Ocean Currents and Coastal Temperatures

Overview

Students will chart the temperatures of two cities at approximately the same *latitude* but on different sides of North America. They will develop a *hypothesis* that explains the *temperature* differences between the two cities and create an air temperature *model* to test their hypothesis. They will measure the air temperature near a "cold water" *current* and a "warm water" *current*.

Concepts

- In coastal regions, cooler ocean currents tend to cause cooler land temperatures, and warmer ocean currents tend to cause warmer land temperatures in coastal regions.

Materials

- 2 One-gallon glass or plastic jars with lids per group of four students
- 2 Thermometers per group of four students
- String
- Hot tap water
- Cold tap water
- 5 Consecutive days of the weather section of the newspaper
- Graph paper
- Chart of the currents off of the United States
- Map of the United States
- Map of ocean currents

Preparation

This activity works best as a small group activity or as a demonstration.

Collect several gallon jars. Punch a hole in the lid of each of the jars. The students will need to suspend the thermometers in the jars through their lids.

Set up one equipment tray for each group. Each tray should have two jars, two thermometers and some string. The students need access to hot and cold tap water. If you are using glass jars, remind the students that the glass will get hot (you might wish to add gloves to the equipment list). Test hot water in the jars before doing the classroom activity to make sure they do not crack.

Procedure

Engagement

Warm and cold water currents can affect the climate of coastal regions. Use a map of the United States to find two coastal cities at the same latitude but on different sides of the continent (e.g. San Francisco, CA and Norfolk, VA). Chart the temperatures (highs) of these two cities. Use at least a week of daily temperatures. Develop a hypothesis that explains the differences in temperature.

Activity

1. Suspend a thermometer through the hole in the lid of each jar. Do not add water yet.
2. Set the jars next to each other and measure the temperature of the air inside each jar. Plot the temperature versus time on graph paper. Take measurements until the temperature in both jars is about equal.
3. Fill one jar half-full with warm water and one jar half-full with cold water. Wait five minutes and take the temperature of air above the water in each jar. Repeat after five additional minutes. Is the temperature of the air changing? Why?
4. Locate your two cities on the map of United States. Also look at the chart of currents. Use the information on the current chart and from your model to determine if there is a warm or a cool water current flowing off each coast. Compare this new information to the hypothesis that you originally developed. Was your original hypothesis correct? If not, develop a new hypothesis to explain why these two cities at the same latitude, which receive similar amounts of solar radiation, have such different temperatures.

Explanation

Warm and cold ocean currents can affect the climate of coastal regions, but only when local winds blow in from the sea. Warm currents heat the air over the ocean and bring higher temperatures over land. Cold currents can lower air temperatures and can bring colder temperatures over land.

Because the current that runs along the California coastline runs from north to south, it carries cool water. Thus the temperature of California's coastal cities is relatively cool. On the eastern side of the United States, the Gulf Stream brings warm water north from equatorial regions to about Cape Hatteras, North Carolina. Thus, the U.S. southeastern coastal cities generally have warmer climates than western coastal cities at that same latitude.

Extension

To test the understanding of the students, give them the global temperature section of the newspaper. Have them find pairs of coastal cities at about the same latitude but on opposite sides of the same continent (not necessarily North America). See if they can determine if the current off each coastline is a warm or a cold water current.

Alternatively, have your students look at the map that shows warm and cold currents [Fig. 1]. They can use this to try to predict the climate of coastal areas throughout the world. Have them compare their predictions to weather and climate data from newspaper, the Internet, or an almanac.

