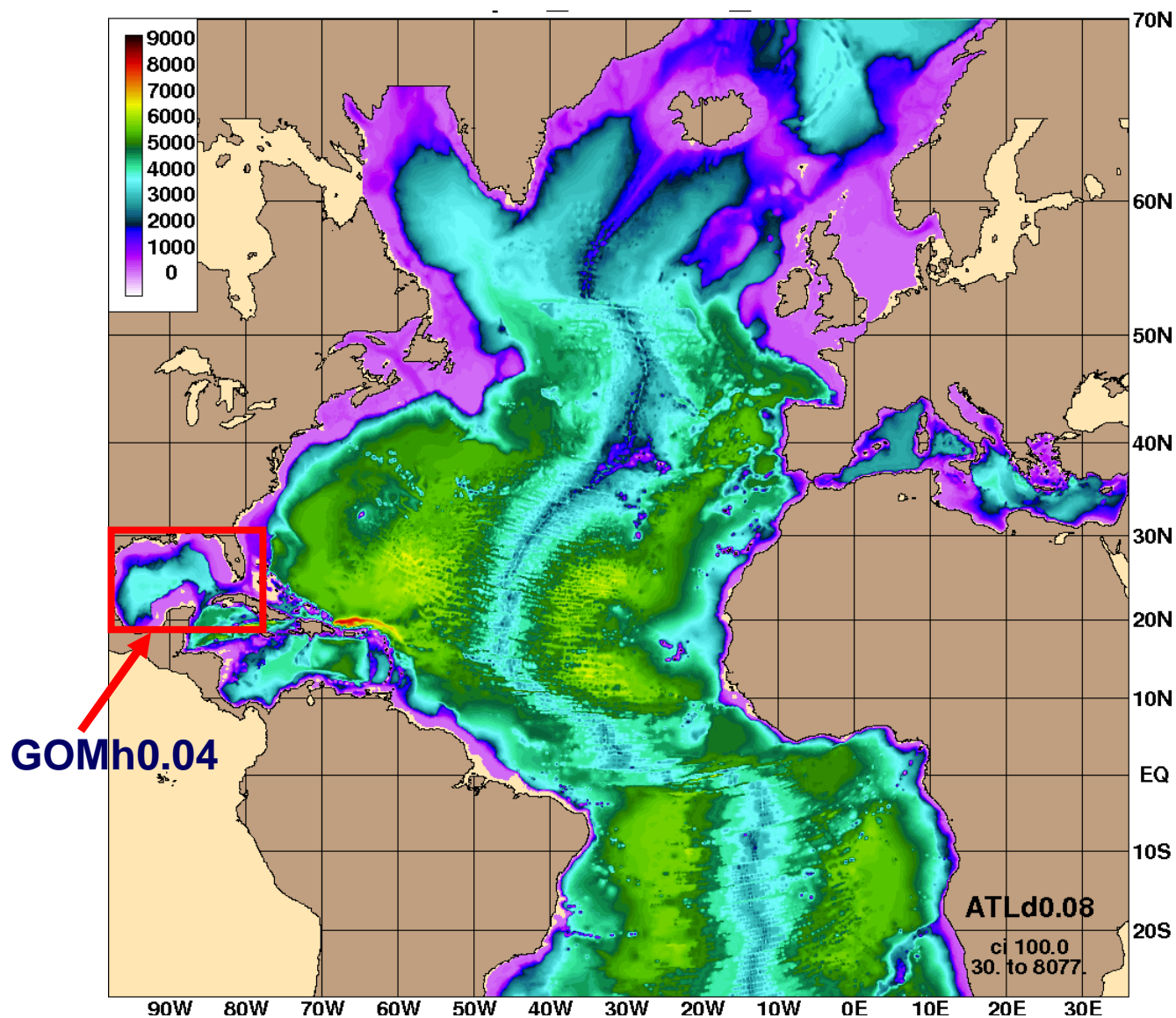
**Statistic Characteristics: Cable**  
**Florida Current Transport: 1982 - 2005**



	Mean	Min	Max	STD
<b>ALL NAO</b>	<b>32.12</b>	<b>30.46</b>	<b>33.71</b>	<b>1.02</b>
<b>Strong Positive NAO</b>	<b>31.31</b>	<b>29.3</b>	<b>33.46</b>	<b>1.54</b>
<b>Strong Negative NAO</b>	<b>32.92</b>	<b>30.37</b>	<b>35.54</b>	<b>1.3</b>
<b>Others</b>	<b>32.51</b>	<b>31.1</b>	<b>34.16</b>	<b>1.04</b>

