

WEATHER SYSTEMS



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Weather Systems

Weather refers to short-term changes in atmospheric variables typically occurring over hours or days. Weather variables include: temperature, precipitation, wind, pressure, cloud cover, etc. Weather predictions are made by meteorologists who use measurements of these variables and computer modeling to forecast probabilities.

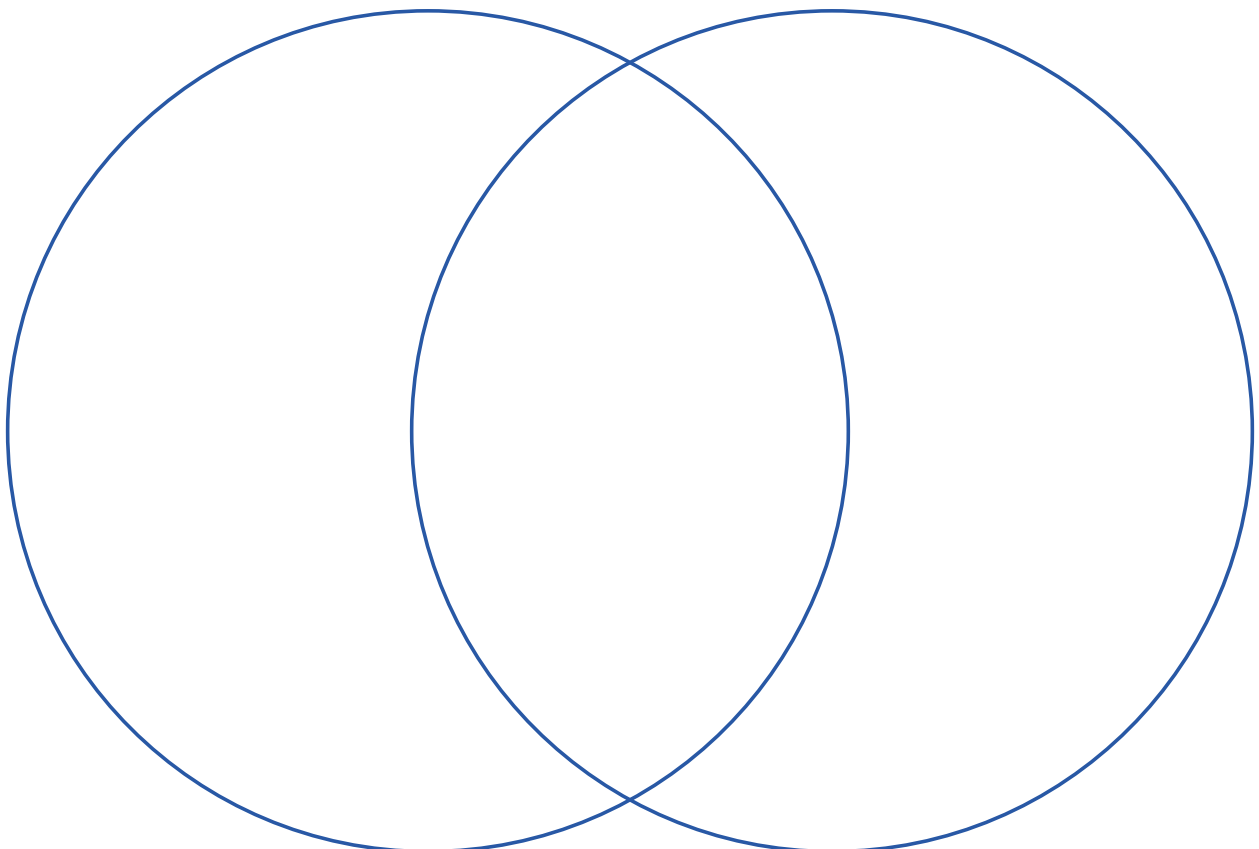
Climate is determined by the average weather conditions of the earth (or a particular region) over periods of at least three decades to a thousand years. Short-term changes in weather are not considered because they don't provide a long enough view of the weather changes to be of any value when looking at climate changes.



The difference between weather and climate is an important one when considering climate change. However, there are some similarities. Fill out the Venn diagram to highlight the similarities and differences.

Weather

Climate





Meteorology

The study of weather is called meteorology; a meteorologist measures temperature, humidity, pressure, precipitation, and makes predictions and forecasts about how the weather will behave in the future.

