MAR 105, Ocean Circulation “Gulf Stream: South Atlantic Bight (SAB)”

Name: ______________________________

Preliminary Exercise and Questions:

(1) Using the provided blank Earth “hemisphere” (see next page), label the significant latitude lines.

(2) On the same “hemisphere,” label the associated “wind” circulation patterns and use arrows to illustrate their general direction. Briefly explain the winds’ impact on ocean circulation:
_______________________________________________________________________

(3) Now look at figure 2. What ocean(s) are located inside the dashed area?
______________________________________ (label on figure as well)

(3a) What continent(s) are inside the dashed area? ______________________________  (label on figure as well)

(4) What OCEAN GYRE is located centrally within the dashed area?
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(4a) Name the 4 currents associated with the (above) gyre: (label on figure as well)
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(4b) Of the 4 currents listed above, select the North/South current associated with the EAST COAST of the U.S. (circle name above)

(5) Now, using the above information and your knowledge of ocean contours, complete the Ocean Circulation “Gulf Stream: South Atlantic Bight (SAB)” lab.
LAB EXERCISE:

Introduction:
There are many inter-related “factors” that affect surface ocean circulation: continental shoreline topography, ocean (floor) contours, ocean currents, wind patterns and weather (to name a few!) predominate. Using these “factors,” you will create a model of the South-Eastern US including both land and ocean-based topography, and highlight the effects of ocean bathymetry on ocean circulation patterns. You will highlight major ocean topographic contour, such as the continental shelf and slope, as well as site specific areas such as the Charleston Bump.
The Charleston Bump is a topographic rise on the continental slope off of Georgia and South Carolina (see maps). The slope off the southeastern US is unusual, in that it splits into 2 parts. At the edge of the shelf (55 m), the steep slope begins, and goes down to about 400 m. Then it flattens out and gradually slopes down to 1000 m. At 1000 m, a steep slope then begins again, dropping rapidly to 3000 m. The relatively flat area between 400-1000 m is the Blake Plateau. On this plateau, the Charleston Bump rises steeply from the depths of 700 m up to 400 m. The rise is so abrupt that it deflects the Gulf Stream offshore, and “riffles” can be seen on the surface as the stream flows over it.

Focus Question: Do major topographic ocean contours such as the Continental Shelf, Continental Slope and Charleston Bump influence surface ocean current patterns?

(1) View figures of the South Atlantic Bight (SAB), attached and larger maps in the lab:
   (a) On the COASTLINE MAP (last pg) Draw and label the continental shelf, shelf break and continental slope from Florida (start north of the Bahamas) to North Carolina (stop at Cape Hatteras).
   (b) Circle the Charleston Bump
   (c) Note any other major morphological features you see on the sea floor that might have an effect on currents.

(2) Create a model of the SAB sea floor morphology in your tray with clay. The clay layer should be thin – no more than 1-2” wide. Your model should show the shoreline from Cape Hatteras, NC to Cape Canaveral, FL and should include the features labeled in “1” above.

(3) Pour sufficient Rheoscopic Fluid over your model to a depth that just covers the Charleston Bump.

(4) Use a drinking straw to create a gentle “wind” (think: which wind is it??) blowing from the South to start a current running along the shoreline. Increase and decrease your wind “speed.” Repeat (at least) 3 times.

(5) Carefully observe the current(s) you created. Record and illustrate your observations either on a separate sheet of paper (on the blank/back of the lab is fine) and answer the following questions:
5(a) Describe the movement of your current.

___________________________________________________________________

If you observed any meanders and eddies in the current, identify where they occurred.
___________________________________________________________________

(b) Were there bathymetric features associated with the meander or eddy?
___________________________________________________________________

(c) Illustrate the circulation patterns affected by the shoreline or over the Charleston Bump.
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(d) What happens to your current when the velocity or speed reduces? What happens specifically to the area toward the North (top) of your tray? Why?
___________________________________________________________________

(e) Record any other observations as needed

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(6) The Clean-Up procedure will be described in detail.
4. On the hemisphere below, draw the following significant lines of latitude and label them. These lines of latitude will be referenced in later labs.

   a. Equator
   b. North and South Poles
   c. 30°N and 30°S
   d. 60°N and 60°S
   e. 23.5°N, Tropic of Cancer
   f. 23.5°S, Tropic of Capricorn
   g. 66.5°N, Arctic Circle
   h. 66.5°S, Antarctic Circle

2. Winds: Doldrums, Easterlies (Trade Winds), Westerlies, Polar Easterlies

   Draw arrows to show the directional pattern of these winds. Label them.
Figure 2.
Appendix B (a): Bathymetric map of the SAB
Appendix B (b): Bathymetric map of SAB – Charleston Bump

South Atlantic Bight EEZ (SBEZ)
Examples to help guide the drawing of your own diagram on the coastline map (next pg).
COASTLINE MAP: Draw and label the continental shelf, shelf break and continental slope from Florida (from north of the Bahamas) to North Carolina (stop at Cape Hatteras). Circle the Charleston Bump.