

A model study of the inter-annual and decadal variations of sea surface height, temperature, and gyre circulation in the North Atlantic

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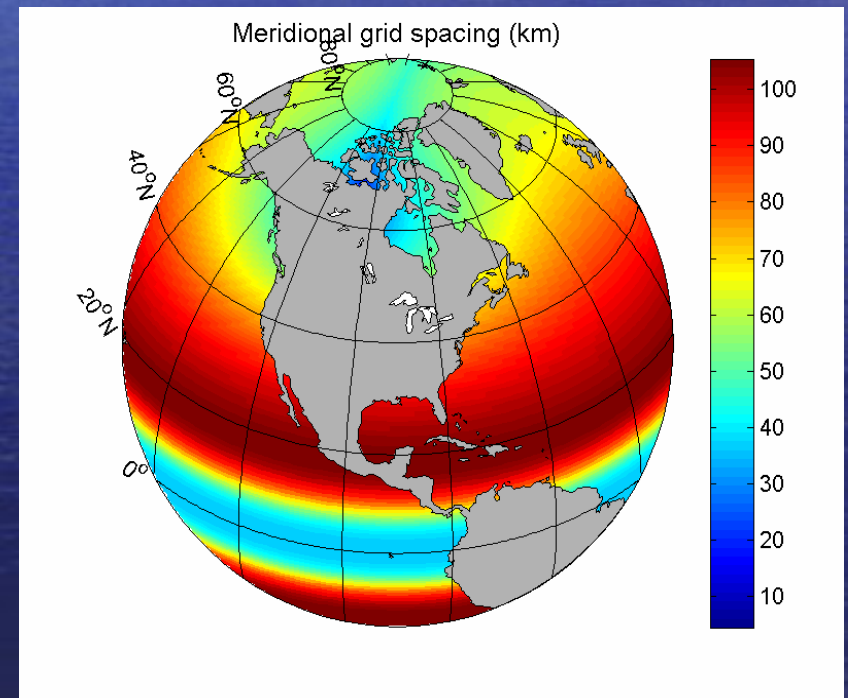
Fisheries and Oceans Canada

Acknowledgements

CONCEPTS, GOAPP, COMDA, PERD, ...

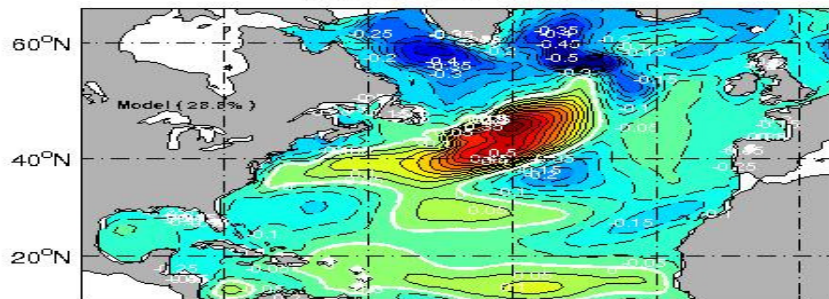
Model Description

- Based on NEMO (Nucleus for European Modelling of the Ocean); ocean module OPA (z-level, C-grid); ice module LIM2 (2 layers ice, 1 layer snow)
- Nominal 1-deg lat/lon; tri-polar configuration
- Forcing: CORE 1958-2004; monthly river runoff; SSS restoration; Bulk formulae

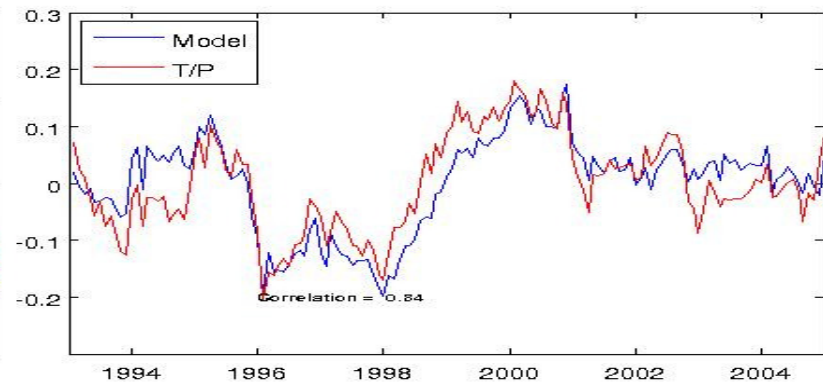
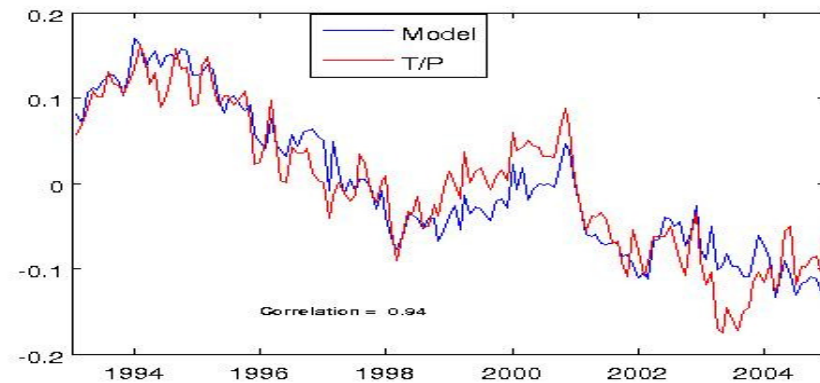
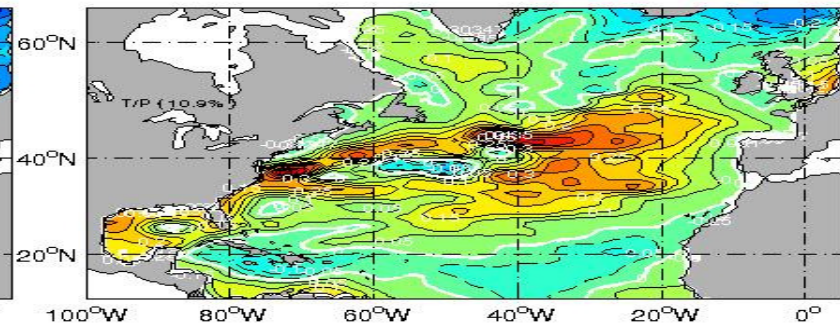
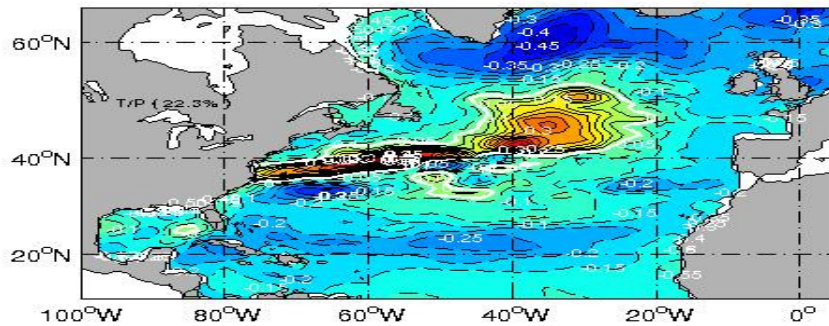
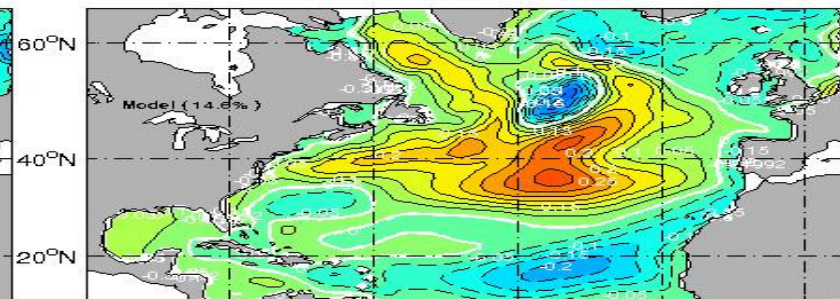


