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8

# HUMIDITY AND PRECIPITATION

The air that surrounds us contains water in the form of vapour. Sometimes we can see it around us in the form of fog or mist or clouds above us. Through water vapour is a minor component of the atmosphere, yet it is a very important element of the atmosphere. In this lesson, we will study the role of water vapour in day-to-day weather conditions. Heat and water are vital ingredients of the biosphere. Plant and animal life on which our life depends need fresh water. The only primarybasic source of water is from the atmosphere through the condensation of water vapour. In this lesson, we are mainly concerned with water in the vapour state in the atmosphere and the process by which it passes into the liquid or solid state and ultimately arrives at the surface of oceans and lands through the process of precipitation.

## OUTCOMES

After studying this lesson, learner:

- distinguishs between absolute and relative humidity;
- explains evaporation and the factors affecting the rate of evaporation;
- explains condensation and its various forms;
- explains conditions required for precipitation;
- explains types of rainfall with a diagram;
- describes various forms of precipitation and
- identifies factors affecting the distribution of precipitation.

## 8.1 IMPORTANCE OF WATER VAPOUR

Thus the presence of water vapour in the air is an extremely important factor for the existence of human being on the earth. It is the most variable gas inof the atmosphere with a proportion

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varying from almost zero to as much as four percent by volume.

Importance of water vapour is given below:

1. Precipitation occurs on account of water vapour.
2. Water vapour in the atmosphere absorbs a significant portion of both incoming solar radiation and outgoing earth radiation. It helps in maintaining a suitable temperature on the earth.
3. The amount of water vapour present in the air affects the rate of evaporation.
4. The water vapour provides necessary energy needed for storms (cyclones, hurricanes etc)Necessary energy needed for storms (cyclones, hurricanes etc) is provided by the water vapour in the form of latent heat energy.
5. The amount of water vapour present at a place or region indicates the potentiality of precipitation
6. Air poorly in water content makes our body skin dry and rough.
7. The presence of water vapour present in the air also affects standing crops.

## 8.2 HUMIDITY

Humidity is the concentration of water vapour present in the air. Water vapour, the gaseous state of Water, is generally invisible to the human eye. Humidity indicates the likelihood of precipitation, dew or fog to be present. Humidity depends on the temperature and pressure of the System. It also indicates the degree of dampness or Wetness of the air. Humidity of the air is mainly expressed in the following two ways-

### A. Absolute Humidity

The amount of actual water vapour per unit of air is known as absolute humidity and expressed in grams per cubic metre of air. For example, if the absolute humidity of air is 10 grams, it means that one cubic metre of that air holds 10 grams of moisture in the form of water vapour. Absolute humidity is variable and changes from place to place and with change in time.

The capacity of air to hold water vapour fully depends on temperature. The capacity of holding water vapour in the air increases with the increase in temperature. For example at 10° C, temperature one cubic metremeter of air can hold 9.4 grams of water vapour. If the temperature is increased to 20°C, its Capacity to hold water vapour also increases to 17.12 grams per cubic metre of air. Likewise at 30°C temperature it may rise to 30.04 grams per cubic metremeter of air At Certain temperatur the quantity of water

vapour held per cubic metre of air is known as its capacity to hold water vapour. When humidity in air is equal to its capacity, it is known as saturated air. Cold air has less capacity to hold water vapour in their warm air. See below given figure.