**Impact of Boundary Conditions  
– Using HYCOM-GODAE Products**

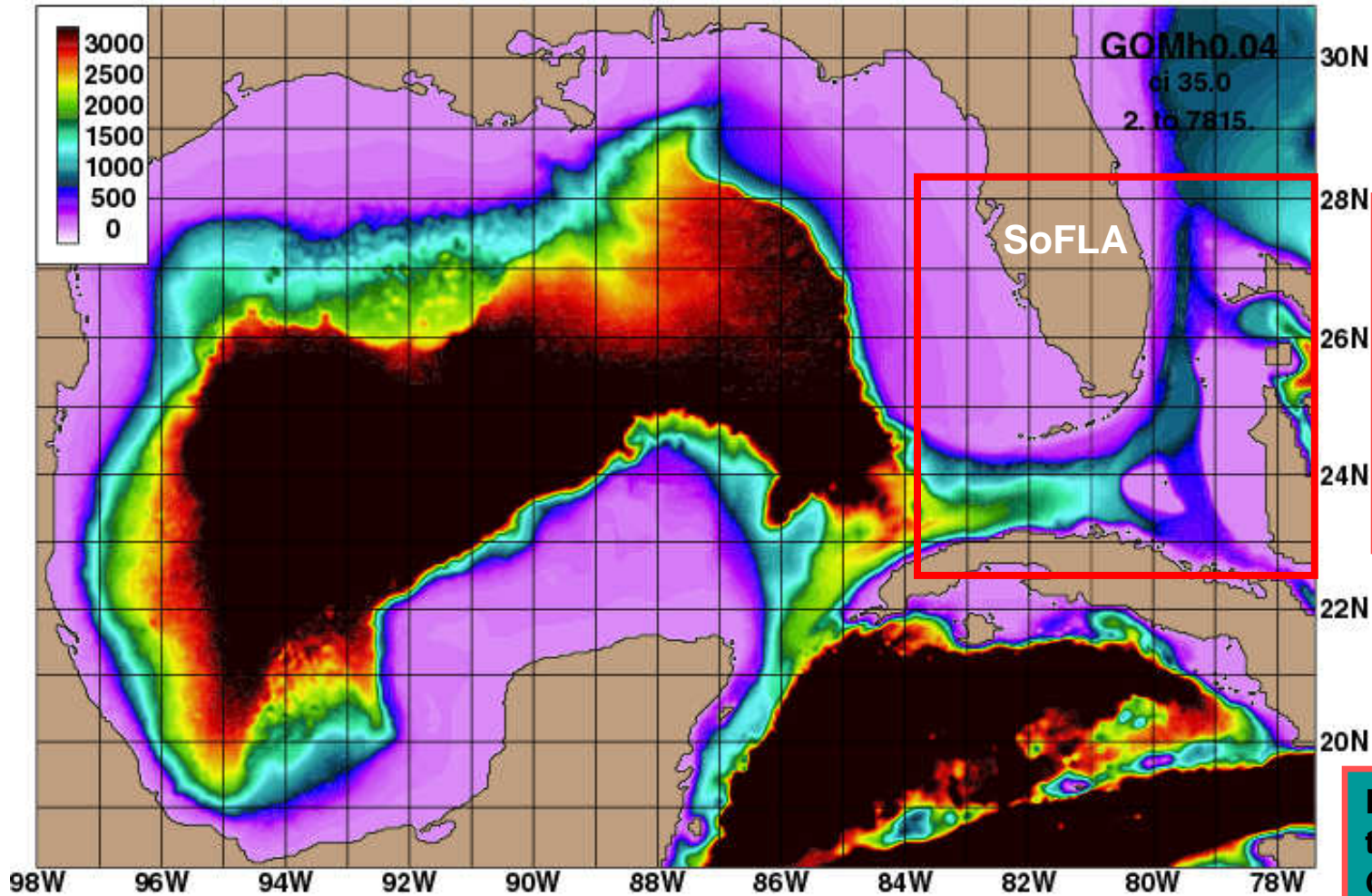
# ATLd0.08 Bathymetry



**ATLd0.08**  
1/12° resolution:  
98°W–36°E  
28°S–70°N  
3 m minimum  
water depth

**GOMh0.04**  
1/25° resolution:  
98°W–77.36°W  
18.90°N–30.71°N  
2 m minimum  
water depth

## GOMh0.04 Bathymetry



### FLAh0.04

1/25° resolution:  
83.76°W–77.36°W  
22.78°N–28.61°N  
2 m minimum  
water depth