Validation: NA Sea Levels (1993-2004)

Monthly SSH - 1st EOF

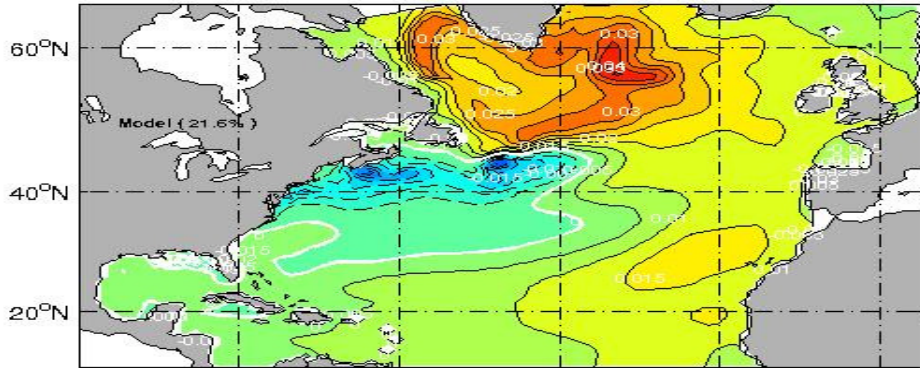


Monthly SSH - 2nd EOF

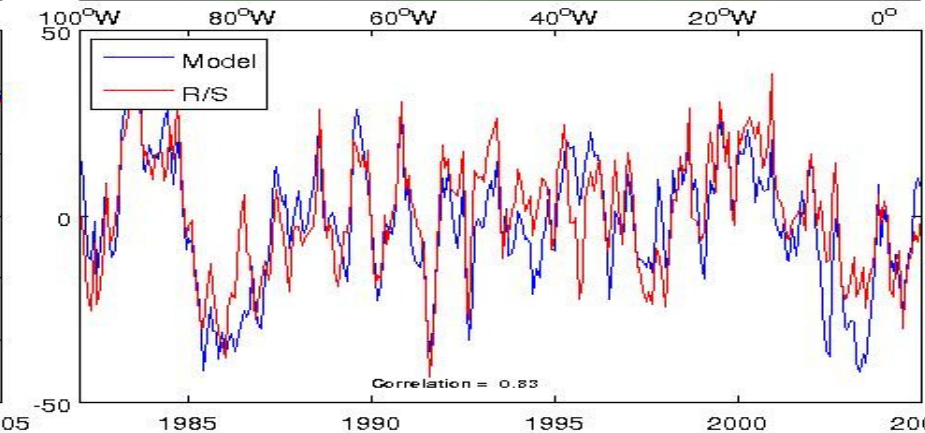
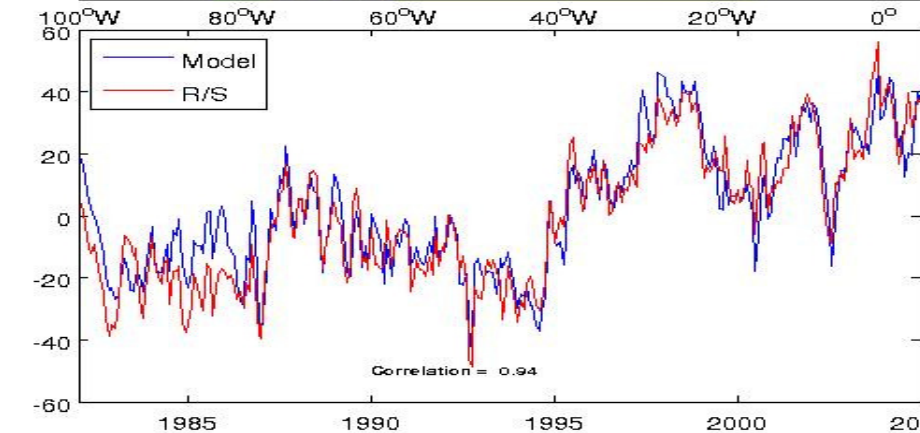
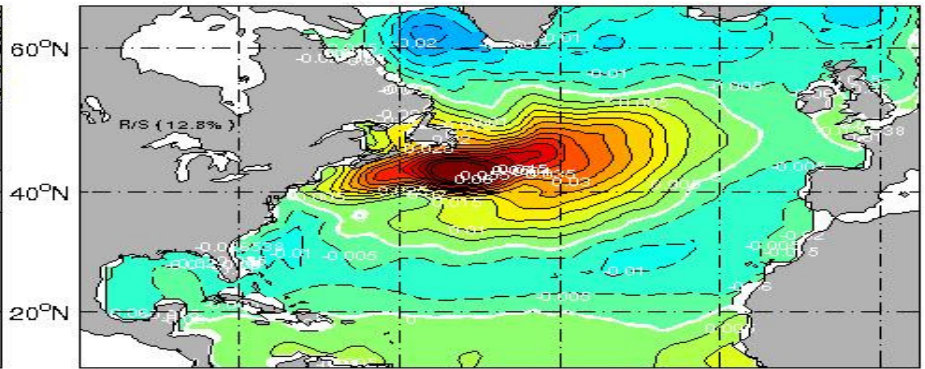
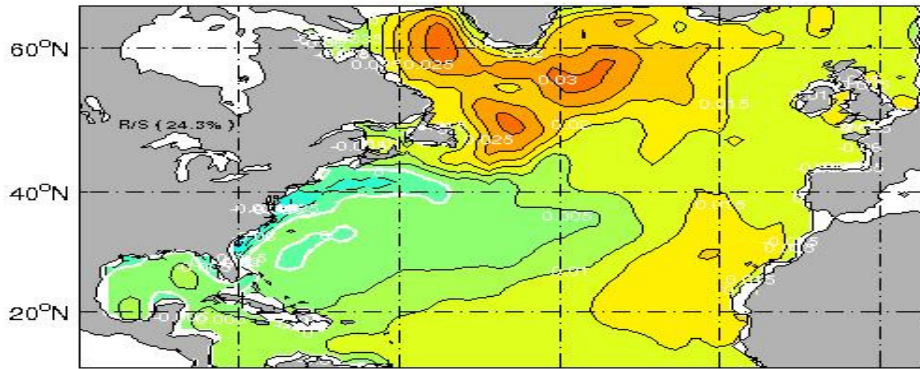
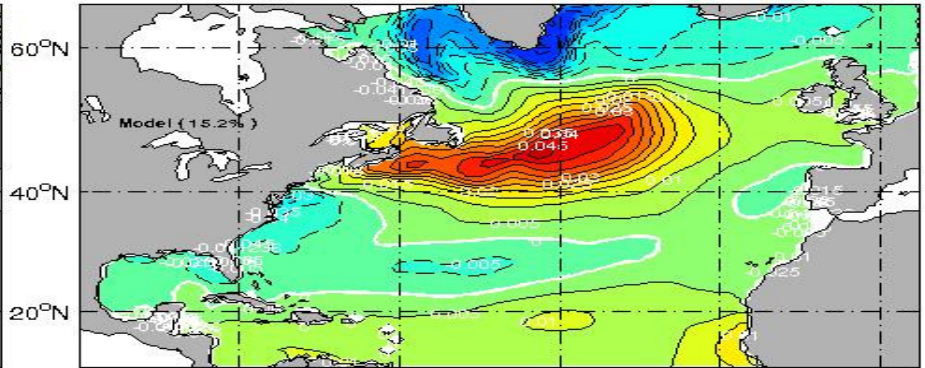


