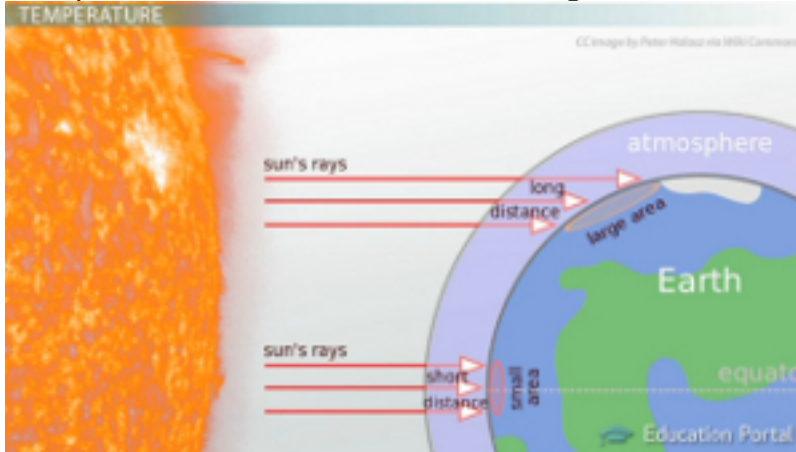


*Weather is the current state of the atmosphere and is determined by factors like temperature, pressure and humidity. These factors that cause periodic changes in the Earth's air masses are explored in this lesson.*

## Weather Or Not!

Temperature affects how much sunlight the surface of the Earth receives



Have you ever been disgusted at the weatherman? How hard can it be to get things right? They have tons of computers and maps and stuff; how can they be so wrong? We all have felt like this from time to time because what we thought was going to happen turned out to be something totally different. What factors do meteorologists study to determine the weather, and how does the **atmosphere** play a role in what happens outside each and every day?

## Five Factors That Determine Weather

First of all, what is meant by the term **weather**? Weather is simply the current state of the atmosphere at a specific location at any given point in time. We use this term correctly when we ask a friend in another part of the world 'What is the weather like there?' Weather can change very rapidly at times, varying hour to hour or even minute to minute. We have all heard the saying, 'If you don't like the weather, wait five minutes, and it will change.' This is different than climate, which refers to the long-term average of the daily weather for that location.

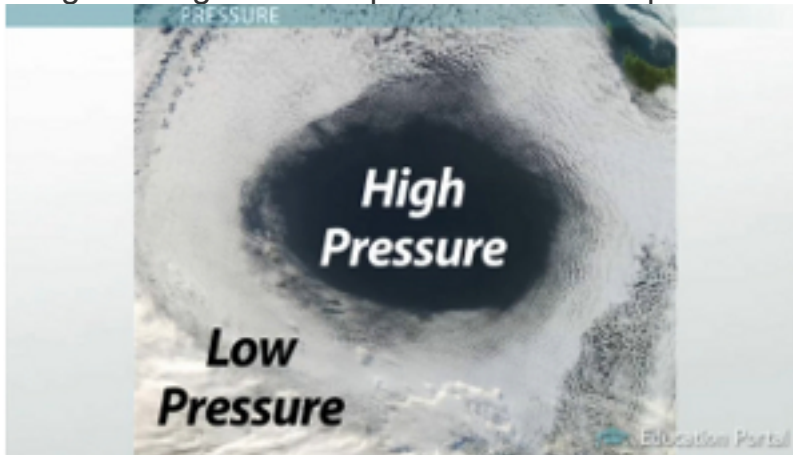
There are five factors that determine the state and condition of the atmosphere and, therefore, influence and determine the weather. They include:

- . **temperature**
- . **air pressure**
- . **humidity**
- . **cloudiness**
- . **wind**

These factors can cause different properties in sections of the atmosphere or air masses. We often might think of the atmosphere as a large ball of air that encircles the earth. While that is true, it is broken up into distinct sections with different physical properties. These properties are determined by the five factors just mentioned, and the differences in the properties between air masses are what cause the changes in our weather.

## **Temperature**

Images of high and low pressure areas captured from space



The first of these air mass factors that determines weather is **temperature**. Temperature is the amount of heat contained in an object, in this case, the air. The amount of heat in the air determines the speed of the molecules in the air. The more heat, the faster the molecules move, raising the temperature. The heat in the atmosphere comes from the sun and varies at different levels in the atmosphere. The layers of the atmosphere are determined generally by their temperature. Near the surface of the Earth, the temperature is a factor of how much sunlight an area receives, how much is changed into heat at the earth's surface and how much of that heat is held near the surface by greenhouse gases or

cloud cover. The higher the elevation above the ground, the cooler the air is. Temperature is measured using a thermometer in degrees Fahrenheit or Celsius.

## Pressure

The next factor that influences the kind of weather we might have is the amount of **air pressure** in an air mass. Air pressure is the amount of pressure exerted by the air in a particular air mass. If you have ever traveled in an elevator up a very tall building, driven a car up a mountain or flew in an airplane, you probably noticed the change in the air pressure affecting your ears. Air pressure is determined by the amount of air that is pushing down on you from the atmosphere. The higher you are, the less air is pushing on you, so there is less pressure. Air pressure is also called barometric pressure because it is measured using a barometer and commonly measured in inches of mercury.