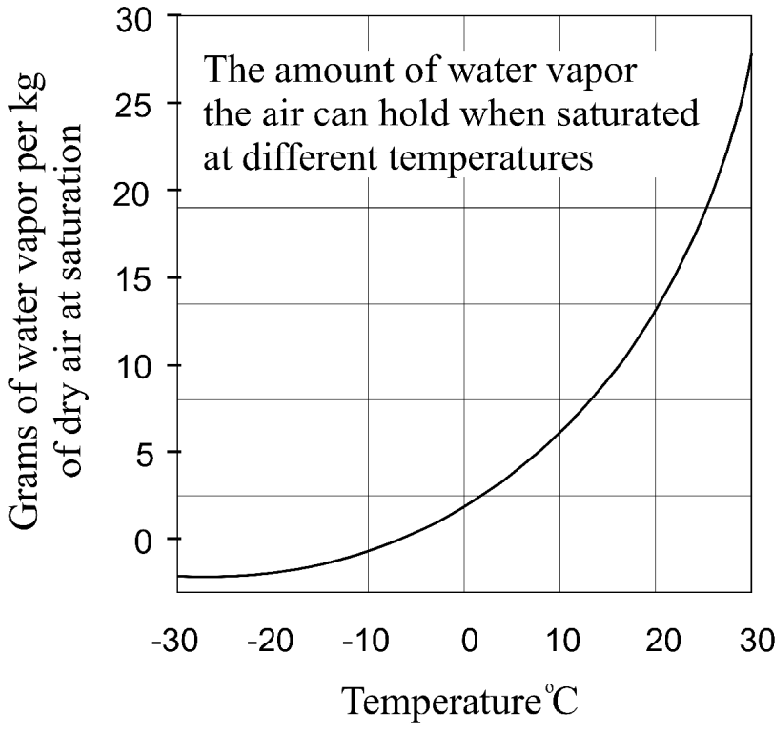


Fig. 8.1 Relation between Temperature and Absolute Humidity

Absolute humidity is a measure of the quantity of water that can be extracted from the atmosphere as precipitation. Cold air can supply only a small quantity of rain or snow whereas warm air is capable of supplying a huge quantity of water.

There is a disadvantage of using absolute humidity, when air rises or sinks in elevation, it undergoes corresponding volume changes like expansion or compression. Thus the absolute humidity cannot remain a constant figure for the same body of air. Modern meteorologists, thus make use of another measure of moisture content specific humidity.

The weight of water vapour per unit weight of air is called specific humidity. The unit of air weight is in kilograms and unit weight of water vapour is in grams. Hot and humid air of Equatorial regions can have 16 to 18 grams water vapour.

## B. Relative Humidity

Relative humidity is the most important and reliable measure of atmospheric moisture. It states the relationship between the absolute humidity and the maximum capacity of the air to hold moisture at the same temperature.

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This ratio between the actual humidity of air and its maximum capacity to hold moisture at a given temperature is known as Relative Humidity. It is always expressed in percentage. It can best be understood with the help of a simple formula.

$$\text{Relative Humidity} \quad \frac{\textit{Absolute humidity(Actual amount of water vapour present in the air at a given temp}}{\textit{Humidity relative capacity (Amount of water vapour that can be held by the same air at the same temperature)}}$$

It is quite clear that air can hold a definite maximum quantity of water vapour at a given temperature. When this situation is attained, the air becomes fully saturated. The temperature at which a given sample of air becomes fully saturated is called the dew point or saturation point. The relative humidity of an air of saturation point is hundred percent. To make it clearer, let us take an example. An example considers at a given time, the temperature of the air is 21°C and the total amount of water vapour present is 11.1 grams. Whereas its retentive capacity is 22.2 gms. Relative humidity will be:

$$\text{Relative humidity} \quad \frac{\textit{Absolute humidity 11.1 gms}}{\textit{Retentive Capacity 22.2 gms}} \times 100 = 50\%$$

If the same air is holding 22.2 gms. of water vapour at the same temperature, the relative humidity will be 100 percent.

The relative humidity increases when the temperature of the air goes down or when more moist air is added to it. The relative humidity decreases when the temperature of the air increases or when less moist air is added to it.

- Absolute humidity is the actual amount of water vapour present in grams per cubic metres of a given air.
- Relative humidity is the ratio of actual water vapour content to the maximum moisture holding capacity of an air at a given temperature and it is expressed in percentage (RH=AH/Max. capacity × 100).
- The weight of water vapour per unit of air is called specific humidity. The unit of air weight is in kilograms and unit weight of water vapour is in grams.
- The temperature at which a given sample of air becomes fully saturated is called 'dew point' or 'saturation point'.

