Background Information on Surface Ocean Currents

Some winds have constant directions, especially when averaged over several days. For example, the "Trade Winds" blow constantly from east to west and the "Westerlies" blow from west to east. These are **prevailing surface winds**. Prevailing winds curve due to the **Coriolis Effect**. The scale of the curvature is so broad that a person standing in one place will not be able to see this swirling motion – satellites are necessary to observe the curving paths. The direction of the rotation (clockwise or counterclockwise) depends mostly on the latitude. To learn about prevailing winds, see *NASA's "Ocean Motion" (winds)* - http://oceanmotion.org/html/background/equatorial-currents.htm

Prevailing winds transfer energy to ocean water, causing the surface water to move in circulating streams. These **surface currents** are ocean-wide in scale. If no land masses interfere, surface currents circulate in huge oval-like flows, such as the currents that carried the Ducks in the Flow ducks around the northern Pacific basin. Several factors affect the direction of the surface currents, including the wind direction, the **Coriolis Effect**, and the placement of land masses. To learn more about ocean surface currents, try *NASA's "Ocean Motion and Surface Currents" (currents)* - http://oceanmotion.org/html/background/wind-driven-surface.htm Surface currents also occur in inland seas, like the Great Lakes. In these smaller seas the circulating water hits land more often, making the surface currents less consistent and less regular in shape, compared to the open ocean. To see visualizations of Great Lakes surface currents, look at *GLERL's Mean Circulation in the Great Lakes* - http://www.glerl.noaa.gov/data/char/circ/mean/mean-circ.html and the *Great Lakes Coastal Forecasting System Nowcast* - http://www.glerl.noaa.gov/res/glcfs/

The Gulf Stream current carries warm water from the tropics along the east coast of North America, causing places like Boston to be much warmer than they would be otherwise. The California current moves cold, northern water south along the coast of California, causing the characteristic contrast of hot land and cool seas that gives California its desirable climate. The Gulf Loop Current in the Gulf of Mexico carries warm water from near the equator into the northern Gulf of Mexico. This causes hurricanes to gain strength just before hitting land on the Gulf shore. To read more about this, see A. C. Revkin's *New York Times* article, "Gulf Currents that Turn Storms into Monsters" (Sept. 27, 2005) - http://www.nytimes.com/2005/09/27/science/earth/27loop.html Children may know about the East Australia current from Pixar's animated film *Finding Nemo*, a film that illustrates how marine animals can ride a surface current long distances. Surface currents can also move pollution such as oil and trash. To learn more about these environmental connections, read this article by K. R. Weiss and colleagues: "Plague of Plastic Chokes the Seas" (Aug. 2, 2006) *Los Angeles Times* - http://www.latimes.com/news/local/oceans/la-me-ocean2aug02,0,3130914.story

When the Earth is turning on its axis it deflects fluids, such as water and air, in a curved path. This is the **Coriolis Effect**. The Coriolis Effect partially explains why prevailing winds and surface currents

move in curving paths. To learn more about the Coriolis Effect, see *UCAR's Windows to the Universe "Coriolis Effect"* - http://www.windows.ucar.edu/tour/link=/physical_science/physics/mechanics/Coriolis.html

Surface currents are not waves. Waves are formed by water rolling; surface water rolls down and deeper water rolls up. This is why waves tend to cause bumps or ripples in water. Surface currents move in the same plane as the bottom of the ocean; they are flows of water, like streams, except powered by wind instead of gravity. To learn more about how waves move water, look at the *National Geographic: Wave Simulator* (be sure to click "water particles") - http://www.nationalgeographic.com/volvooceanrace/interactives/waves/index.html

For more information, please visit: www.windows.ucar.edu/ocean_education.html

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