Validation: NA SST(1982-2004)

Monthly SST - 1st EOF

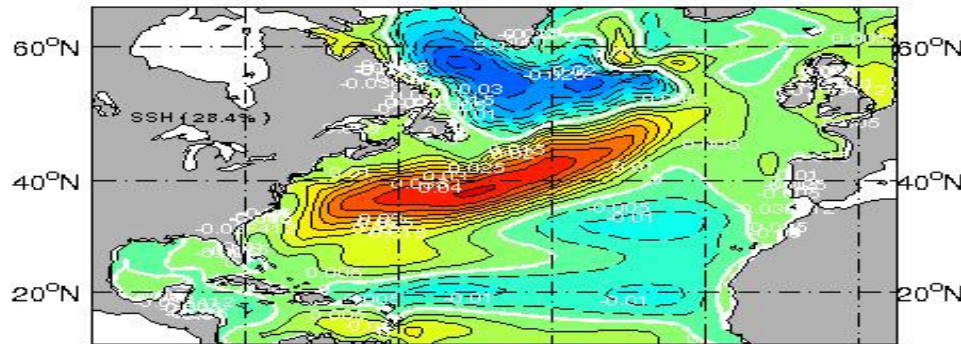


Monthly SST - 2nd EOF

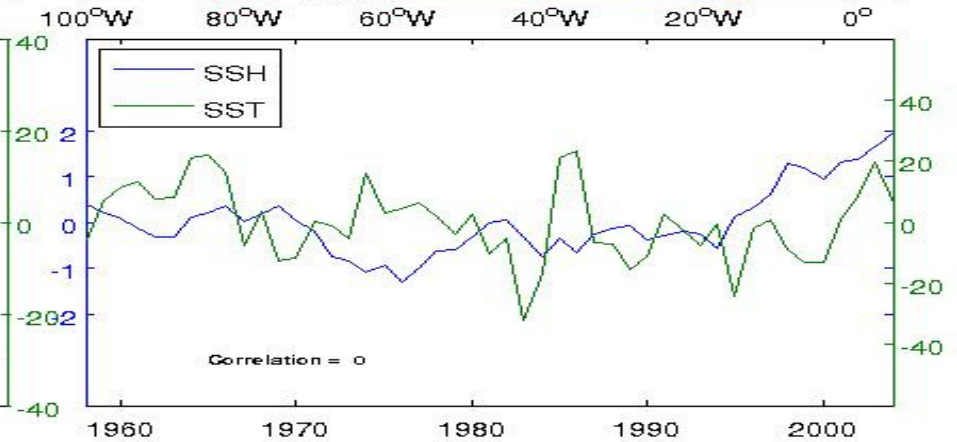
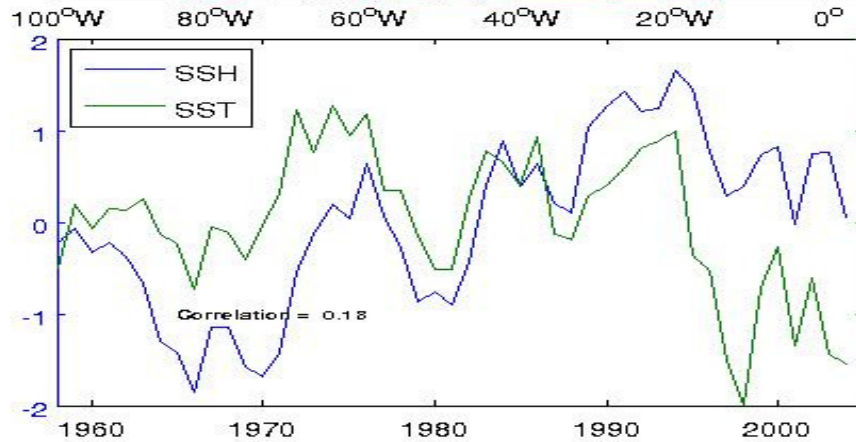
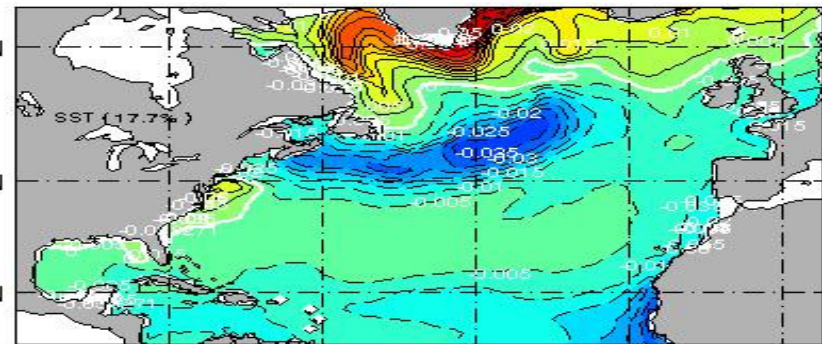
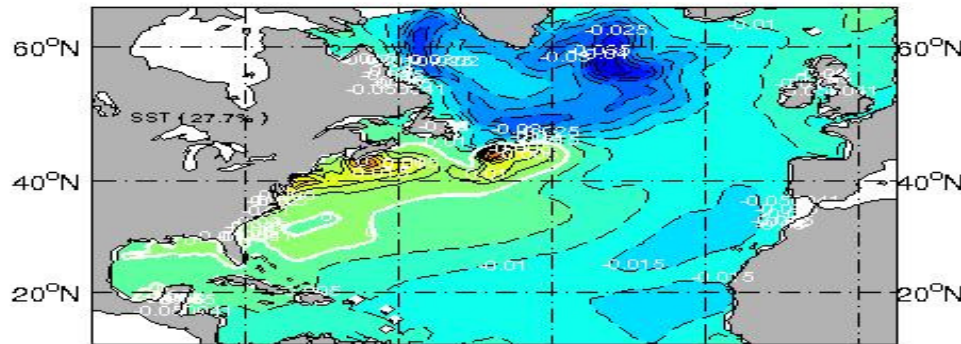
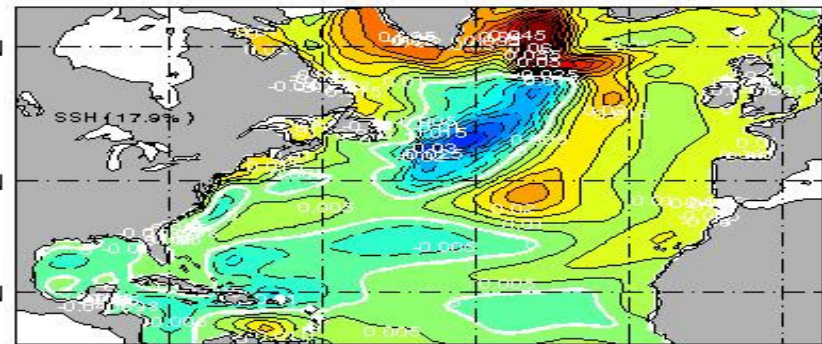


Model Results: SSH & SST(1958-2004)