Temperature

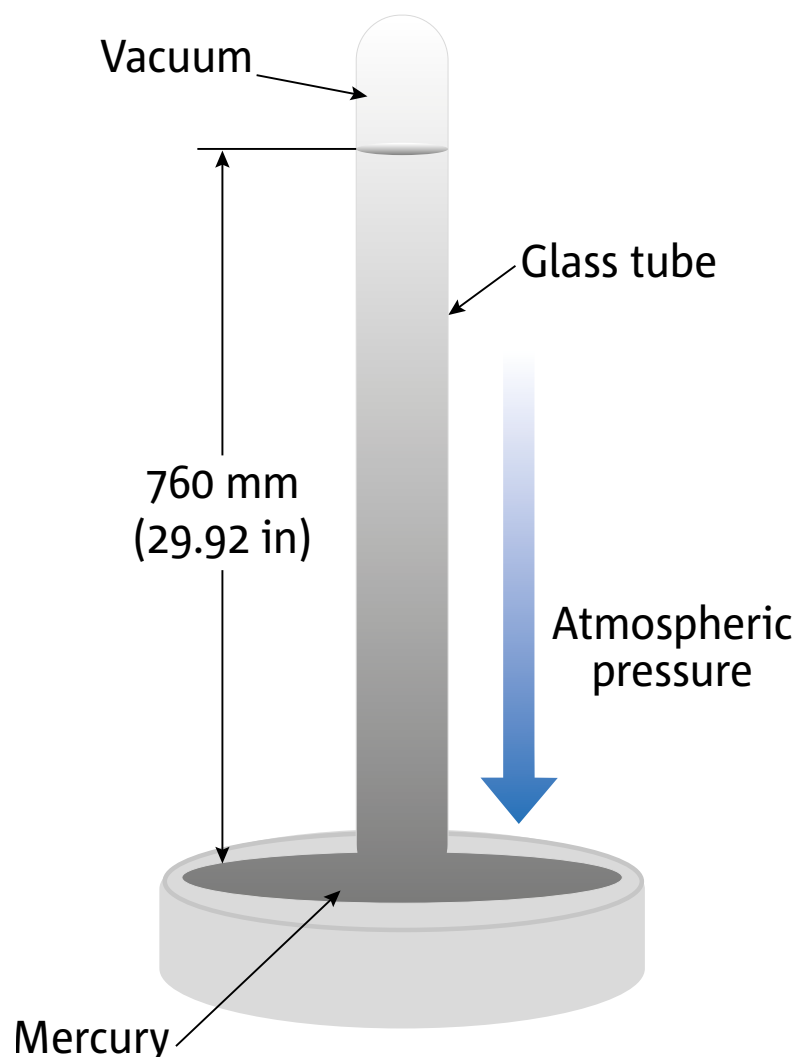
The hotness or coldness of a substance is called its temperature and is measured with a thermometer. An ordinary thermometer consists of a hollow glass bulb attached to a narrow stem with a thread-like bore. The bulb is filled with liquid, usually mercury which expands when the temperature rises and contracts when the temperature falls. The amount of expansion and contraction is measured by a calibrated scale.

Pressure

Although you may not think of air as a fluid, it is (all gases can be considered fluids)! Fluids, like air, exert pressure on everything within and around it, although we are not acutely aware of it. Pressure is a force, exerted on a surface and is measured in Pascals (Pa). The pressure exerted by a kilogram mass on a surface equals 9.8 Pa. The pressure exerted by the whole atmosphere on the Earth's surface is approximately 100,000 Pa. Usually, atmospheric pressure is quoted in millibars (mb). 1mb

is equal to 100 Pa, so standard atmospheric pressure is about 1000mb. In fact, actual values of atmospheric pressure vary from place to place and from hour to hour. At sea level, commonly observed values range between 970 mb and 1040 mb. Because pressure decreases with altitude, pressure observed at various stations must be adjusted to the same level, usually sea level.

Atmospheric pressure is measured by a barometer. A mercury barometer measures the pressure by noting the length of mercury which is supported by the weight of the atmosphere. One centimeter of mercury is equal to 13.33 mb, so normal atmospheric pressure can support a column of mercury about 75 cm (or 30 inches) high.





Meteorology

Humidity

Water vapor is mixed with the air throughout the atmosphere. It is the condensation (the process in which a gas is converted into liquid form) of this vapor which gives rise to most weather phenomena: clouds, rain, snow, dew and fog. There is a limit to how much water vapor the air can hold and this limit varies with temperature. When the air contains the maximum amount of vapor possible for a particular temperature, the air is said to be saturated. Warm air can hold more vapor than cold air. In general the air is not saturated, containing only a fraction of the possible water vapor.

The amount of vapor in the air can be measured in a number of ways.

The humidity of a packet of air is usually denoted by the mass of vapor contained within it, or the pressure that the water vapor exerts. Measures of humidity can be calculated from readings taken by a hygrometer. A hygrometer has two thermometers, one dry bulb or standard air temperature thermometer, and one wet bulb thermometer. The wet bulb thermometer is an ordinary thermometer which has a cloth covered bulb that is kept moist. Evaporation of water from the cloth lowers the temperature of the thermometer. The difference between wet and dry bulb temperatures is used to calculate the various measures of humidity.

Precipitation

The amount of rain, sleet, snow or hail which falls in a specified time is expressed as the depth of water it would produce on a large, level impermeable surface. Usually it is expressed in millimeters although inches may sometimes be used. Rainfall is measured daily (24 hours) by means of a rain gauge. Rain gauges are simple to use with pre-calibrated scales on their sides. When measuring rainfall, certain precautions have to be taken against the effects of obstructions, wind, splashing and evaporation.

