

Introduction to Oceanography

EAS 4300

Homework # 6

Climate Variability

a) What is the North Atlantic Oscillation (NAO) and how is it defined?

b) When the NAO is in the positive phase northern Europe experiences a wet climate. Explain why?

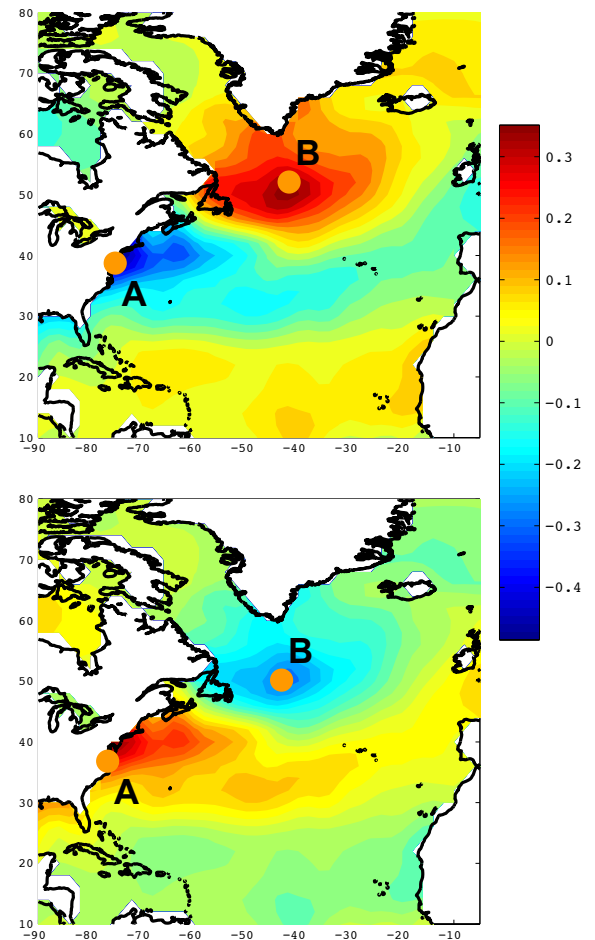
c) The figures on the right shows a dipole structure in sea surface temperatures anomalies (SSTa) in the North Atlantic during different phases of the NAO (upper panel shows warm SST in the subpolar gyre region and warm SST in the Gulf Stream region). Which of the two patterns corresponds to the positive phase of the NAO?

(Hint: during the NAO the Gulf Stream is stronger and the storm track intensifies and shift northward bringing wet climate over northern Europe).

d) Briefly explain which physical processes force the SST anomalies at location A and B (in the figure) during the NAO positive and negative phase.

d) The ecosystem response to the NAO is classified into direct, indirect or integrated. For each type of response state briefly what it means and give at least one example.

SST Anomalies [C]



Oxygen Cycle and Climate

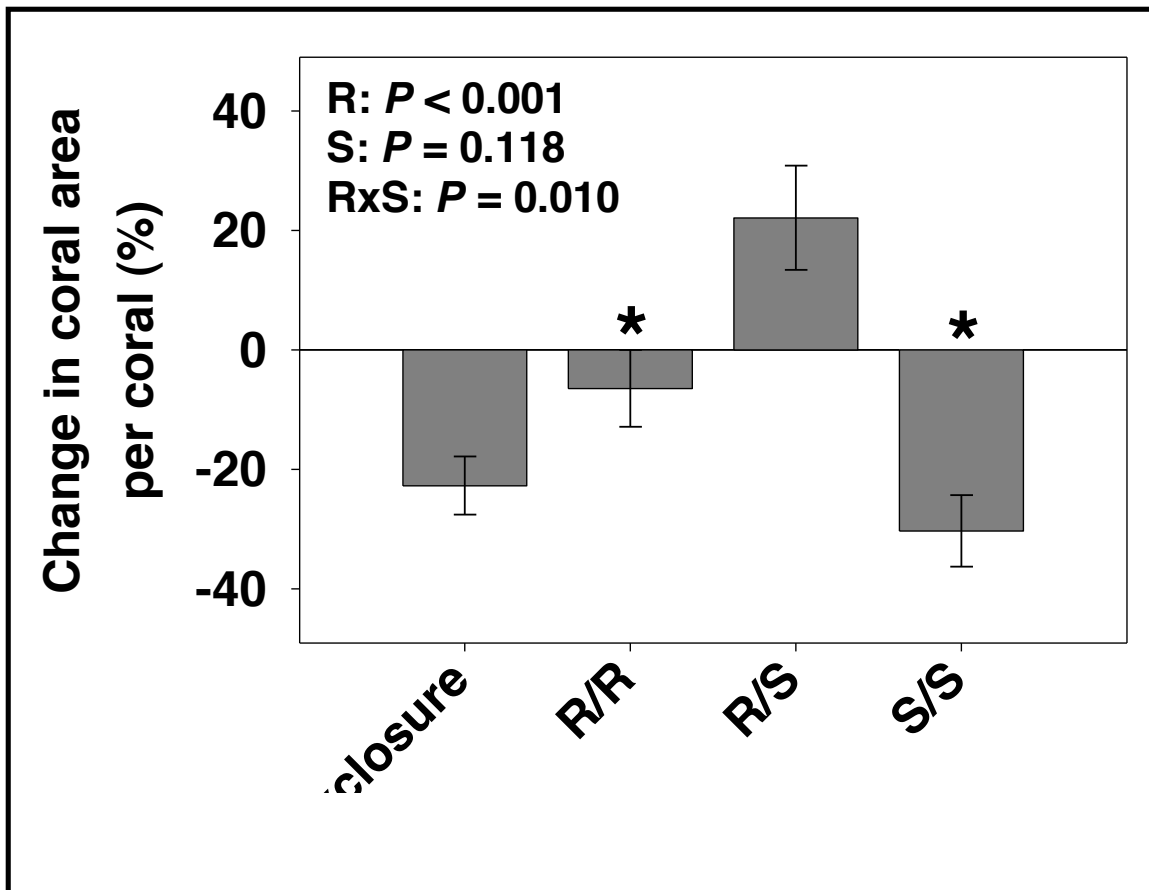
The figure on the next page shows in the top panel a vertical section of oxygen across the three major oceanic basins while the bottom panel shows the dissolved inorganic carbon.

a) Explain the overall processes that control the vertical distribution of oxygen in the Atlantic and Pacific basins. Why does the Pacific show lower oxygen water?

Coral in Crisis (Guest Lecture)

Read the short article from the *The Scientist* by M. Hay.

- a) Explain how macroalgae impact the health of coral reefs.
- b) Using the experimental data showed in the figure below explain what are the effects of herbivore richness on coral survivorship/growth?



(from slide 27 of Coral Sprial Lecture posted on class website)

- c) Explain why Marine Protected Areas can improve the resistance and recovery of coral reefs?