Yearly 1st EOF

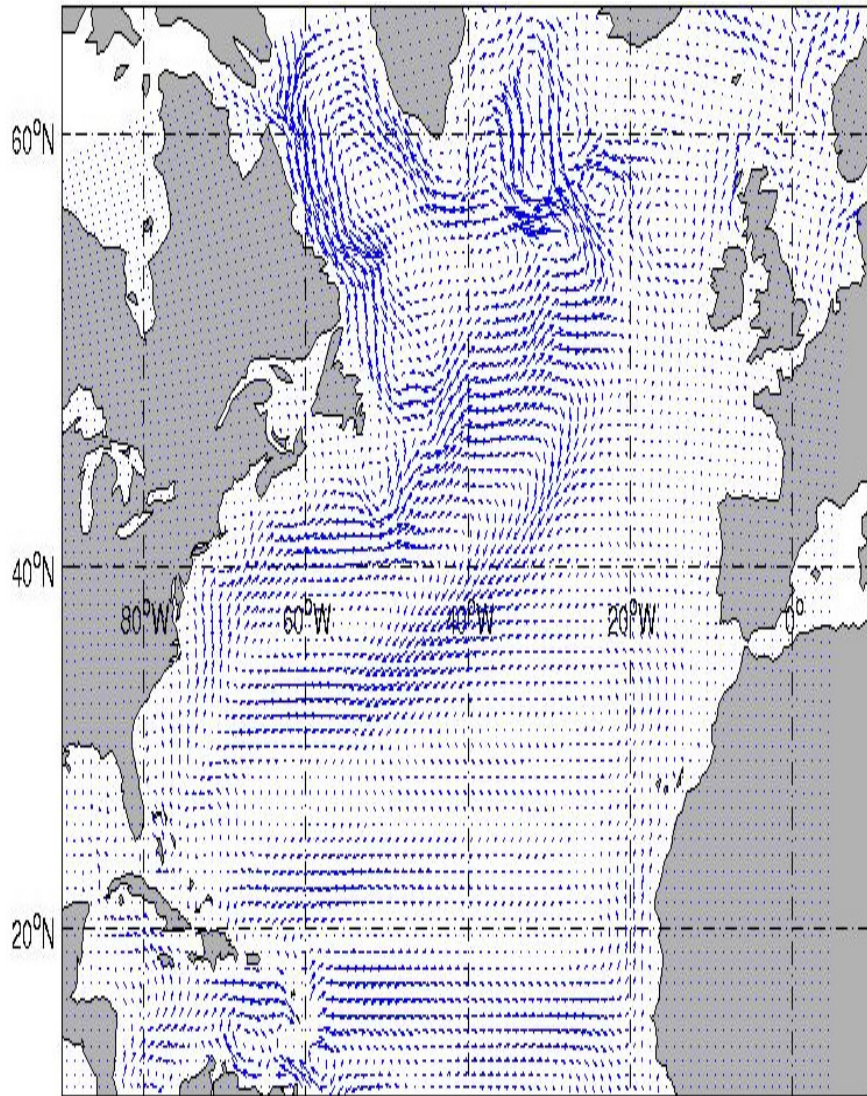


Yearly - 2nd EOF

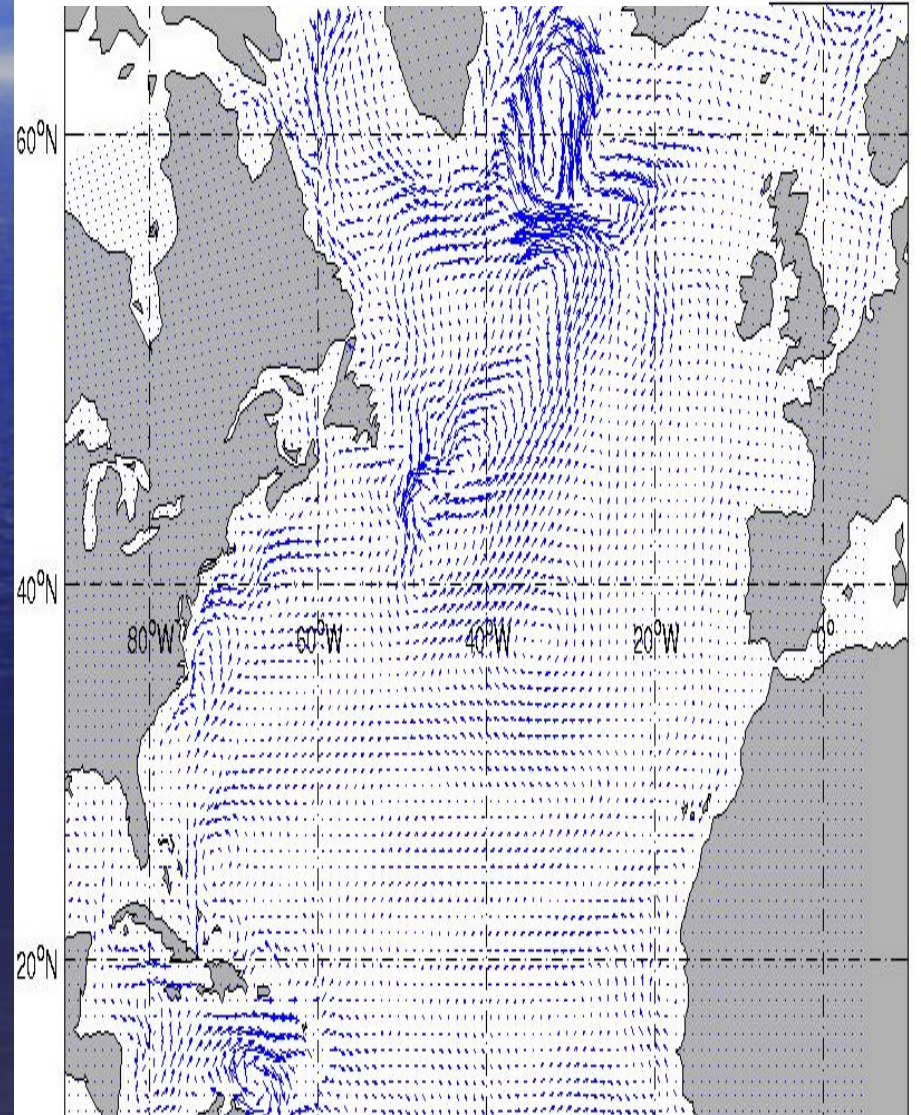


Anomalous Surface Geostrophic Circulation: Computed from EOF1 and EOF2 of SSH

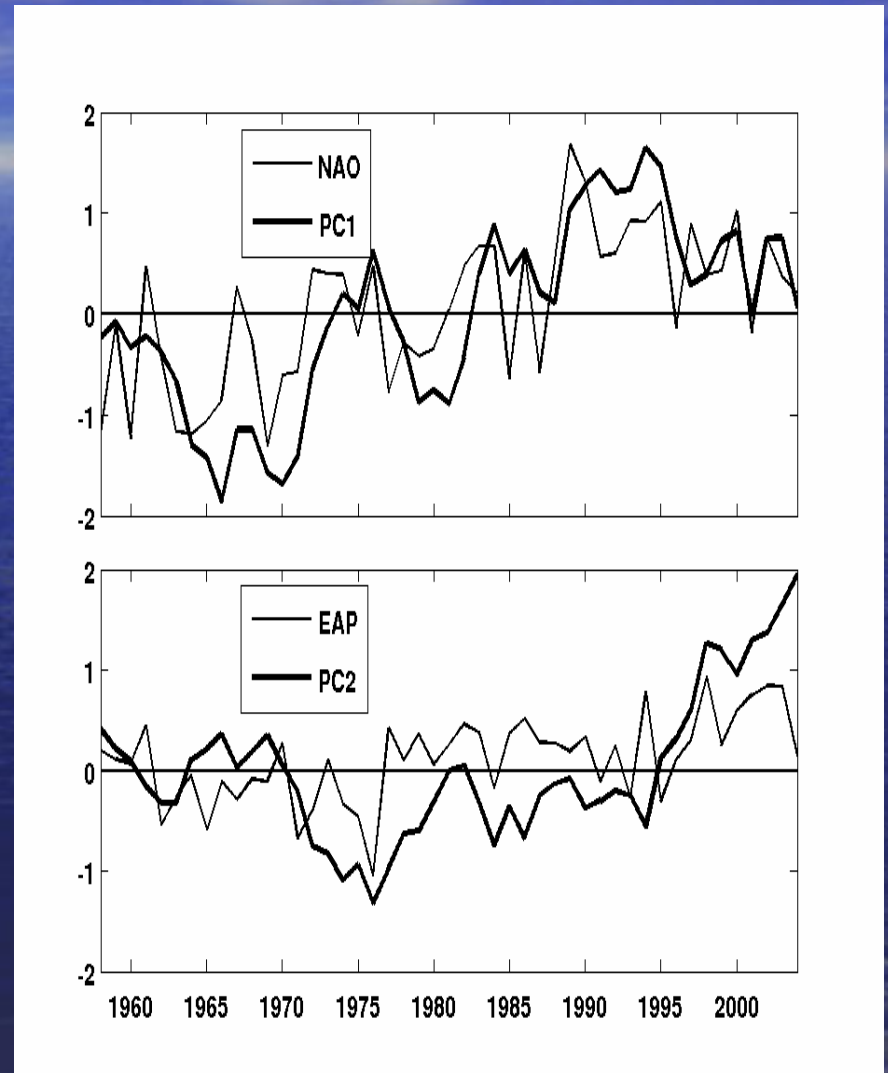
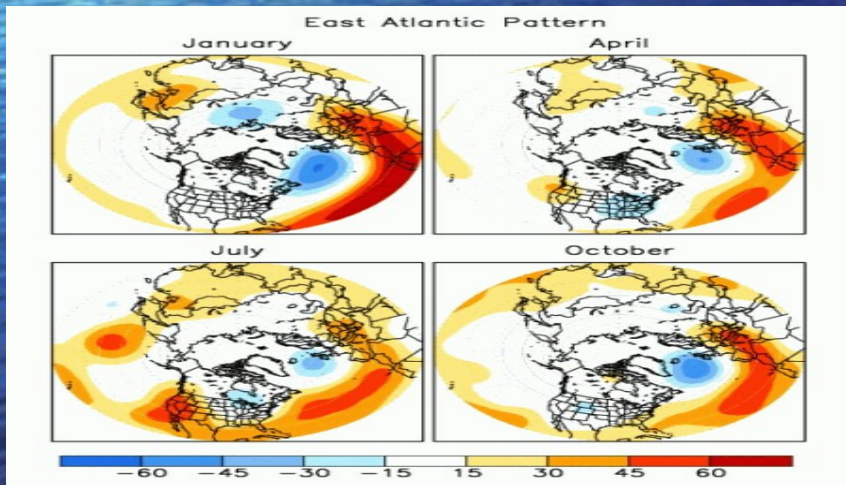
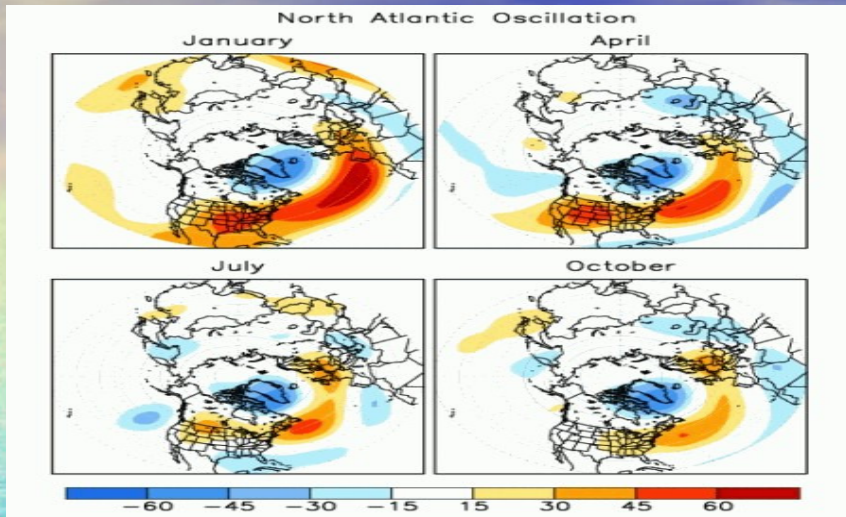
EOF1



