

CLLOUDS AND THEIR CLASSIFICATION – PRECIPITATION – FORMS OF PRECIPITATION – ISOHYETS VARIABILITY AND DROUGHT

CLLOUDS

A cloud is a mass of water drops or ice crystals suspended in the atmosphere. Clouds form when water condenses in the sky. The condensation lets us see the water vapor. There are many different types of clouds.

How do clouds form?

Clouds form from water in the sky. The water may evaporate from the ground or move from other areas. Water vapor is always in the sky in some amount but is invisible. Clouds form when an area of air becomes cooler until the water vapor there condenses to liquid form. At that point, the air is said to be "saturated" with water vapor. The air where the cloud forms must be cool enough for the water vapor to condense. The water will condense around things like dust, ice or sea salt - all known as condensation nuclei. The temperature, wind and other conditions where a cloud forms determine what type of cloud it will be

What causes rain?

Most of the water in clouds is in very small droplets, but sometimes those droplets collect more water. Then they turn into larger drops. When that happens, gravity causes them to fall through the air faster. The falling water drops are rain. When it is colder, the water may form snowflakes instead. Clouds also can cause freezing rain or sleet. These happen when snow melts on the way to ground but then gets colder again. Hail falls during more severe weather. Air currents cause rain and snow to move around in the sky. As they move, they get colder and turn into ice. As they move, the ice chunks get bigger. Finally, they fall to the ground as hail.

WMO cloud classification

The World Meteorological Organisation (WMO) classified the clouds according to their height and appearance into 10 categories. From the height, clouds are grouped into 4 categories (viz., family A, B, C and D) as stated below and there are sub- categories in each of these main categories.

FAMILY A

The clouds in this category are high. The mean lower level is 7 kilometers and the mean upper level is 12 kilometers in tropics and sub-tropics. In this family there are three sub-categories.

1. Cirrus (Ci)

- ❖ Height: High
- ❖ Color: White
- ❖ Shape: Wispy or feathery
- ❖ Weather: May mean a warm front is approaching

They are thin and white with lots of blue sky visible. In these clouds ice crystals are present. Sun rays pass through these clouds and sunshine without shadow. This cloud does not produce precipitation.

2. Cirrocumulus (Cc)

- ❖ Height: High
- ❖ Color: White or gray
- ❖ Shape: Rows of small patchy clouds
- ❖ Weather: Typically sunny and cold

Cirrocumulus clouds are much smaller than most other types of clouds, and they are sometimes called cloudlets. They are found at high altitudes and are made of ice crystals. They often are arranged in parallel rows.

3. Cirrostratus (Cs)

- ❖ Height: High
- ❖ Color: Transparent/white
- ❖ Shape: Wispy, but thicker than cirrus clouds
- ❖ Weather: Varies

These are transparent, wispy clouds that cover most or all of the sky. The best identifier for cirrostratus clouds is a halo or ring of light surrounding the sun or moon.

FAMILY B

The clouds in this category are middle clouds. The mean lower level is 2.5 kilometers and the mean upper level is 7 kilometers in tropics and sub-tropics. In this family there are 2 sub-categories as details below:

1. Altocumulus (Ac)

- ❖ Height: Mid
- ❖ Color: White
- ❖ Shape: Heap-like and often grouped together
- ❖ Weather: Varies

Altocumulus clouds are fairly common clouds that look like round white or gray patches in the sky. They are sometimes grouped in parallel lines and have been described as looking similar to tufts of wool.

2. Alto-stratus (As)

- ❖ Height: Mid
- ❖ Color: White or light gray
- ❖ Shape: Thick and flat
- ❖ Weather: Usually indicate warmer weather is approaching; can cause light precipitation

These clouds form a white or gray layer that blankets the sky at mid-level. There are usually no patches of blue sky when these clouds appear, but the sun is often visible as a dimly lit disk behind the clouds (although no shadows appear on the ground).

FAMILY C

The clouds in this category are lower clouds. The height of these clouds extends from ground to upper level of 2.5 kilometers in tropics and sub-tropics. In this family, like high clouds, there are 3 sub-categorises.

1. Strato cumulus (Sc)

- ❖ Height: Low
- ❖ Color: White
- ❖ Shape: Fluffy
- ❖ Weather: Appear before or after a front/when there is weak convection in the atmosphere

Stratocumulus clouds are somewhat similar to cumulus clouds but are flatter, thicker, and darker. There is less blue sky between the clouds, and the weather will appear more cloudy than sunny.