FLAh0.04 shares  
the same grid with  
GOMh0.04 within  
the SoFLA domain

## Attributes for Model Experiments

Run ID	Domain	Grid	Layer	Forcing	Run type	Nesting/ relaxation
ATLd091	N. Atlantic	1/12°	20	nogaps 1-deg*	OI <sup>1</sup>	Levitus climatology
GOMh200	Gulf of Mexico	1/25°	20	nogaps 1-deg	NCODA <sup>2</sup>	ATLd091 climatology
FLAh291	So. FLA	1/25°	20	nogaps 1-deg	Free	GOMh200
FLAh271	So. FLA	1/25°	20	coamps 27km**	Free	GOMh200
FLAh025	So. FLA	1/25°	26	coamps 27km	Free	GOMh200
FLAh391	So. FLA	1/25°	20	coamps 27km	Free	ATLd091
ATLn303	N. Atlantic	1/3°	28	NCEP***	Free	Levitus climatology

GODAE products

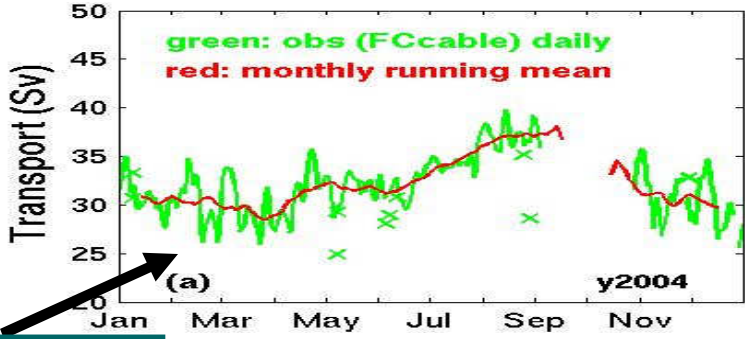
\* nogaps 1-deg: one-degree, 3-hourly atmospheric forcing data set from the Navy's Operational Global Atmospheric Prediction System (NOGAPS) .

\*\* coamps 27 km: 27 km, 3-hourly atmospheric forcing data set from the Coupled Ocean Atmosphere Prediction System (COAMPS).

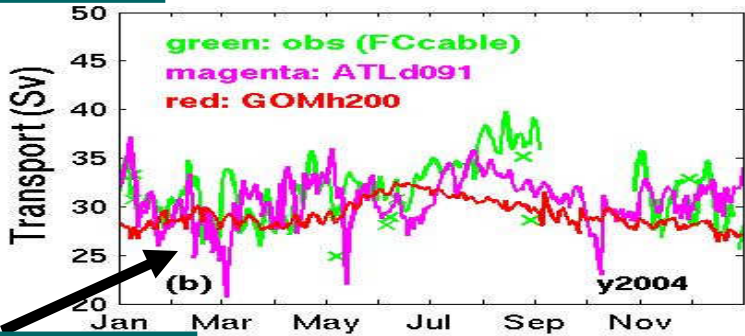
\*\*\*\* NCEP: 6-hourly atmospheric forcing from the NCEP/NCAR (before 1979) and NCEP/DOE AMIPS-II (after 1979) on a T62 grid which yields a resolution of about 2.5° x 2.5°.

<sup>1</sup> Optimal Interpolation scheme <sup>2</sup> the Navy Coupled Ocean Data Assimilation (NCODA) system

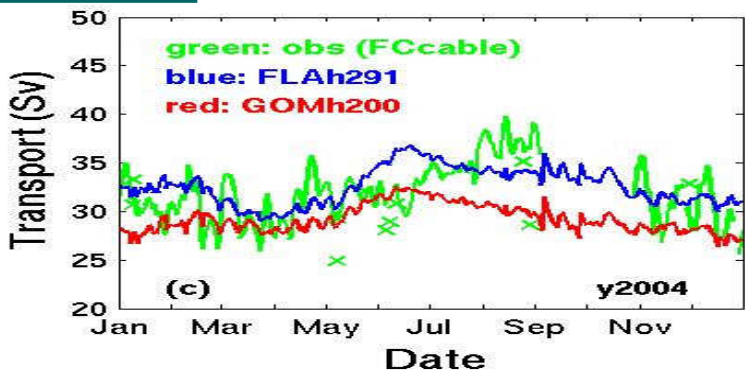
# Cable Data and HYCOM: FC Transport at ~27N Year 2004



