Message In a Bottle

Overview

In this activity the students who live near coastlines will release drift bottles in the ocean to help chart *coastal currents*. The bottles will be stuffed with school-addressed, stamped postcards and dropped from a boat. The postcard will ask the finder to write her or his location and date of discovery before mailing it back.

(If you do not live close to the beach and do not have access to the ocean, contact a school that is close to the beach and develop a partnership with them.)

Concepts

- A *current* is the flow of water or air in a definite direction.
- Currents in the open ocean are influenced by wind and Earth's rotation.
- Nearshore currents are caused by waves, tides and the wind.

Materials

- Narrow-mouthed, 8 oz. air-tight bottles with caps or rubber stoppers (The more bottles that you use, the more likely that you are to get a response. However, the more bottles that you use, the more you are polluting the ocean)
- Sand
- School-addressed, stamped postcard per bottle
- Map of ocean surface currents and *wind circulation* patterns for the classroom
- Overhead of ocean surface currents and wind circulation patterns
- Local pilot chart of the coastal region that you are studying

Preparation

The simplest method is to have the students each bring in bottles. Many are needed because the percentage returned is usually low. It is also important to choose your drop points carefully. For this you will need a detailed chart of the nearshore currents. It is possible to purchase a monthly local pilot chart of a specific coastal region or harbor.

The students should clean the bottles and fill them with school-addressed, stamped postcards (one per bottle). The postcard should ask the finder to write her or his location and the date that the bottle was discovered. With this information, the students can plot the movement of the bottles.

The bottles should be mostly filled with sand. They need to still float, but with a significant portion of the bottle beneath the surface. This will ensure that you study surface currents rather than wind direction. Have the students add sand until there is only a small bit of the neck showing. While holding the neck of a test bottle, lower it into water to make sure it still floats. If not, remove some sand. Cap the bottles with rubber stoppers and glue or wire them into place.

If you wish to compare wind-blown movement to surface current movement, leave some of the bottles empty except for the postcard. Remember to add the words "No Sand" on the postcards that go into the empty bottles.

Contact the governmental agency responsible for the area and ask permission to complete the activity.

Procedure

Engagement

The water in the ocean moves in a variety of ways and for many different reasons. For example, there are deep ocean currents, wind-driven open ocean surface currents, and nearshore coastal currents. Have the students make a *hypothesis* about the factors that cause nearshore currents.

In order to begin testing their hypothesis, have the students use a map of the coastline to determine the best drop off point for the drift bottles. Take a field trip on a boat to drop the messages into the ocean.

Activity

1. Use the map of the coastline to chart the path of the bottles.
2. Use daily newspapers to determine wind speed and direction, tides and wave height. Keep a log of these data. Is there a relationship between wind and water movement? What other factors can influence the movement of the bottles? Make a hypothesis about how these factors will affect the paths of the bottles.
3. Use the overheads of current and wind patterns to discuss the relationship between ocean surface currents and wind circulation patterns.
4. As the postcards return (if they return) post the location of discovery on a wall chart.

Explanation

Currents in the open ocean are influenced by the winds and Earth's rotation (the *Coriolis effect*). Currents in the open ocean travel in huge *gyres*. However, these *open-ocean currents* usually do not flow very close to shore. The California Current, for example, flows 50 to 100 miles off the coast of California moving toward the south.

Nearshore current systems are often quite different from open ocean current systems. They are often responsible for the transport of huge amounts of sand from one beach to another. Nearshore currents have several causes: breaking waves, tides and winds.

It is important to measure the speed and direction of nearshore currents because they affect coastal marine activities. These currents may be studied by using *current drifters*.

Extension

Earth's major wind belts set surface ocean waters into motion. This produces horizontal movement of water across vast distances of ocean. Give the students a map of the major ocean surface currents [Fig. 1]. Tell them that they are stranded on Madagascar and have only the currents to get home. Have them determine the currents that they would use to drift around the ocean. Then provide a wind map [Fig. 2] and give them the same challenge. See if they can use the winds to predict the flow of ocean currents. Is predicting ocean currents from winds more complicated than expected? If so, why?

If the students were indeed stranded on Madagascar with a sailboat and could only have one of these maps, which would they choose? Why? They may wish to consult someone who sails to discover the better answer.

