Horizontal Water Movement Using Drifters

Objective
To have students analyze horizontal water movement using drifters.

Correlations
National Science Education Standards
Grades 5-8: A, B, E, G
Grades 9-12: A, B, E, G

California State Science Education Standards
Grade 6: 2b, 4d, 7b
Grade 7: 4f, 7a
Grade 8: 1a-d, 2d, e, 8c, d, 9f
Grades 9-12: Physics 1a-h, 2d, Earth Sciences 5a-d, f, g

Ocean Literacy Principles and Fundamental Concepts: 3 & 7

Introduction
Winds drive the currents on the surface of the ocean. The strength and variability of surface currents affect weather over short and long distance and time scales, impacting climate and environments for all life on Earth. Data from drifters, buoys and satellites provide observations about speed and direction of currents. Storms can cause deviation of normal current patterns. Surface currents can vary considerably in both strength and in depth. Nearshore winds can cause upwelling resulting in plankton production. El Nino conditions can result in the reduction or cessation of upwelling, a loss of plankton production, and can severely impact fisheries.

Understanding and tracking ocean currents are important economically for shipping and fisheries, important ecologically in understanding population distribution, and environmentally critical in looking at impacts of pollution. Surface currents transport not only nutrients and planktonic organisms which affect the distribution of life, they also redistribute pollution that enters the ocean.

Ocean surface currents have a large influence on weather patterns along the coast as well as inland. As we learn more about the influence of human activities on the warming of the earth, it is imperative that we understand the role that the ocean and its surface currents play in shaping weather and climate.

Materials
- Access to a stretch of water at least 15 meters in length along a pier, jetty, or stretch of land
- Method of measuring and marking off a given distance (meter tape, tape measure or yard stick, use landmarks or boat(s) or a pier, etc.)
- Bottle drifter, 1 per team (e.g. plastic bottle filled with sand - so that the bottle floats just below the surface of the water - with a long string or rope attached so that you don't lose it)
- Timing device, such as a wrist watch or stop watch
- Compass
- Wind gauge
- Student worksheet

Procedure

1. Test the drifter's buoyancy to make sure that when it is in the water it remains vertical with its cap right at the surface of the water.

2. Put the drifter in the water for a test run. Determine which direction it goes so that you can set up your next step.

Option 1:

3. On land, measure and mark off a known distance along the shoreline, an anchored boat, a pier, jetty, etc. Select a starting point and mark it as "point A". Move at least 15 meters along the shoreline, jetty, etc. and mark the end "point B". Measure and record the actual distance between point A and point B in meters. With a wind gauge and a compass, measure and record wind speed and direction.

4. Lower drifter (with attached string!) in the water at point A.

5. Use a timing device to record the time it takes for the bottle to move from point A to point B.

6. Use a compass to determine the general direction the bottle went. Remember, current direction is the direction the water is ***going*** (as opposed to wind direction which is reported as the direction that the air is ***coming from***).

7. Record your data in the worksheet below.

8. Repeat steps 2 and 3 two more times.

9. Calculate the speed of the current for each trial, then calculate an average current speed.

Option 2:

3. Lower drifter (with attached string!) in the water and mark the starting point.

4. Let the drifter drift for a pre-chosen amount of time (what you choose will depend on the conditions).

5. Measure the distance traveled by the drifter.

6. Use a compass to determine the general direction the bottle went. Remember, current direction is the direction it is going (as opposed to wind which gets reported as the direction that it is coming from).

7. Record your data in the worksheet below.

8. Repeat steps 2 and 3 two more times.

9. Calculate the speed of the current for each trial, then calculate an average current speed.

Drifter Tracking Data Worksheet

Date: _____Time_____Wind speed_____Wind direction_____

Station Name: _____Tidal height_____

Latitude, Longitude: _____, _____

Team Members: _____

_____

Trial Number	Distance (m)	Time Interval from A to B (sec)	Speed (m/sec)	Direction
1				
2				
3				
			Avg= m/sec	