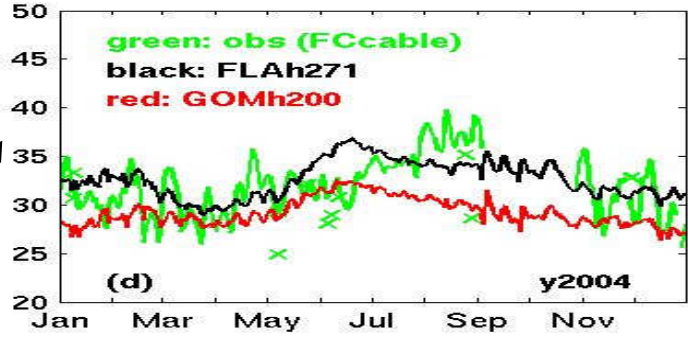
**Observations**



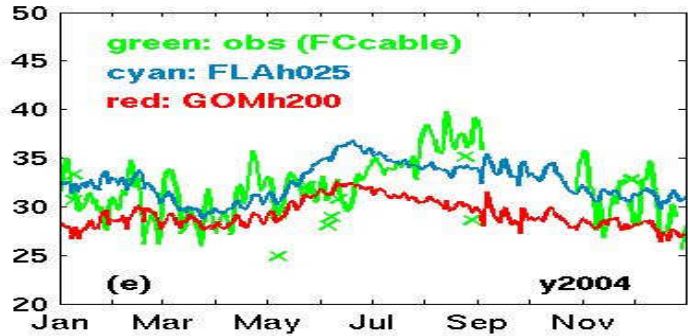
**Outer domains**



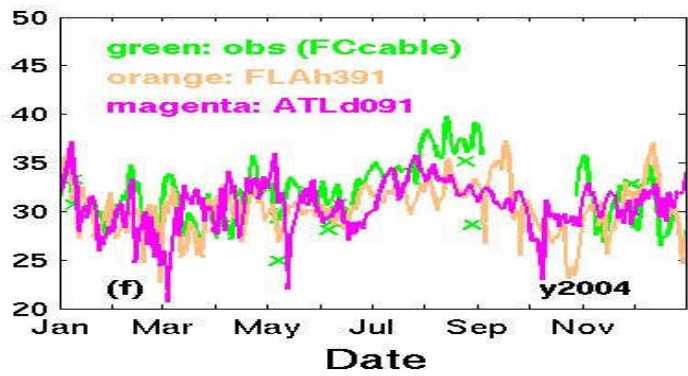
nogaps-1deg vs coamps-27km



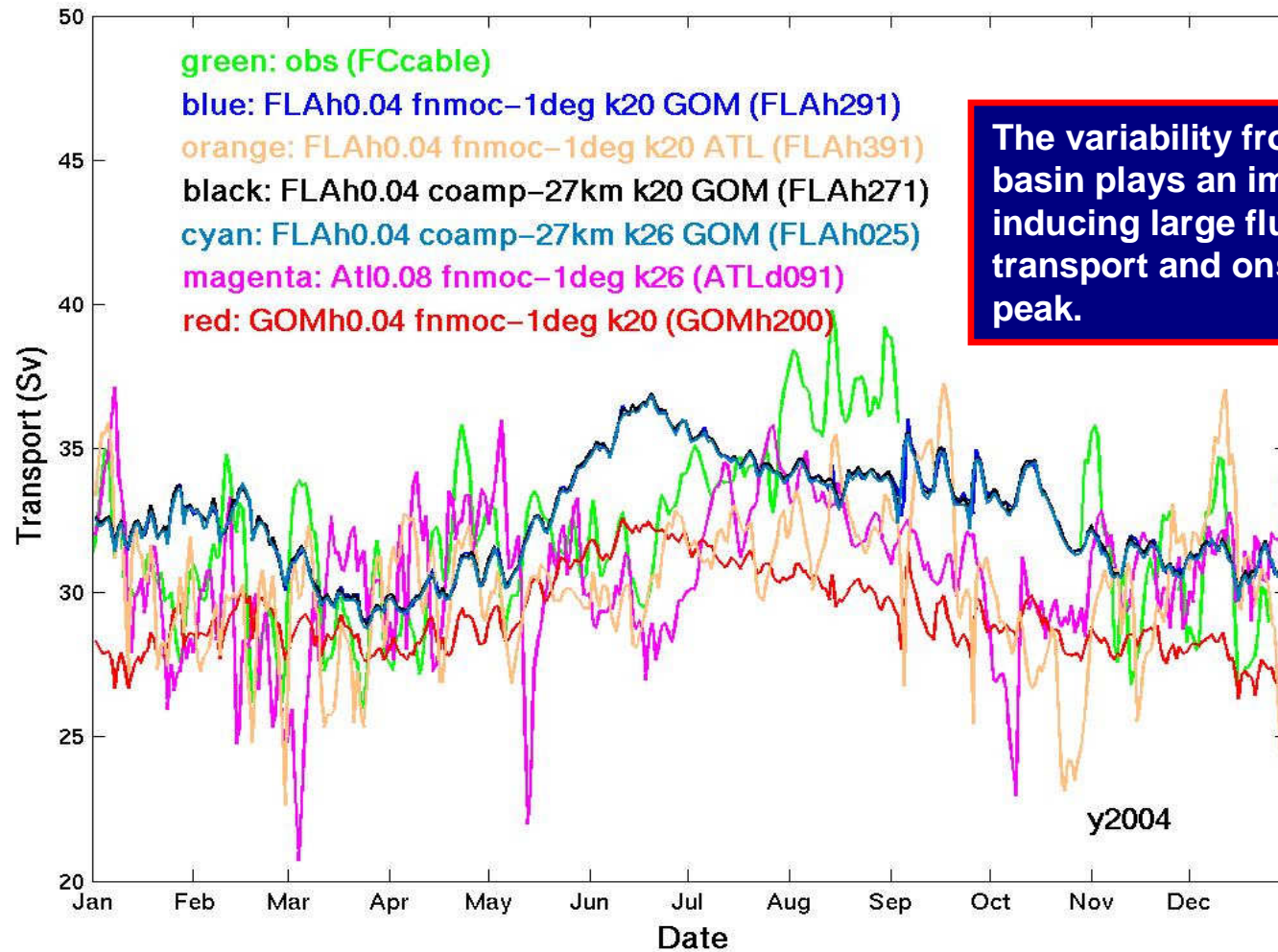
**k20 vs k26**



**GOM vs ATL**



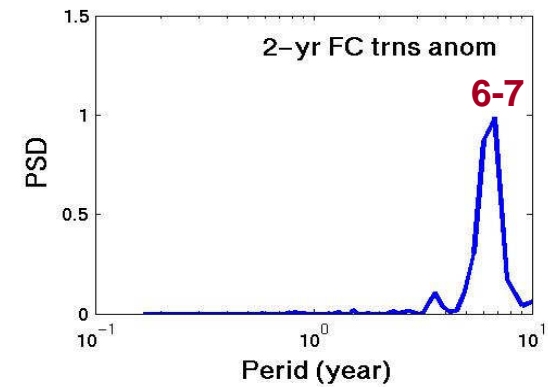