Links to Related CD Activities, Images, and Movies

Map of *Wind-driven ocean currents*

Image of *Prevailing wind patterns*

Animation of *How the Coriolis affect wind and ocean current directions*

VOCABULARY

coastal currents	*Coriolis effect*	*current*
current drifters	*gyre*	*hypothesis*
open-ocean currents	*wind circulation*	

SOURCE

Adapted from Phleger, Charles F. and Wallace, William J. *Field Guide and Laboratory Manual for Oceanography: An Introduction.* Wadsworth Publishing Company. 1979. p. 120 - 126.

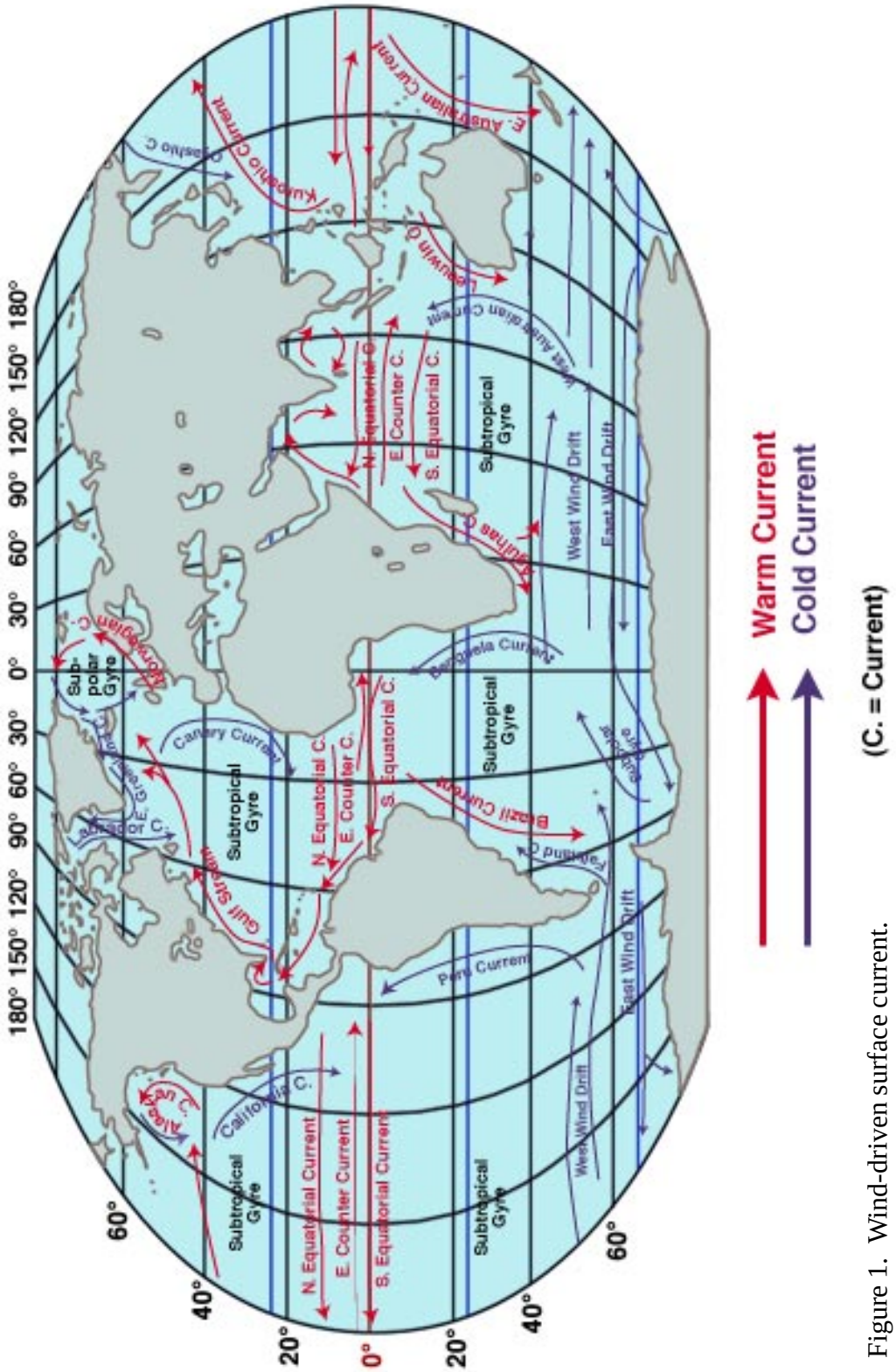

Figure 1. Wind-driven surface current.

