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SEC4T (Weather Forecasting) , Topic :- Weather systems, Climate and Climate Change

Introduction : The difference between weather and climate is a measure of time. Weather is what conditions of the atmosphere are over a short period of time, and climate is how the atmosphere "behaves" over relatively long periods of time. Weather is the day-to-day conditions of a particular place. Most weather phenomena occur in the troposphere, just below the stratosphere. Weather is driven by air pressure (temperature and moisture) differences between one place and another. These pressure and temperature differences can occur due to the sun angle at any particular spot, which varies by latitude from the tropics. Higher altitudes are cooler than lower altitudes due to differences in compressional heating.

Elements of Weather and Climate :

There are several elements that make up the weather and climate of a place. The major of these elements are five:

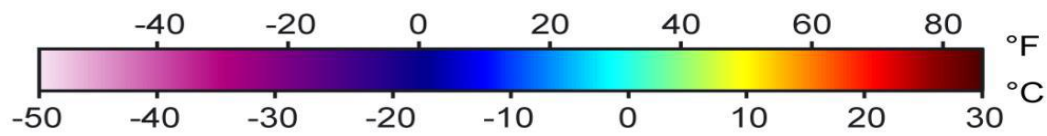
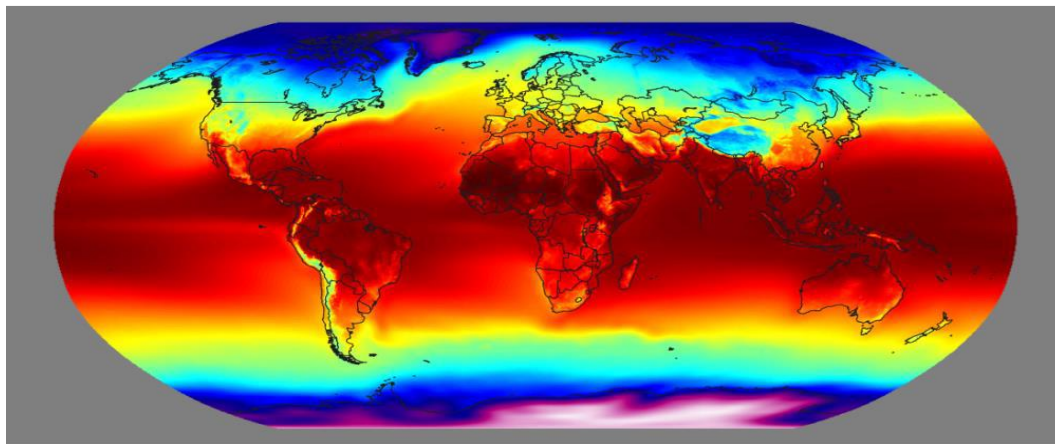
- **Temperature**
- **pressure**
- **wind**
- **humidity**
- **precipitation**

Analysis of these elements can provide the basis for forecasting weather and defining its climate. These same elements make also the basis of climatology study, of course, within a longer time scale rather than it does in meteorology.

Temperature is how hot or cold the atmosphere is, how many degrees it is above or below freezing. Temperature is a very important factor in determining the weather, because it influences or controls other elements of the weather, such as precipitation, humidity, clouds and atmospheric pressure.

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Annual Mean Temperature





Wind is the movement of air masses, especially on the Earth's surface.



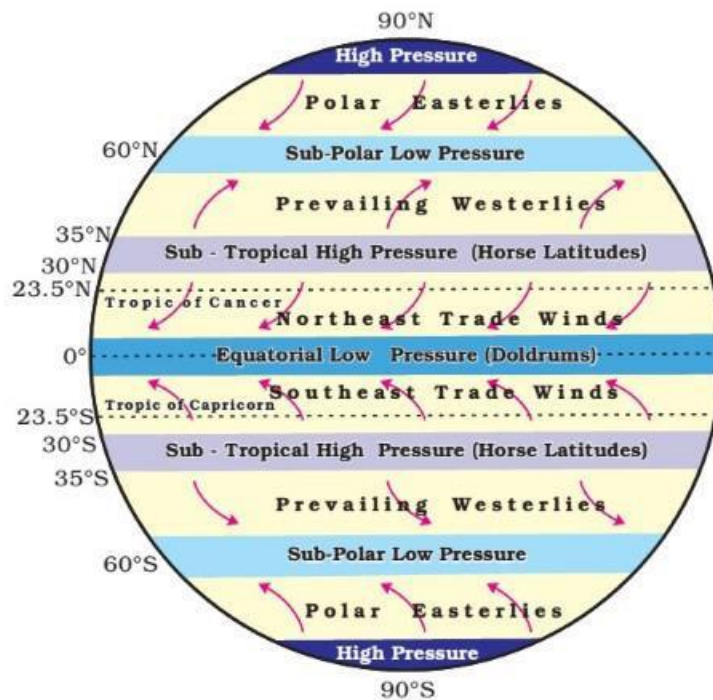
Humidity is the amount of water vapour in the atmosphere .



