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Ocean Currents, Winds,
and Climate

SC-06-4.6.1, SC-06-4.6.2



Getting the Idea

Key Words

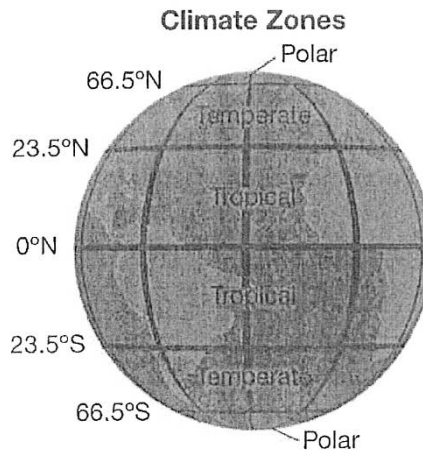
climate
current
sea breeze
land breeze

You may have heard the term climate before, and you may think it means the same as weather. However, weather and climate are different. **Climate** is the average weather of an area over a very long period of time. Many different factors affect climates on Earth.

Climate Zones

Climate is mostly determined by temperature and rainfall. There are many different climates all over Earth, but most scientists group these different climates into zones.

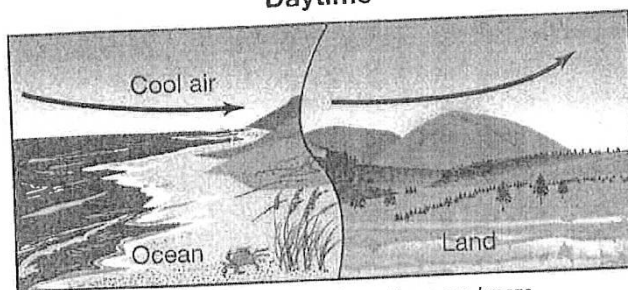
Earth has three major types of climate zones. These include tropical zones, temperate zones, and polar zones. These zones are determined by latitude, the distance from Earth's equator. Tropical zones are found closest to the equator, where sunlight is the most direct. Polar zones are found near Earth's north and south poles. Temperate zones are found between tropical and polar zones.



Land and Sea Breezes

Land breezes and sea breezes are examples of how large bodies of water influence local winds. During the day, air over the ocean is cool. Cool air is heavier than warm air. Cool air masses form areas of high pressure. Air over the land is warmer, and as it rises, it creates an area of low pressure. The cool, high-pressure air over the ocean now flows toward the land, creating a **sea breeze**. At night, the air over the ocean is warmer than the air over the land. The warm air over the ocean rises, creating an area of low pressure. The cool air over the land forms an area of high pressure and moves toward the ocean, producing a **land breeze**.

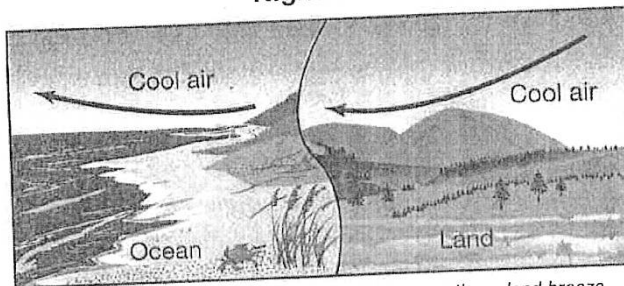
Daytime



Sea Breeze

Cool air flows toward land, creating a sea breeze.

Nighttime



Land Breeze

Cool air over land moves toward the ocean, creating a land breeze.

DISCUSSION QUESTION

How do ocean currents affect the climate of coastal areas in northern latitudes?

Many things other than latitude can affect climate. For example, the climate of a region may be affected by its location on Earth, by wind patterns, by mountains, and by oceans.

How Oceans Affect Climate

Water warms up and cools down much more slowly than land. So the temperature of water does not change as easily as the temperature on land. Areas of land that are close to large bodies of water, such as a coastline, have milder weather because of the water's influence on the weather. The ocean makes the winters warmer and the summers cooler. A coastal region that is at the same latitude as a region in the middle of a continent is likely to have a milder climate. For example, the state of Kentucky is at about the same latitude as the state of California. Yet, California generally has warmer temperatures on a year-round basis than Kentucky.

Ocean currents also affect the climate of an area. Currents are a kind of ocean motion. A **current** is a flow of water in a certain direction. Winds are the main cause of surface currents. Heat is exchanged between currents and the atmosphere above them. Warm-water currents that flow from the equator carry warmth from the tropical zone to northern areas. The warm-water currents warm the air and keep coastal regions warm. Cold-water currents carry cold water from polar zones toward the equator. The cold water absorbs heat from the air and cools nearby coastal areas.

For example, the Gulf Stream is a warm-water current that flows up from the Gulf of Mexico and then out into the Atlantic Ocean. There the Gulf Stream becomes part of the North Atlantic Current, which brings warm water to the coasts of Iceland, southwestern England, and Norway. The warm water warms the atmosphere and helps make the winters mild in these areas.

The ocean and the atmosphere are linked together in one system. A change in either the ocean or the atmosphere is likely to cause a change in the other. Some scientists think that global warming of the atmosphere may slow the Gulf Stream or even make it stop flowing altogether. If that happened, climates could change on both sides of the Atlantic Ocean.