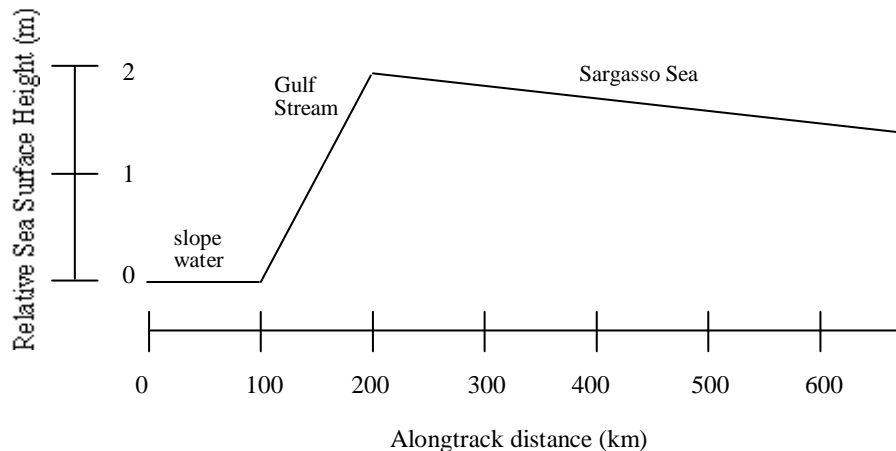


- 1) Give a verbal description of the forces acting on a sheet of ice driven by a steady wind off Antarctica. Draw a picture showing the force vector balance. Which direction is the ice sheet moving relative to the wind?
- 2) For a mixed layer, calculate the hydrostatic pressure (p_h in db) at 50 m. You know that g equals 9.8 m s^{-2} and that the temperature of the mixed layer is 20 C and its salinity is 35.3 psu . Use an online calculator to estimate in situ density.
- 3) An atmospheric low pressure system travels over the site where the temperature of a 70 m thick mixed layer is 20 C and its salinity is 35.3 psu . The atmospheric pressure (p_a) drops from 1010 mb to 980 mb . How much is the *total* pressure ($p_h + p_a$) at 50 m altered? As oceanographers measure pressure with their instruments, how much do they need to change their pressure reading (in db) to measure correctly hydrostatic pressure (p_h)?
- 4) A satellite altimeter measures a zonal transect of sea level height (after correcting for tides, orbit error and geoid variations) from the continental of the United States into the Sargasso Sea. The data are taken along a line of constant latitude ($\phi=30^\circ\text{N}$). Calculate the speed and direction of the surface currents for the three regions indicated (i.e., slope water, Gulf Stream and Sargasso Sea).



- 5) At the same time as the above altimeter track, you have measured the average density of the upper 2000 db at stations 100 and 200 km offshore. At the 100 km station, the mean density is equal to $1039.50 \text{ kg m}^{-3}$, while at the 200 km station it is $1038.56 \text{ kg m}^{-3}$. Calculate the geostrophic current of the Gulf Stream at the surface relative to an assumed level of no motion. What did you assume for the depth (pressure) of your level of “no motion”? Over what depths and spatial extent does your estimate of geostrophic current apply to?
- 6) Define barotropic and baroclinic currents using just two sentences (one for each definition). Use the results of the first two examples to partition the barotropic and baroclinic currents for the example of the Gulf Stream (problems #4 and 5 above). For this example, what fraction of the Gulf Stream current is barotropic? State the assumptions that you needed to make.