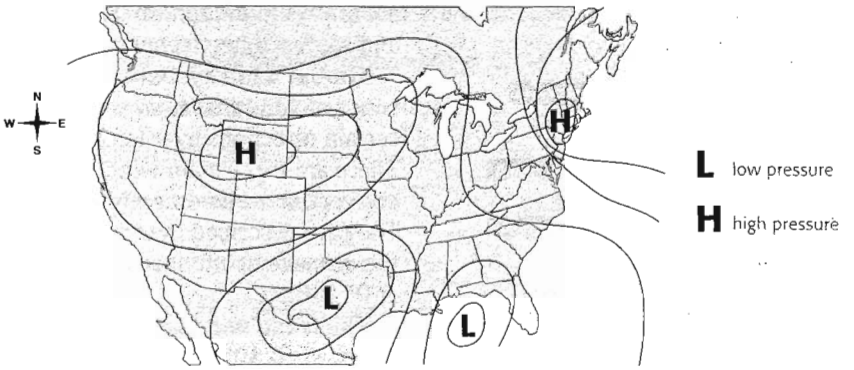
Air Pressure and Wind

How does air pressure affect weather?



Air pressure is the force air has on a surface. This includes your skin! How much force air has depends on how much gas is in the air. Air pressure is greatest at sea level, where the atmosphere is most dense. There are fewer air molecules at higher altitudes, so air pressure decreases.

Warm air causes water to evaporate and change into water vapor. It also rises and expands, so its pressure decreases with higher altitude. This can form a **low-pressure system**, where air pressure is low over a large area of Earth's surface. However, air temperatures in the troposphere cool with altitude. So, the rising, warm air filled with water vapor condenses, forming clouds and causing precipitation. Low-pressure systems often bring cloudy, wet weather.

Cool air contains less water vapor, so its air molecules are more densely packed. This creates a **high-pressure system** that sinks through the atmosphere toward Earth's surface, where it warms again. High-pressure systems usually bring clear, dry weather.

The sun heats Earth's surface unevenly. As a result, air pressure is different from one region to another. These differences cause air to move from areas of higher pressure to areas of lower pressure. This movement of air is called **wind**. The greater the difference in air pressure, the stronger the wind is. Meteorologists describe wind by both its speed and its direction. **Wind direction** is the direction a wind is moving from.

Show What You Know

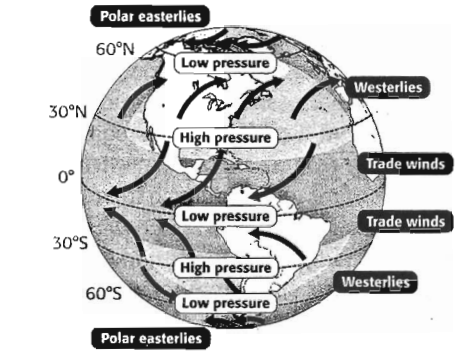
Your class is planning a school picnic. Which air-pressure system should you hope for? Why?

_____

_____

Global Wind Patterns

What causes global winds?



Global winds

Earth's equator receives more intense and constant sunlight than the rest of the planet. So, air temperatures around the equator tend to be warm all year round. As this warm air rises from Earth's surface, cooler air from north or south moves toward the equator to take its place. Meanwhile, the warm air that rose cools and descends again. This circular process is the source of convection currents and winds around the globe.

Earth is a sphere with halves called **hemispheres**. Giant convection currents are always in motion, in both the northern and southern hemispheres.

Global wind systems are large-scale bands of wind that blow steadily from certain directions over long distances. There are three main wind systems, or **convection cells**, in each hemisphere. They are described in terms of **latitude**, the distance north or south of the equator, or 0° latitude.

The **trade winds** occur between the equator and 30° north or south latitude. Because they move from east to west, they are sometimes called the **easterlies**. The **westerlies** move from west to east, between 30° and 60° latitude. Weather in the United States is most affected by the westerlies, which often move major weather systems across the country. **Polar easterlies** blow from the east to west around the poles, or 90° latitude.

Earth rotates, so large global wind systems curve toward the equator. This curve is called the **Coriolis effect**. In the northern hemisphere, large wind systems curve to the right. Similar systems in the southern hemisphere curve to the left.

Show What You Know

Use these terms to complete the paragraph.

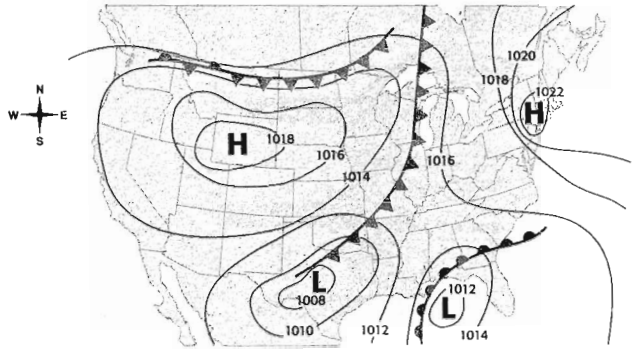
polar easterlies high-pressure equator poles

_____ cold air sinks at the _____. Air moves from areas of high-pressure to areas of low-pressure, so cold, polar air moves south toward the _____. The resulting winds move from east to west, so they are called the _____.

Weather Maps

How do you read a weather map?

Meteorologists are scientists who study Earth's atmosphere. They use many sources to help develop weather forecasts, including data gathered from weather satellites, radar stations, and weather stations. The data are analyzed by computers and then plotted on **weather maps.**



cold front

warm front

stationary front

H high pressure

L low pressure

1014 isobar with pressure value in millibars

Symbols on a weather map give information about air pressure, air temperature, and moving air masses. Lines called **isobars** connect areas of equal air pressure. A blue "H" indicates the center of a high-pressure system; a red "L" indicates the center of a low-pressure system. Differences in air pressure are related to wind, which moves from high to low-pressure areas. Isobars that are close together on a map indicate a greater pressure difference over a relatively small area, meaning strong winds are likely in the area.

Isotherms are lines that connect areas of equal temperature. The closer the isotherms are on a map, the greater the temperature difference over a relatively small area. Fronts are also shown on weather maps, using the symbols shown in the key below.

Station models are used to show weather data collected at stations in individual towns and cities. A typical station model includes information about local temperature, humidity, precipitation, wind speed and direction, air pressure, and cloud cover.

Show What You Know

Complete the following sentences.

1. _____ show areas of equal pressure.

2. _____ show areas of equal temperature.

3. How can you remember which term is which?

_____