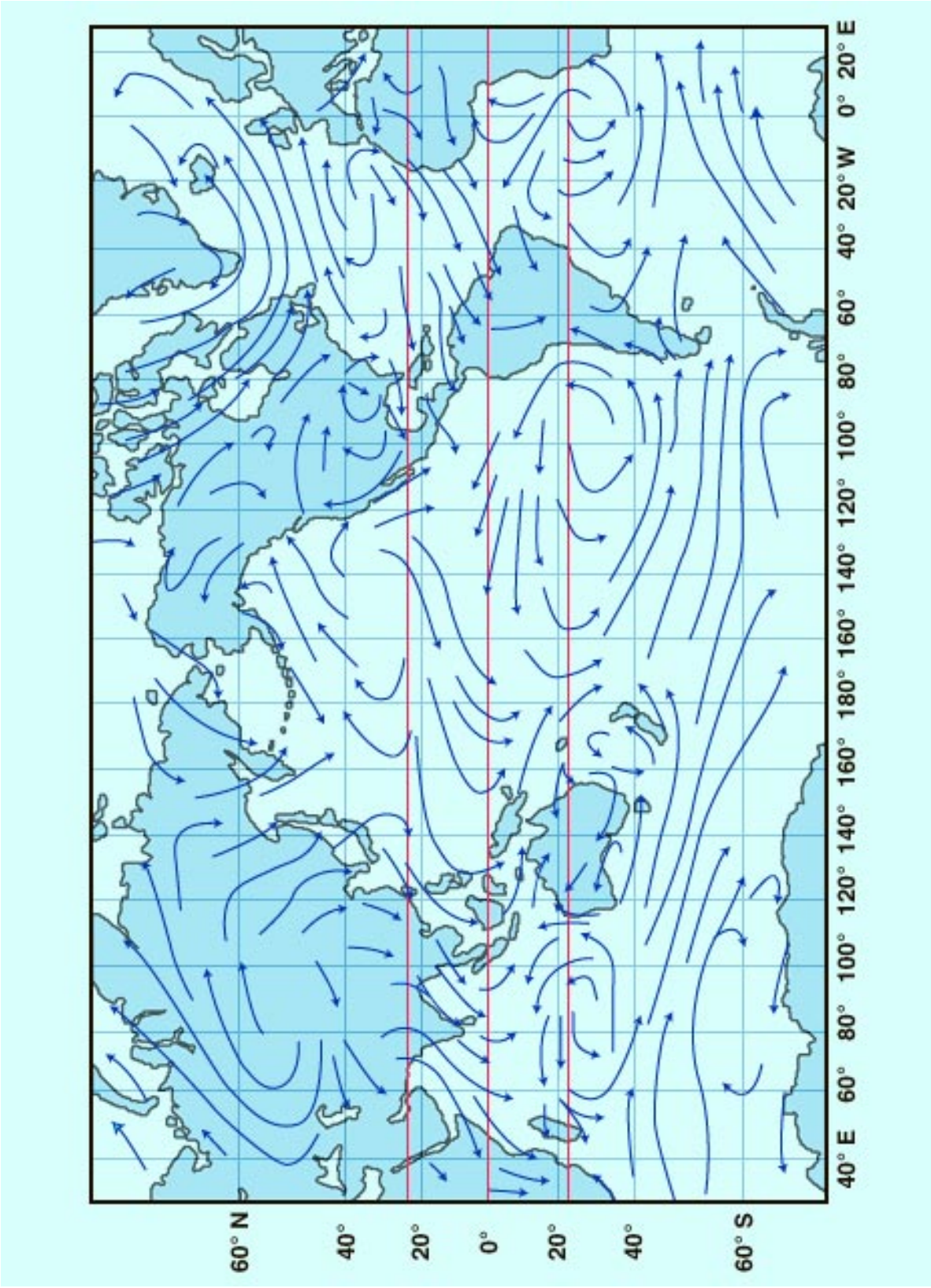

Figure 2. Global wind patterns - The prevailing winds of Earth's surface in January.