Links to Related CD Activities, Images, and Movies

Map of *Wind-driven surface currents*

Image of *Seasonal variations in similar latitude cities*

Animation of *Offshore/Onshore Winds*

Activity *Coastal versus Inland Temperatures*

Vocabulary

current	*hypothesis*	*latitude*
model	*temperature*	

Source

Orange County Marine Institute

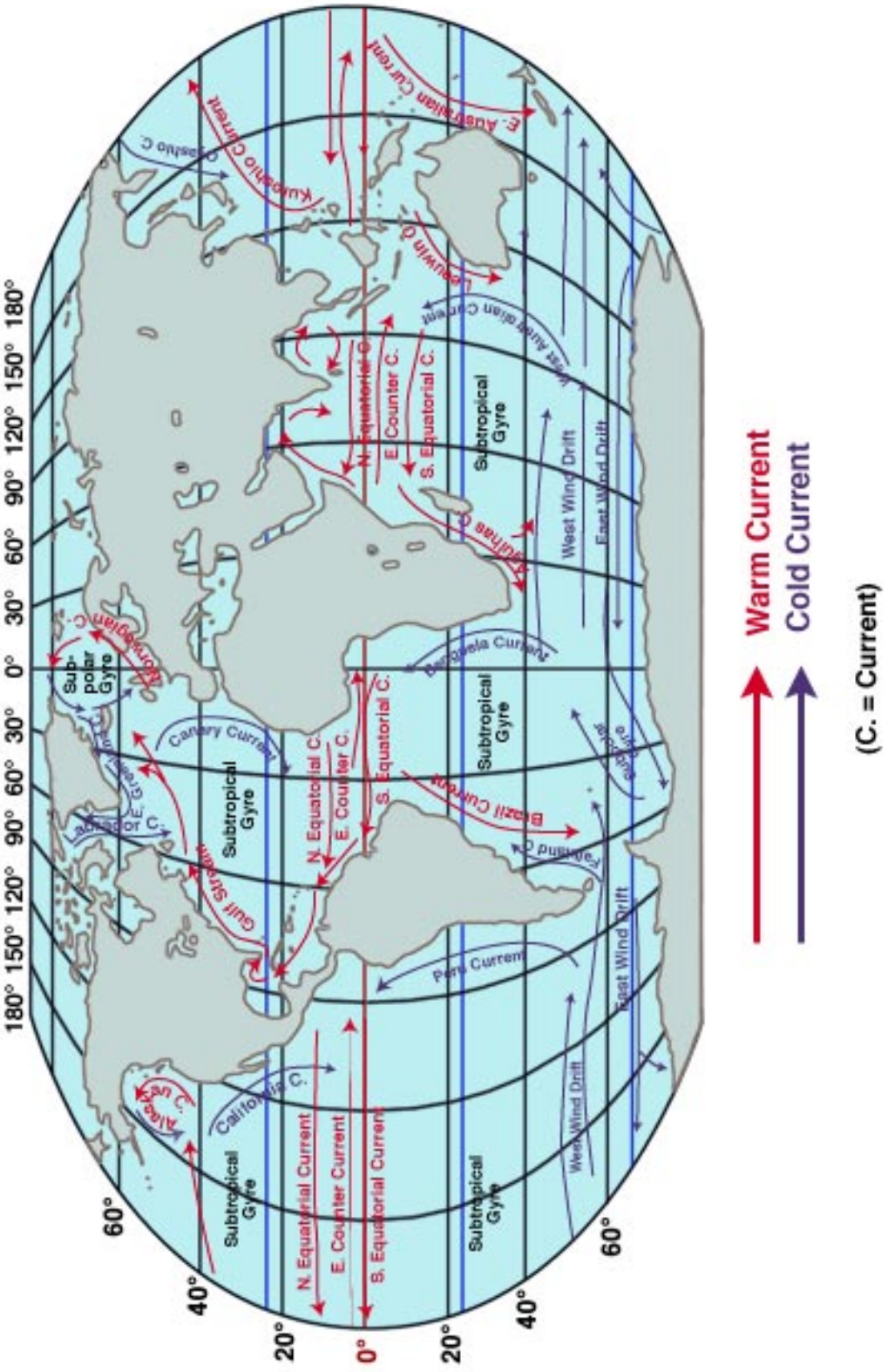

Figure 1. Wind-driven surface currents