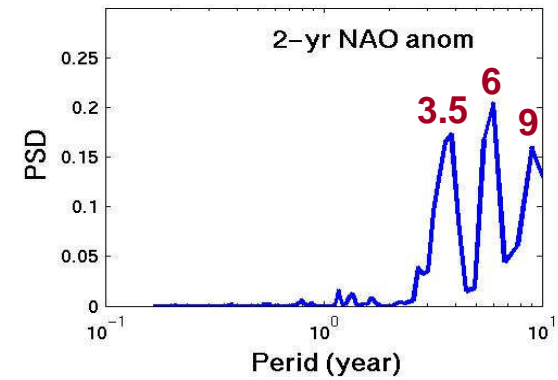
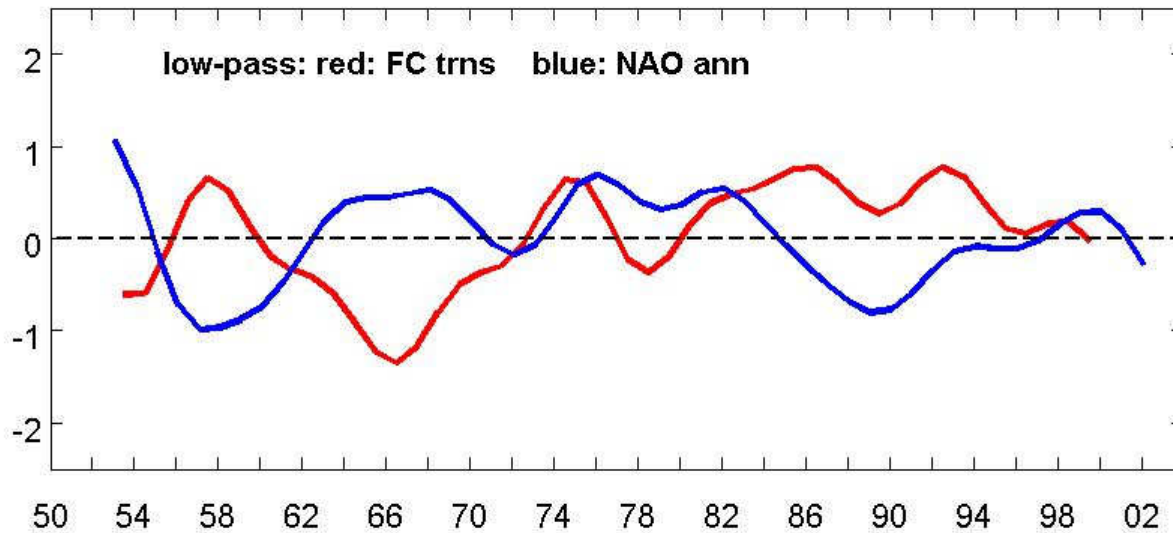
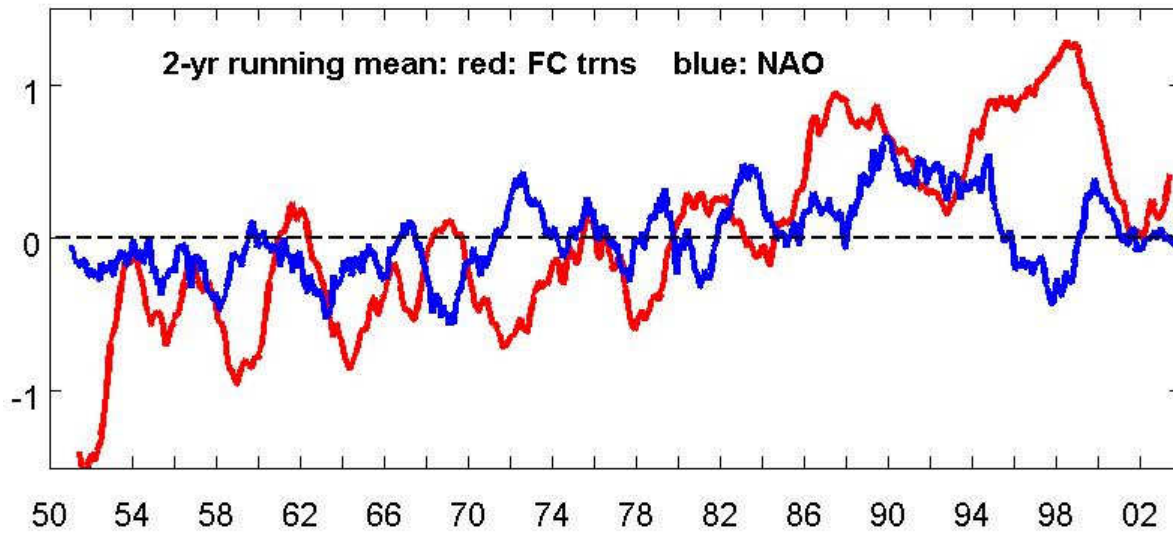
## Cable Data and HYCOM: FC Transport $\sim 27^\circ\text{N}$ Year 2004



FC transport at  $27^\circ\text{N}$  is not sensitive to the