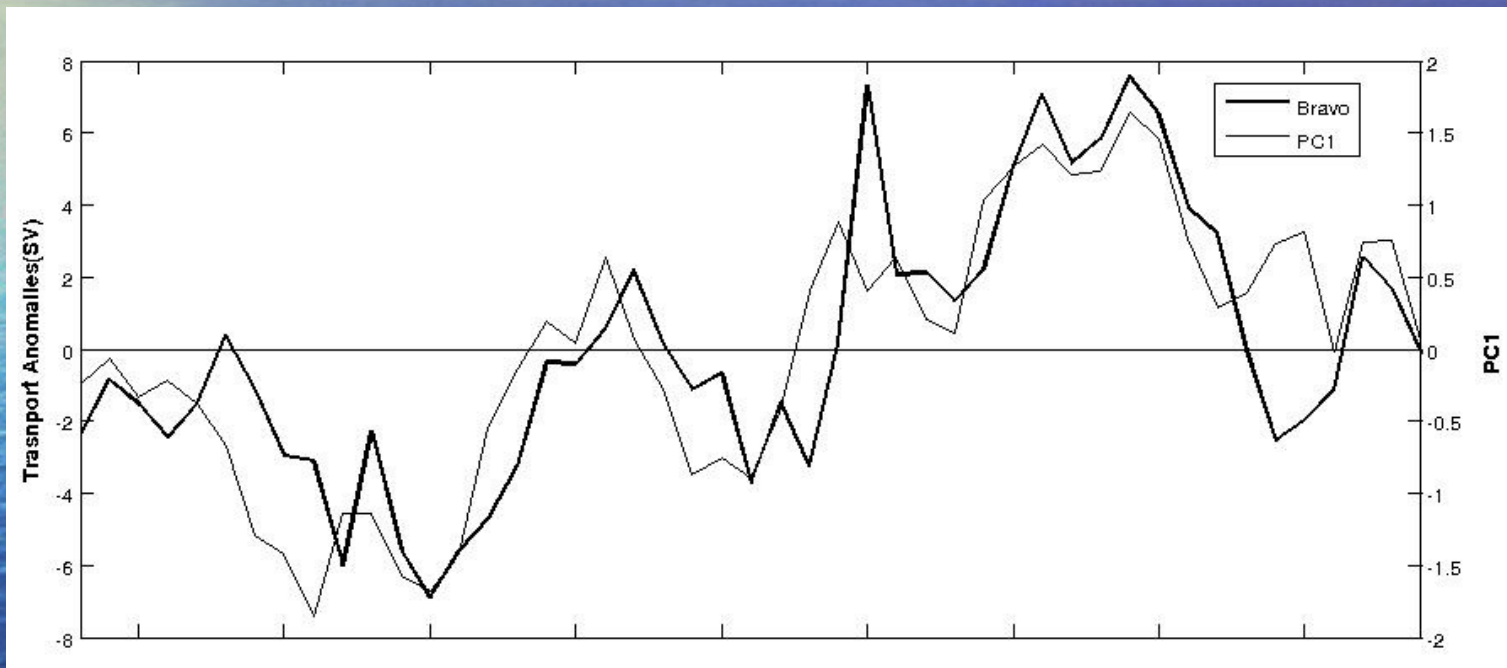
EOF2



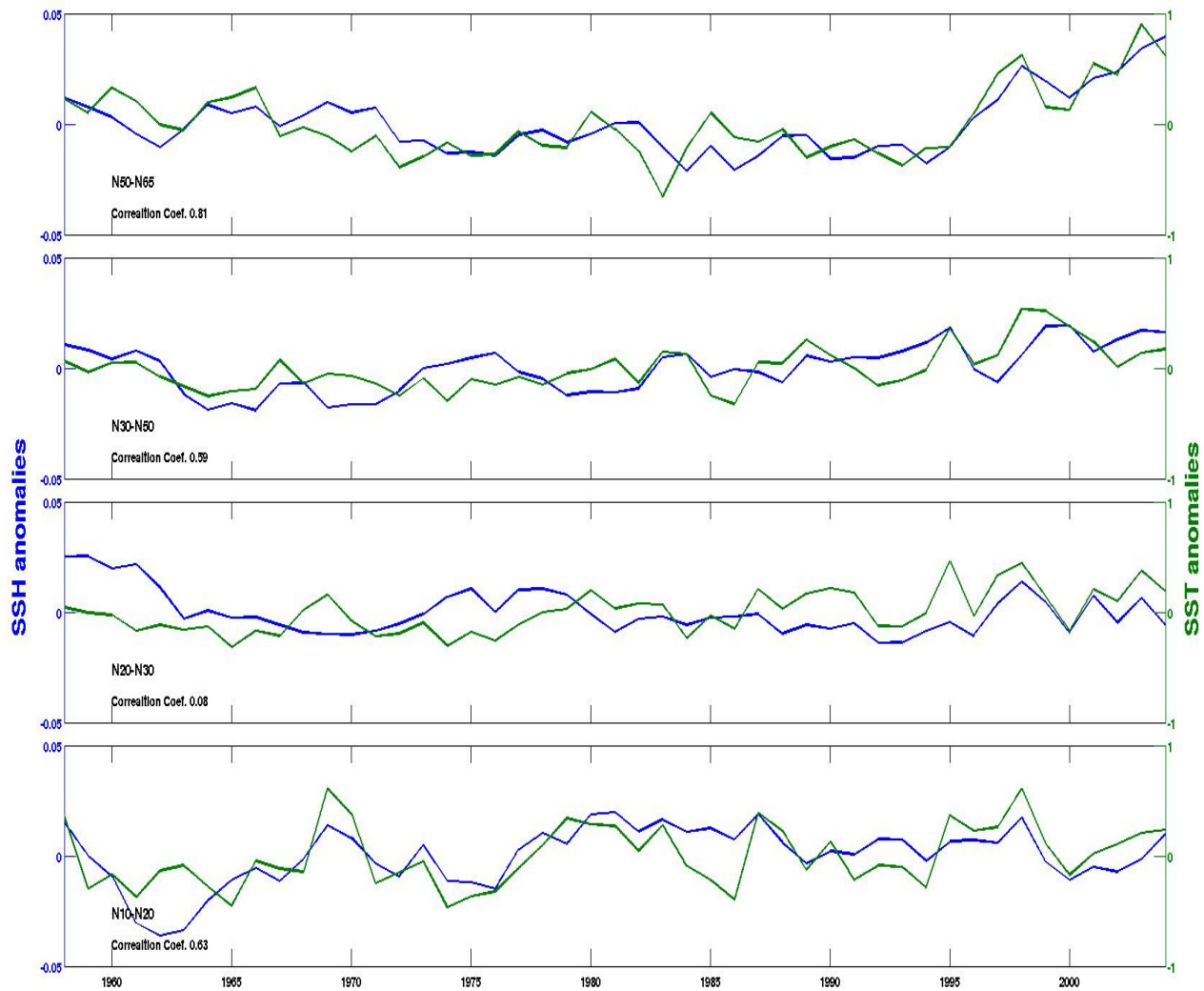
Link to Atmospheric Forcing



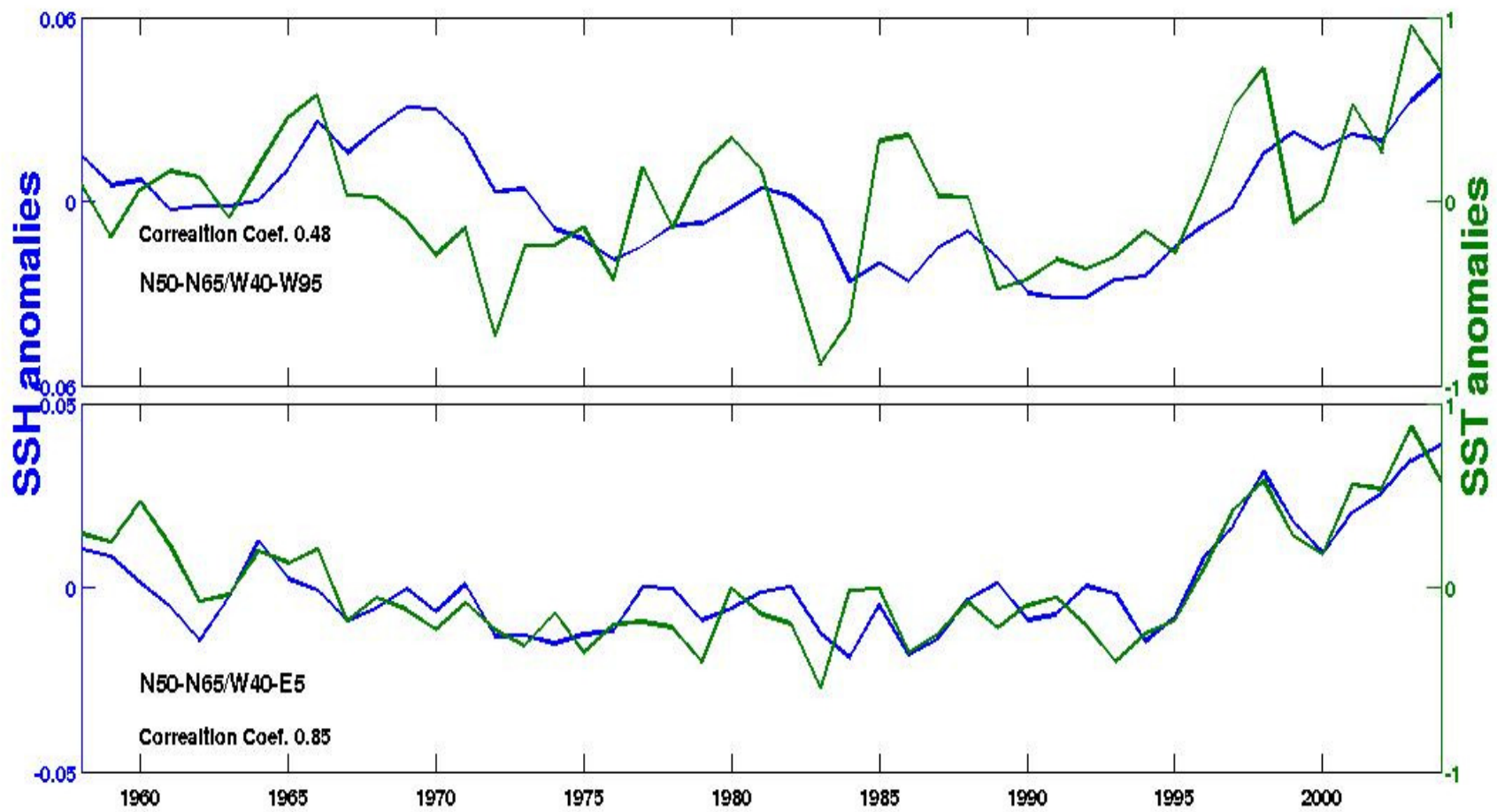
Correlation between PC1 of SSH and Strength of Sub-polar Gyre (Volume Transport Integrated from Labrador Coast to Bravo)