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| | Absolute Humidity | Relative humidity |
|---|---|---|
| 1. | It helps us to know the actual amount of water vapour present in air | It shows the ratio of water vapour actually present in the air at a given temp. to the retentive capacity of humidity of the same parcel of air at the same temp. |
| 2. | It does not take temp. into account | It takes temp. into account |
| 3. | It is expressed in grams per cubic metre | It is expressed in percentage |
| 4. | It is not useful measure of humidity because it does not fell us the amount of water vapour required for the air to become saturated | It is a useful measure of humidity because it can show how humidfor the air isis humid. |

## Changes in the relative humidity of Air

Change in Relative Humidity can occur in the following three ways:

1. The temperature remains the same and the amount of water vapour in the airin air increases. Its relative humidity will also increase.

2. When the temperature of air rises, its water vapour retentive capacity also rises correspondingly, the relative humidity decreases.

3. If the temperature of air decreases, its water vapour retentive capacity also decreases and relative humidity decreases.

The humidity of air determines the amount and rate of evaporation. It is why humidity is an important element of climate.

## Effects of humidity

1. High relative humidity causes irritation to human beings because perspiration does not dry easily.

2. In the case of low relative humidity, skin becomes dry. Cracks begin to appear on the skin.

3. On account of rise in relative humidity patients suffering from trouble in joints feel pain.

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## INTEXT QUESTIONS 8.1

1. Fill in the blanks with appropriate word -

   (a) _____ is very important among elements of weather.

   (b) The temperature at which the air becomes fully saturated is called _____.

   (c) The relative humidity of saturated air is _____ percent.

2. Give a geographical term for each of the following;

   (a) The amount of water vapour actually present in the atmosphere.

   _____

   (b) The air that contains moisture to its full capacity is called

   _____

   (c) Amount of invisible water vapour present in atmosphere is generally termed as

   _____

   (d) The temperature at which a sample of air becomes saturated.

   _____

   (e) The weight of water vapour per unit of air is termed as _____

   _____

## 8.3 EVAPORATION

The evaporation is the physical process by which a liquid like water is transformed into a gaseous form. This process takes place at all places, at all times and at all temperatures excepts at dew point or when the air is saturated. It is important to note that about 600 calories of heat is used for converting each gram of water into water vapour (calorie is a unit of amount to energy). To raise the temperature of 1 gram of water through 1°C, one calorie of energy is required. At the time of evaporation, heat is absorbed and conserved in water vapour. It is known as latent heat. It is a sort of hidden heat. The latent heat consumed in changing water into gaseous form is released when water vapour changes into water or ice. The release of latent heat in the air is an important source of energy for causing the development of storms, cyclones or typhoons. A loss of water from leaf and stem tissues of growing vegetation is called transpiration. The combined losses of moisture by evaporation and transpiration from given areas are termed as evapo-transpiration.

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The rate of evaporation is affected by several factors. Some important factors are given below: -

1. **Accessibility of water bodies-** the rate of evaporation is higher over the oceans than on the continents.

2. **Temperature -** Due to higher temperature in summers, the rate of evaporation is more in summers than in winter. That is why wet clothes dry faster in summers than in winters.

3. **Air moisture -** Aridity or dryness of the air also increases the rate of evaporation. During rainy days, wet clothes take more time to dry owing to the high percentage of moisture content in the air than on dry days.

4. **Cloud cover -** The cloud cover prevents solar radiation and thus influences the air temperatures at a place. This way, it indirectly controls the process of evaporation.

5. **Wind -** Winds induce a higher rate of evaporation. Winds blow away humid air and dry winds take over their place. Dry winds cause rapid evaporation.

- The evaporation is the process of charging water into water vapour.
- The rate of evaporations is affected by the accessibility of water, temperature, aridity of air, wind and cloud cover.
- The heat energy used for changing the state of water or liquid to gaseous state or from solid to liquid state without changing its temperature is called latent heat.