resolution of local atmospheric forcing; neither is to the vertical resolution of the model.

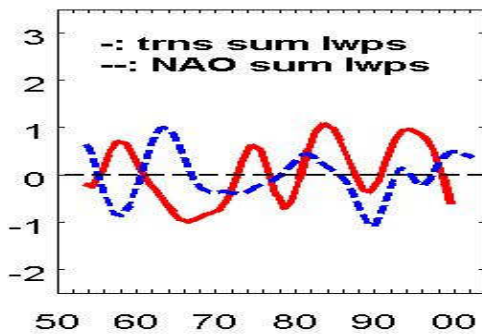
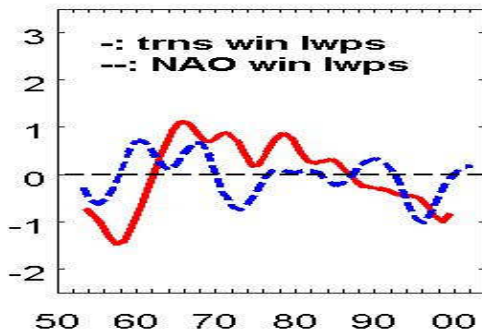
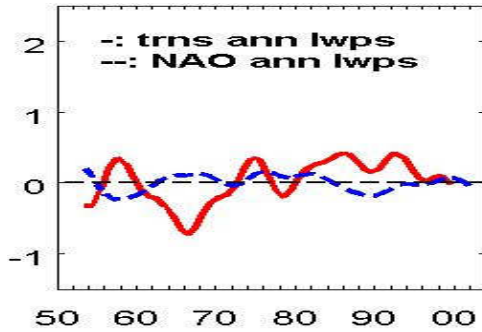
**Inter-annual and decadal variability**  
**→ A model study (1950-2003)**

