

Wind driven circulation describes the process in which winds moving along the surface of the ocean push the water in their direction and create currents near the surface. These winds are subject to the Coriolis Effect, which creates their motion based on the rotation of the earth. Wind will rotate in a clockwise direction in the northern hemisphere and a counter clockwise direction in the southern hemisphere. Because of the Coriolis Effect, water will also rotate in this direction. This means that water is pushed by winds, but as it is pushed, it is still deflected by Earth's rotation and will rotate.

There are many large circulating patterns in the open ocean, driven by the Coriolis Effect. These circulating patterns are called gyres. They move in the same directions as the winds in their respective hemispheres: clockwise in the northern hemisphere, and counter-clockwise in the southern hemisphere. At the equator, there are also many westward flowing currents, and at the equator itself, there is a current flowing eastward in the Pacific Ocean. The Coriolis Effect also causes these currents. These gyres cause water to flow north on the western side of oceans and south on the eastern side of oceans in the northern hemisphere, and in the southern hemisphere, water flows south on the western side of oceans and north on the eastern side of oceans.

The water off the Oregon/Washington coastline travels south because of the Coriolis Effect and gyres. This brings colder water from the northern Pacific Ocean along the coastline. This cold water is dense water, and so it will sink in a convection current and be replaced from nutrient rich water from lower in the ocean. These nutrients will help plants to grow and thrive and provide food for other organisms. The colder water also creates a cooler climate in Oregon and Washington. In contrast, the Gulf Stream flows from the Gulf of Mexico across the Atlantic, bringing warm water to western Europe, creating a warmer climate than would otherwise be natural.

From the deck of a ship, it is easy to see small effects the winds have on water. Strong winds will create stronger waves or turbulence. Also, objects floating in the water will move in the direction of the wind as it drags the water along with it. Deeper in the water column, water influenced by the wind will start to spin in a direction dictated by the Coriolis Effect.