The Possible Influence of the NAO on the Mediterranean Outflow Water Path in the North Atlantic

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*Hycom meeting, April, 24-26*
Outline

• Observations
• Parameterization of the MOW tongue in HYCOM
• Results in the 1/3° resolution HYCOM
• Future work
Observations

*From Lozier and Stewart, 2006*
On $\sigma_1 = 32.10$; at MOW core

**Increasing salinity anomaly**

*Lozier and Stewart, 2006*
Weak westerlies: NAO-

Strong westerlies: NAO+

Lozier and Stewart, 2006
Comparison of the outflow representation in different model resolution of the ATL

• 2° simulation: ATLc2.00 (2deg-PY)
  – Initial state: GDEM3 climatology
  – Forcing: ECMWF-ERA40 climatology

• 1°x0.5°: ATLc1b.00 (extracted from global configuration) (1deg-med and 1deg-PY) (Y. Yang and T. Ozgokmen)
  – Initial state: GDEM3 climatology
  – Forcing: ERA40 climatology

• 1/3° : ATLc0.32 (0.32deg-PY) (Z. Garraffo and G. Halliwell)
  – Initial state: GDEM3 climatology
  – Forcing: interannual NCEP 1948-2003
The Price and Yang model (Price and Yang, 1998) is used as a boundary condition to prescribe the outflow in the HYCOM ocean model. Specified parameters are:

- Med. Surf. Fluxes
  - E-P-R over Mediterranean
  - Net Heat flux over Mediterranean
- Specified Atlantic Ocean Water Properties
  - \( \rho_1, S_1 \) of Gibraltar inflow water
  - Density, salinity of entrained interior water at shelf-slope break
- P-Y Model Output
  - Gibraltar outflow , \( S_2, Q_2 \)
  - Entrained interior water transport
  - Final product water \( \rho_3, S_3 \), depth, transport(\( Q_3 \))

(implemented in HYCOM by George Halliwell)
Model Grids
Price and Yang in ATLc2.00

Simulation 2° (climatology: ERA40 forcing)

- Depth: 1000m

2deg-buffer: with buffer zone in the Gulf of Cadiz

2deg-PY: with Price and Yang
Price and Yang in ATLc1.00

Simulation $1^\circ \times 0.5^\circ$ (climatology: ERA40 forcing)  
Depth $= 1000\text{m}$
Price and Yang in 1/3° ATL: 0.32 deg-PY
First results: 0.32deg-PY
Conclusion/summary

• The mechanism of expansion/contraction found in the observations is also present in the 1/3° HYCOM interannual simulations.
• Future work: Can we find a relation between the NAO and the salinity anomalies in the Rockall Trough as in the observation? If yes, can we develop a physical explanation for the expansion/contraction mechanism as a function of NAO?