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87.202 - PRINCIPLES OF EARTH & ENVIRONMENTAL SYSTEMS II
STUDY QUESTIONS AND PROBLEMS XI

1. What causes the principal open-ocean surface currents?

2. Contrast the eastern and western boundary currents.

3. Explain Ekman transport and its role in upwelling.

4. Why does the current continually change direction and decrease with depth in the Ekman spiral?

5. Describe geostrophic flow.

6. Explain the thermohaline circulation of the deep ocean.

7. Draw a generalized wind and surface current pattern for a rectangular Atlantic Ocean.

8. You are involved in an oceanographic cruise and are currently sailing at a latitude of 40°N. An anemometer mounted on your mast, at a height of 10 m above sealevel, records a wind velocity of 14 m s^{-1}. The density of air is 0.00129 g cm^{-3} and the drag coefficient is 2.6 x 10^{-3}. Calculate the following:

   a. Wind stress. (ans: 6.57 dynes/cm^2)

   b. Water speed. (ans: 0.22 m/s)

   c. Depth of the Ekman spiral. (ans: 239.8 m)

   d. The magnitude of the Coriolis force exerted on the moving water. (ans: 2.06 x 10^{-5} m/s^2)

9. The following data were taken in the South Atlantic at two stations separated by a distance of 140 km. Station 2 is directly east of Station 1 and both are at a latitude of 37°S. Calculate the magnitude and direction of the relative current in the upper 100 meter layer. (ans: 11.25 cm/s, to the North)

Depth (m)	σ_t (Station 1)	σ_t (Station 2)
0	25.7	26.0
20	25.8	26.1
40	25.9	26.2
60	26.0	26.3
80	26.1	26.4
100	26.2	26.5
200	26.7	27.0
300	27.2	27.4
400	27.6	27.8
500	28.2	28.2
600	28.4	28.4