## HYCOM: FC Transport ~27°N

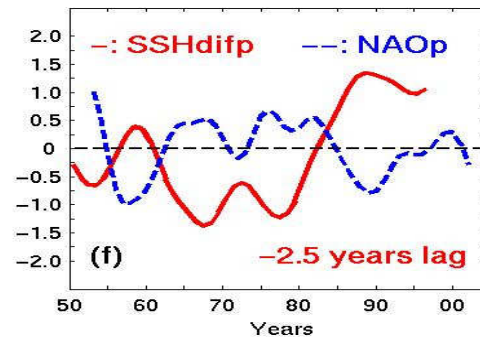
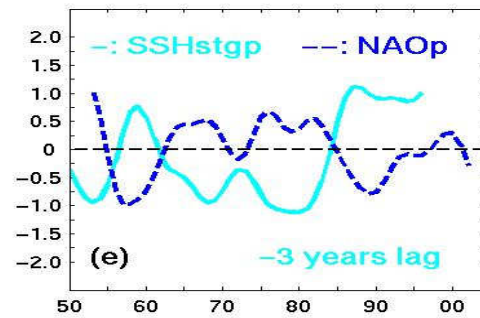
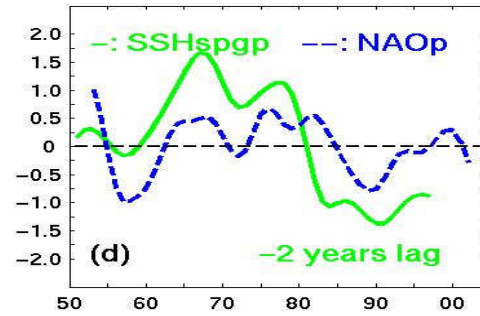


Modeled FC transport is only loosely correlated with NAO: negatively at zero lag (-0.45) and positively with NAO at a 7-year lag (0.59).