Just as altitude determines the amount of pressure on you, air masses can have differing amounts of pressure. Some air masses have high pressure, where air is piled up and exerts more pressure, and some have air that is thinner or more spread out to produce low pressure. When the air mass where you are is under high pressure, it is clearer because air sinks and warms, absorbing more moisture, while low-pressure systems are cooler and cloudier, often producing storms. In this image taken from space, the area of high pressure is the clear sky, surrounded by the clouds, where there is low pressure.

Thunderheads develop when warm and moist air rises above cooler, dry air



## Humidity

The third factor that can determine the weather is if a place is experiencing **humidity**. Humidity is a measure of the water content of the air mass. The amount of moisture in the air can vary widely depending on the conditions. In the winter, air is generally cooler and drier, whereas in the summer when air is warmer, it can hold more moisture. That's what gives it that sticky, soupy feeling of a very humid day. The amount of moisture can be seen when it condenses as fog. A foggy morning occurs when the moisture in the air becomes cool enough to condense and form tiny drops in the air. As the air warms through the morning, the drops evaporate back into the air again, making it clear. Humidity is measured using a psychrometer or hygrometer and is measured as a percentage.

## Clouds

The fourth factor that determines weather is clouds. This is similar to the fog example we just mentioned. **Clouds** are tiny drops of water or ice that form in the atmosphere. Fog is really just clouds forming near the ground. Clouds often form as warm, moist air rises and cools, a phenomenon we mentioned that happens in air masses with low pressure. Different kinds of clouds form in different situations of air masses. For example, thunderheads form when warm, moist air rises over cooler, dry air. As it rises, clouds and rain form. The larger the temperature difference between the two air masses, the stronger the wind and lightening forms. There are many different kinds of clouds that form in different layers of the atmosphere and mean different things. These include names like cirrus, cumulus and nimbus.

## Wind

An anemometer is used to measure wind speed in miles/hour



Finally, **wind** can be a factor determining weather, particularly its speed and direction. Wind is a process of movement of air that occurs due to the uneven heating of the Earth's surface. Different parts of the earth heat at different rates depending on factors like the amount of water present, snow cover and vegetation. Areas that heat up faster have air that rises, and air from cooler regions moves in to replace it, causing wind. The bigger the temperature differential, the stronger the wind. This movement of air can move air masses and bring clouds or other weather-related factors with it. Wind speed is measured with an anemometer and is measured in miles per hour.

## Lesson Summary

**Weather** is the current state of the atmosphere at a specific location at any given point in time. The weather is mostly influenced by the physical properties of air masses near the surface. Those physical properties include five main factors:

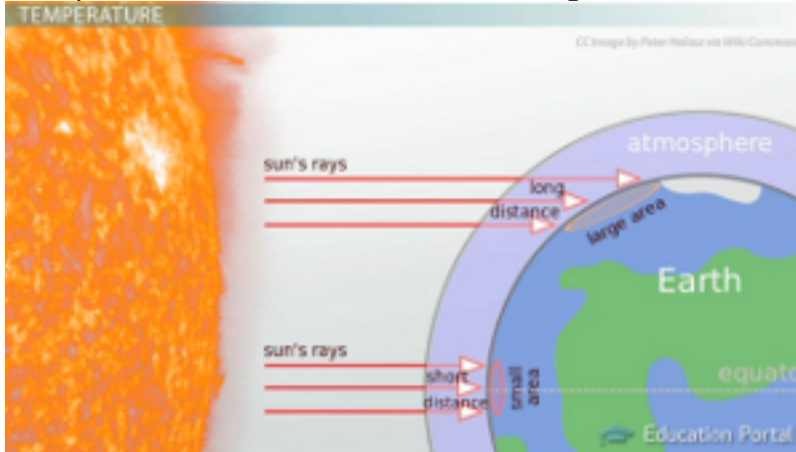
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These factors are measured using different instruments and are the main factors that determine the weather. They can change rapidly, making it challenging to predict for even the most veteran of weather forecasters.

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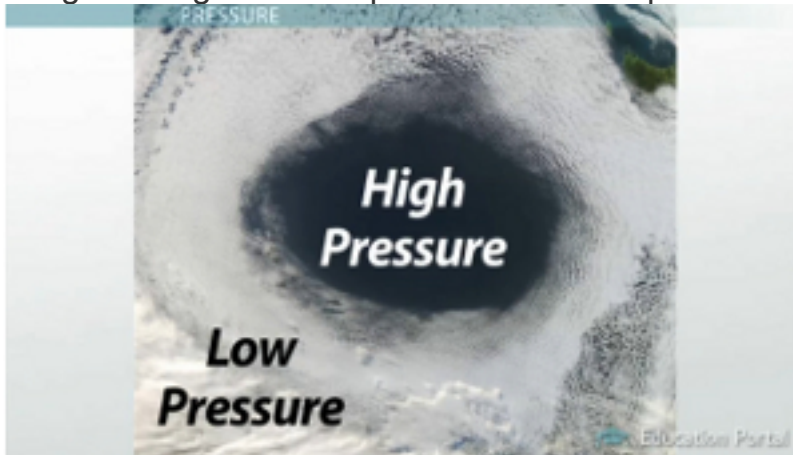
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