2. Stratus (St)

- ❖ Height: Low
- ❖ Color: Gray or white
- ❖ Shape: Featureless flat layer
- ❖ Weather: Gloomy weather, sometimes with light precipitation

Similar to fog (but on the horizon instead of on the ground), stratus clouds are a gray featureless layer of clouds that cover all or most of the sky.

3. Nimbostratus (Ns)

- ❖ Height: Low
- ❖ Color: Dark gray
- ❖ Shape: Large thick layer
- ❖ Weather: Steady rain or snow

Nimbostratus clouds form a thick, dark layer across the sky. They are often thick enough to blot out the sun. Like cumulonimbus clouds, they are associated with heavy precipitation.

FAMILY D

These clouds form due to vertical development i.e., due to convection. The mean low level is 0.5 and means upper level goes up to 16 kilometers. In this family two sub-categories are present.

1. Cumulus (Cu)

- ❖ Height: Low
- ❖ Color: White
- ❖ Shape: Fluffy, tall, often described as looking similar to cauliflower
- ❖ Weather: Typically sunny

Cumulus clouds are dense individual clouds that are bright white on top and gray underneath. They typically appear earlier in the day when it's sunny.

2. Cumulonimbus (Cb)

- ❖ Height: Low
- ❖ Color: Pale to dark gray
- ❖ Shape: Dense and towering
- ❖ Weather: Thunderstorms

Cumulonimbus are the classic “thunderstorm clouds” and are large towering clouds that are often dark in color. Seeing them is a sign that a storm is likely on its way. They can be very large, appearing like a mountain (sometimes with a flat top).

Forms of Precipitation

1. Rain: It is precipitation of liquid water particles either in the form of drops having diameter greater than 0.5 mm or in the form of smaller widely scattered drops. When the precipitation process is very active, the lower air is moist and the clouds are very deep, rainfall is in the form of heavy downpour. On occasions, falling raindrops completely evaporate before reaching the ground.

2. Drizzle: It is fairly uniform precipitation composed of fine drops of water having diameter less than 0.5 mm small and uniform size and seems to be floated in the air, it is referred as drizzle. If the drops in a drizzle completely evaporates before reaching the ground, the condition is referred to as ‘mist’.

3. Snow: It is the precipitation of white and opaque grains of ice. Snow is the precipitation of solid water mainly in the form of branched hexagonal crystals of stars. In winter, when temperatures are below freezing in the whole atmosphere, the ice crystals falling from the Altostratus do not melt and reach the ground as snow.

4. Sleet: It refers to precipitation in the form of a mixture of rain and snow. It consists of small pellets of transparent ice, 5 mm or less in diameter. It refers to a frozen rain that forms when rain falling to the earth passing through a layer of cold air and freezes. This happens when temperature is very low.

5. Hail: Precipitation of small pieces of ice with diameter ranging from 5 to 50 mm or something more is known as hail. Hailstorms are frequent in tropics.

Isohyets: Isohyets are the lines connecting various locations, having an equal amount of precipitation.

Drought

The term drought can be defined by several ways.

1. The condition under which crops fail to mature because of insufficient supply of water through rains.
2. The situation in which the amount of water required for transpiration and evaporation by crop plants in a defined area exceeds the amount of available moisture in the soil.
3. A situation of no precipitation in a rainy season for more than 15 days continuously. Such length of non-rainy days can also be called as dry spells.

Classification of Drought

Droughts are broadly divided into 3 categories based on the nature of impact and spatial extent.

i. Meteorological Drought

If annual rainfall is significantly short of certain level (75 per cent) of the climatologically expected normal rainfall over a wide area, then the situation is called meteorological drought. In every state each region receives certain amount of normal rainfall. This is the basis for planning the cropping pattern of that region or area.

ii. Hydrological drought

This is a situation in which the hydrological resources like streams, rivers, reservoirs, lakes, wells etc dry up because of marked depletion of surface water. The ground water table also depletes. The industry, power generation and other income generating major sources are affected. If Meteorological drought is significantly prolonged, the hydrological drought sets in.

iii. Agricultural Drought

This is a situation, which is a result of inadequate rainfall and followed by soil moisture deficit. As a result, the soil moisture falls short to meet the demands of the crops during its growth. Since, the soil moisture available to a crops insufficient, it affects growth and finally results in the reduction of yield. This is further classified as early season drought, mid-season drought and late season drought.