

**Round: 5B**

1. Name and define the two principal direct methods by which ocean current speed and direction are measured.

*Eulerian Method: Employs fixed current meters (1 pt) attached to the sea floor with platforms and/or cables. The current meters orient in the direction of water flow and measure speed of the current as it flows past the instrument (2 pts).*

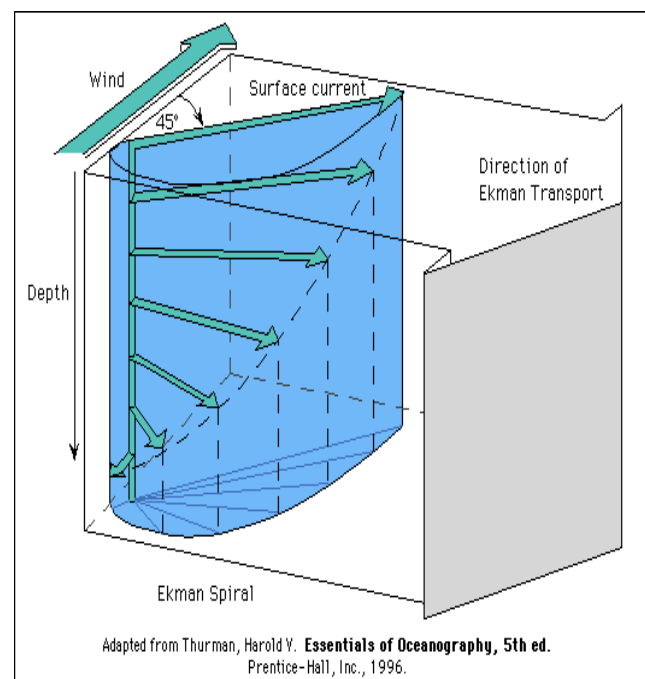
*Lagrangian Method: Employs drifters (drogues or floats) (1 pt) released at the surface or specific water depths that drift with water flow (2 pts). These instruments are typically tracked acoustically by a surface vessel or surface floats that communicate with satellites to determine position.*

2. What does ADCP stand for and how does it measure currents?

*Acoustic Doppler Current Profiler (1 pt): ADCPs use sound waves reflected off of particles in the water column to measure the “Doppler shift” or the displaced reflected echo of the particles as they move toward or away from the instrument (3 pts).*

3. Assume you are in the Northern Hemisphere. Describe the causes of Ekman spiral and explain how the causes lead to different current directions and speeds at depth. Illustrate your explanation.

*An Ekman spiral is caused by the surface flow of water being deflected to the right (or left depending on hemisphere) of a generating wind force due to the Coriolis effect. As the current deepens, successive layers are deflected slightly to the right (or left) of the preceding layer above. The speed of each layer decreases with depth due to friction while the bulk of water mass moves at a 90 degree angle to that of the surface wind (Ekman transport). Thus, current direction and speed might be quite different at the surface than at depth (4 pts).*



4. How do seasonal winds and Ekman transport interact to produce coastal upwelling off of the California coast?

*Winds blowing in a southerly direction in the Northern Hemisphere will tend to bend surface waters to the right due to the Coriolis effect. This displacement of warm surface water offshore brings deep, cooler nutrient rich water up to the surface (4 pts).*