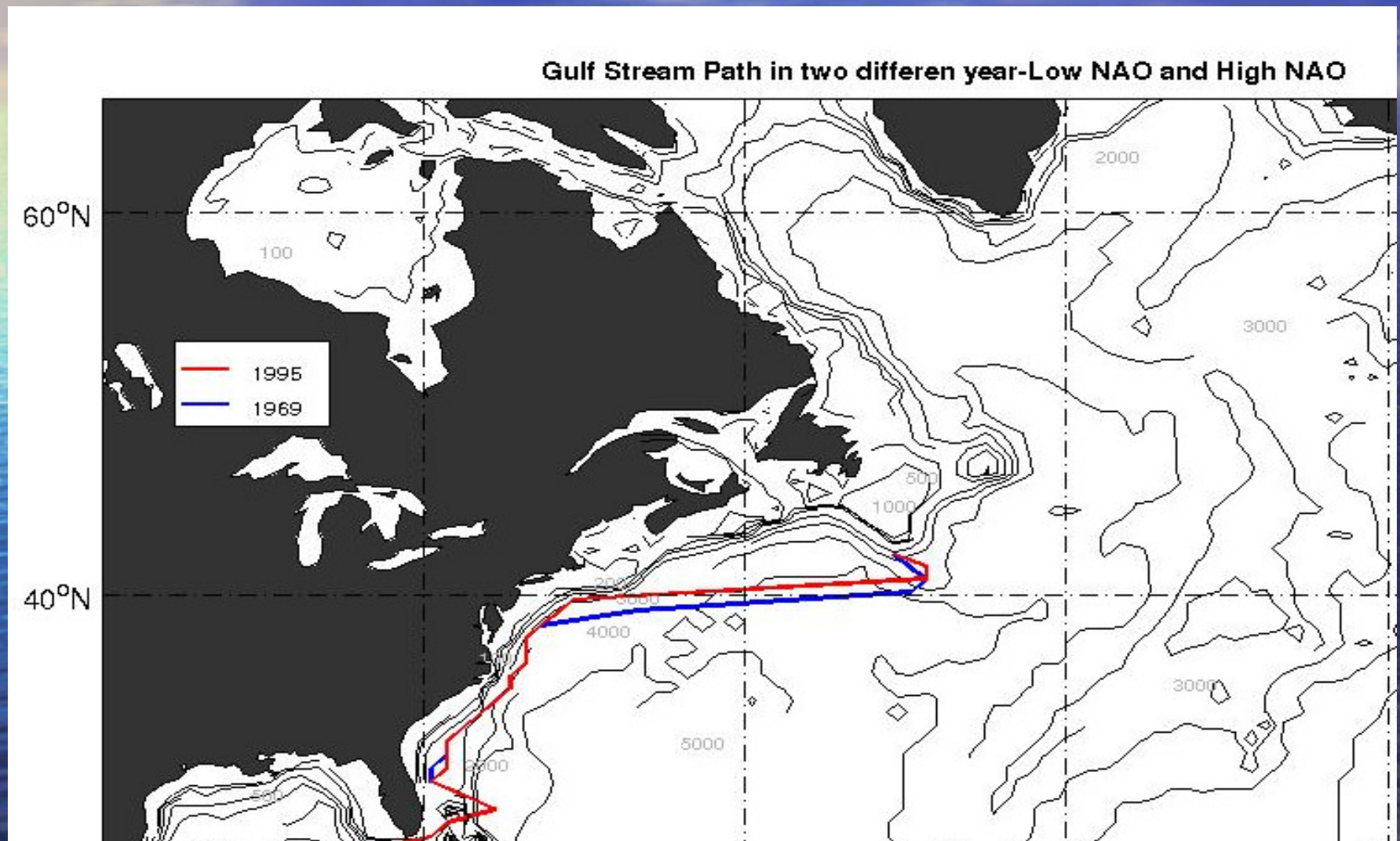
Region Averaged SST and SSH Anomalies



Region Averaged SST and SSH Anomalies: Western vs. Eastern Sub-polar NA



Just for Fun: Shifting of Gulf Stream in 1° model!



Conclusions and Discussions

- 1° model shows good skills to reproduce inter-annual and decadal variability of SSH and SST in North Atlantic.
- The PC's of SSH and SST are correlated, suggesting linkage between the two quantities. (Evidence of PC1 of SST leads PC1 of SSH.)
- Results show PC1 of SSH highly correlated with winter NAO; PC2 moderately correlated with the East Atlantic Pattern (EAP).
- Higher SSH-SST correlation in sub-polar compared with other regions of NA. The eastern subpolar NA has particularly high correlation.
- Some indications of Gulf Stream shifting connected with winter NAO.