win: DJFM    sum: JJAS

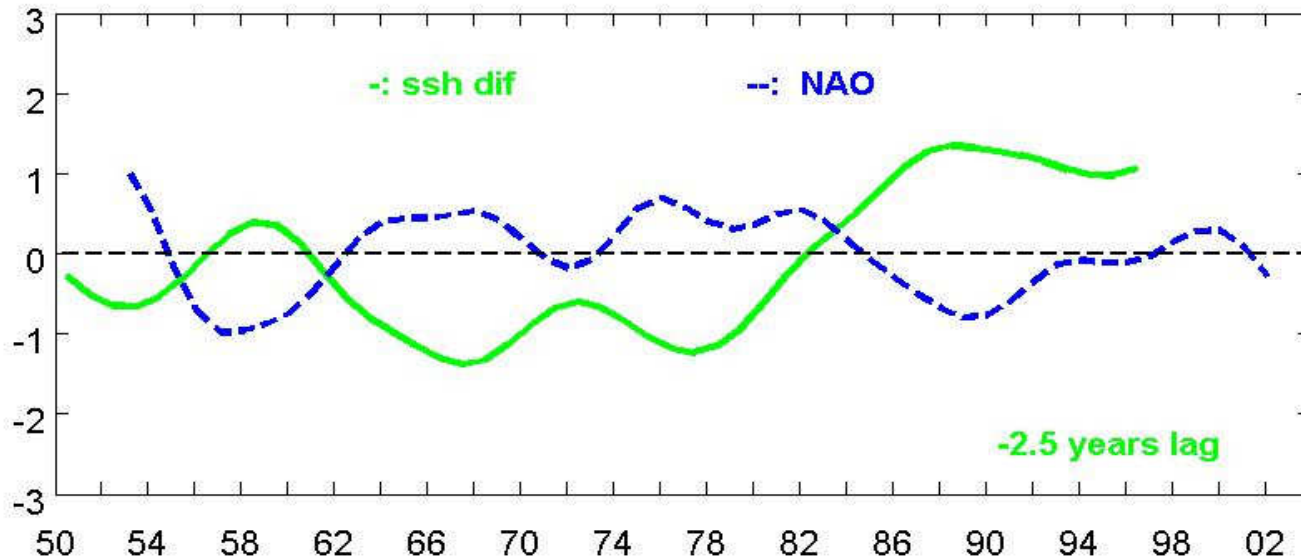


Low-Pass Filtered Normalized Anomalies

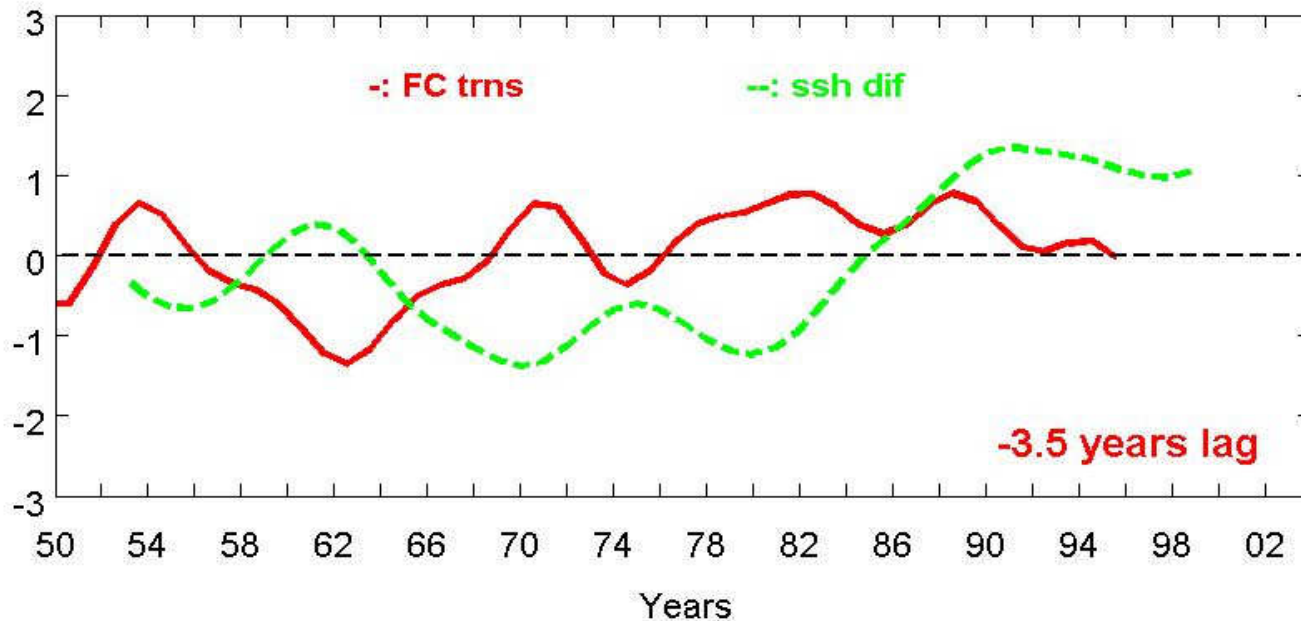


sshdif: the difference between Sea Surface Height (SSH) at the subpolar gyre and SSH at the subtropical gyre.

# HYCOM: FC Transport ~27°N Year 1950 - 2003



← The maximum correlation coefficient is **0.81**.



← The maximum correlation coefficient is **0.71**.

## Summary

- A minimum (maximum) in March is found in cable FC transport for the strong positive (negative) NAO regime. The onset of the summer peak is in May for strong positive NAOs but in July for the strong negative NAOs.
- The variation of the mean values of FC transport for those two regimes is about 5%, which is on the order of observed fluctuations.
- The FC transport is sensitive to the boundary conditions. The major influence on the fluctuations of FC transport on time scales of a few days to a few weeks is found to be from the North Atlantic basin.
- On decadal time scales, the modeled FC transport is loosely correlated with NAO: negatively at zero-lag and positively at a 7-year lag. The sshdif is shown to be a better indicator as it is better correlated with both NAO and FC transport, with sshdif leading FC transport by about 3-4 years. This implies that FC transport is more controlled by the internal ocean dynamics forced by NAO rather than by NAO itself.

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- Patrick Hogan, NRL
  - Alan Wallcraft, NRL
- } Help in model domain configurations and HYCOM related issues
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  - Zhijin Li, JPL → Discussion on statistical analysis
  - The Office of Naval Research
  - The National Ocean Partnership Program
  - The NOAA Coastal Ocean Program and Office of Climate Observations
- } Funding