

Activity #7 - Density Currents

Concepts # 7, 8, 9

#7 Water density is affected by temperature and salinity, resulting in deep water currents.

#8 At the poles very cold, salty water sinks to the ocean bottom and flows toward the equator.

#9 The primary source of oxygen for the deep sea is the cold polar bottom current.

Objective:

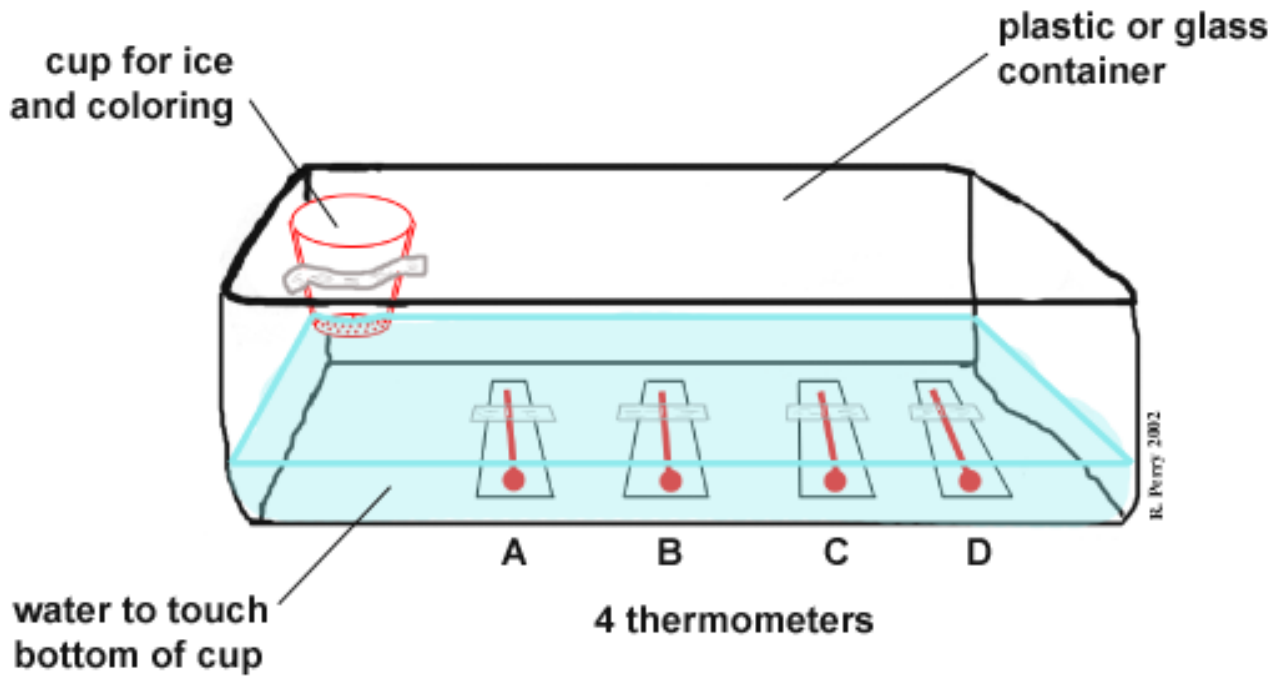
Students work in small groups to experiment with currents caused by temperature variations that simulate the origins and flow of polar bottom currents.

Materials:

- rectangular container (glass dish, plastic shoebox or storage container)
- 4 small thermometers (to fit in plastic container)
- cup (paper or plastic) with pinholes in bottom
- tape
- food coloring
- crushed ice
- eye dropper
- paper, small approx. 1/2"
- tap water

Procedures: (see illustration - next page)

1. Divide class into small groups of 3 - 4 students. Have one student get supplies and equipment.
2. Students tape cup in one corner of rectangular container, about one inch from the bottom.
3. Tape 4 thermometers in bottom of dish, all oriented in same direction with equal spacing.
4. Add water to the container, so the bottom of the cup is covered. Let water settle.
5. Record the temperature on all 4 thermometers at the start of the experiment, or time = 0.
6. Place ice in the cup and add 10 drops of food coloring.
7. Record the temperatures again every 5 minutes for ½ hour on the data sheet.
8. Observe what happens by looking through the side of the dish at table level. Record your observations by making a small sketch or diagram of what you see, and explain what you think causes what think causes this.
9. NOTE: If you can not see a bottom current, heat the corner opposite the ice by placing a beaker of hot water in the dish.
10. At the end of 30 minutes place a small piece of paper (1/2 inch square) on top of the water in the corner opposite the ice.



Equipment setup for Density Currents activity.

Density Currents Data Chart

	thermometers			
	A	B	C	D
0 min				
5				
10				
15				
20				
25				
30				

Evaluation:

- The paper moves in which direction? (toward ice)
- What does the paper represent, a surface or deep current? (surface)
- Which thermometer showed the greatest change during the readings? (nearest the ice)
- Which thermometer changed the fastest? (nearest the ice)
- Did all the thermometers get hotter or colder? (colder)
- Which thermometer's temperature dropped last? (farthest from ice)
- Explain what happened to cause the changes in the 4 thermometers' temperatures. (cool water sank and flowed across the container while the warm surface water flowed toward the cup.)
- What can we learn from the movement of the colored water? (It traces the movement of the water current across the bottom.)
- What does your cup of ice imitate in the real world? (polar sea ice)
- How does cooling affect the density of water? (Cold water is denser than warm water.)
- Where would you find cold water currents in the ocean? (Moving away from the polar regions in the deep ocean)