Precipitation is the product of a rapid condensation process (if this process is slow, it only causes cloudy skies). It may include snow, hail, sleet, drizzle, fog, mist and rain.

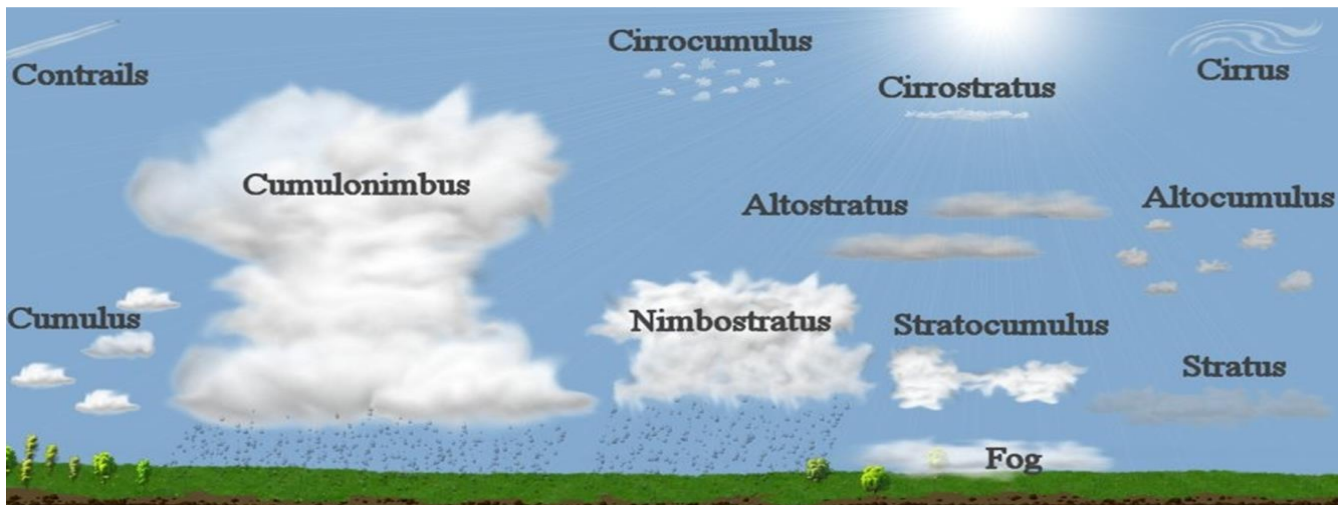
<p>Rain</p>  <ul style="list-style-type: none">• Falling drops of liquid water.• Most common type of precipitation.	<p>Snow</p>  <ul style="list-style-type: none">• Falls when the temperature in the cloud is below freezing.
<p>Sleet</p>  <ul style="list-style-type: none">• Rain that freeze as it falls.	<p>Hail</p>  <ul style="list-style-type: none">• Forms when drop of rain freeze and strong wind carry them higher into a cloud.

Atmospheric pressure (or air pressure) is the weight of air resting on the earth's surface. Pressure is shown on a weather map, often called a synoptic map, with lines called isobars.



Major Pressure Belts and Wind System

Clouds : A cloud is made of water drops or ice crystals floating in the sky. There are many kinds of clouds. Clouds are an important part of Earth's weather.



What Causes Weather?

Weather processes such as wind, clouds, and precipitation are all the result of the atmosphere responding to uneven heating of the Earth by the Sun. The uneven heating causes temperature differences, which in turn cause air currents (wind) to develop, which then move heat from where there is more heat (higher temperatures) to where there is less heat (lower temperatures). The atmosphere thus becomes a giant "heat engine", continuously driven by the sun. High and low pressure areas, wind, clouds, and precipitation systems are all caused, either directly or indirectly, by this uneven heating and the resulting heat redistribution processes. Generally speaking, there are two main modes of this heat redistribution:

(1) Vertical heat transport: Solar heating of the Earth's surface makes the atmosphere convectively unstable, causing vertical air currents to develop. This is what causes puffy-looking clouds, showers, and thunderstorms to form in warm air masses.

(2) Horizontal heat transport: Because the Earth is a sphere, it receives more sunlight in the tropics, and less sunlight toward the North and South Poles. This causes horizontal temperature differences to develop, which in turn causes air pressure differences, leading to wind that transports heat from the tropics to the high latitudes. Together, this uneven heating in both the horizontal and vertical directions in the atmosphere causes everything that we perceive as "weather".

High & Low Pressure Areas

Temperature differences caused by uneven solar heating between different regions causes high and low pressure areas to develop. The horizontal transport of heat by wind from low to high latitudes is strongly influenced by the Earth's rotation, which prevents the wind from flowing directly from high pressure to low pressure, and instead causes the wind to flow around high and low pressure centers. The following example shows how the wind flows in the Northern Hemisphere...in the Southern Hemisphere, the wind flows in the opposite direction around high and low pressure areas.