## 8.4 CONDENSATION

The process of condensation is the reverse of evaporation. In this process a gaseous substance changes its state into liquid or solid state. When the temperature of saturated air falls below the dew point, the air becomes incapable of holding its entire moisture content in vapour form. The excess of moisture is then released into liquid state, and if the temperature is sufficiently low, the release can be in solid state. This change of the state of moisture from invisible water vapour to visible liquid (water) or solid (ice or snow) state is known as condensation.

Condensation always takes place around some particles present in air. These may be dust particles, smoke, oceanic salt or carbon dioxide which act as a nuclei to hold water. They are thus called hydroscopic nuclei.

The process of condensation is directly related to the relative humidity and the rate of cooling. The most favourable condition for condensation is on account of fall in temperature of air. When the humid air faces an obstruction like a hill, it rises. On rising its temperature further decreases and the process of condensation begins to operate.

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- Condensation is a process of changing water vapour in tiny droplets of water or ice crystals.
- Condensation takes place when temperature of air falls below dew point and is controlled by relative humidity of the air and rate of cooling.

## Forms of condensation

The forms of condensation may be classified into two groups on the basis of place where it is occurring.

| | |
|---|---|
| On the ground or on natural objects such as leaves of plants or trees and grass | In the air at some height in the troposphere. |
| Dew, frost, fog, mist, smog | Clouds |
| Condensation may also take place according to temperature | |
| When the dew point is below freezing point or below 0°c | When it is above freezing point |
| Frost, snow and cirrus clouds | Dew, mist, fog, smog and some clouds are formed |

### A DEW

The tiny drops of Water found early morning on the blades of grass, on the leaves of small plants and trees are called dew. It is formed on account of condensation of moisture in the atmosphere on or near the ground surface. Some favourable conditions for the formation of dew are the following.

1. **Long Nights -** During long nights earth's surface is cooled. When humid air comescome into contact with thethe contact with cold surface, condensation occurs in the form of dew.

2. **Cloudless clear sky -** When there is clear sky, little or no wind, high relative humidity and cold long nights condensation occurs in the form of dew. These conditions lead to greater terrestrial radiation and the solid objects become cold enough to bring the temperature of air down below dew point. In this process extra moisture of the air gets deposited on various objects or surfaces.

3. **Relative humidity -** High relative humidity promotes more condensation and dew formation. Therefore dew can be found more in the months of August - September in India.

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4. **Dew point -** Dew point being higher than freezing point, promotes dew formation and conversely frost is formed.

## B. Frost

When the dew point is below freezing point, the condensation of extra moisture takes place in the form of very minute particles of ice crystals. It is called frost. This form of condensation is disastrous for standing crops, such as potato, peas, pulses, grams. Generally the conditions of formation of dew and frost are the same. Only temperature should fall below freezing point for the formation of frost.

## C. Fog

Fog comprises a dense mass of small water drops or smoke or dust particles in the lower layers of the atmosphere. Fog results from the cooling of air below its dew point; cooling is caused by radiation, conduction and mixing of warm and cold air masses.

Three types of fog have been identified. These are as follows -

(a) Radiation Fog - It is the commonest type of fog. It needs the following for its formations - (i) An should have been under a cloud cover with rain falling a day before (ii) Pools of air, cooled to an excessive degree (iii) cloudless sky on the night before.

(b) Advection fog is formed through the transportation of warm, moist air over cold surfaces. This type of fog occurs along the sea coasts and shores of large inland water bodies.

(c) Frontal fog is formed along the front separating cold and warm air masses. Cooling is caused by the forced ascent of air due to convergence. Frontal fogs are commonin the cool temperate belt where fronts are frequent.

## D. Mist

Mist is a type of fog in which the visibility is more than 1000 metres but less than 2000 metres. It becomes foggy when the visibility is less than 1000 metres.

## E. Smog

Smog is a fog that has been polluted by smoke, dust, carbon monoxide, sulpher dioxide and other poisonous wastes smog frequently occurs in large cities and industrial centres. In 1952 smog caused deaths of over 4000 people in London.

## F. Clouds

As against fog clouds are formed at considerable height above the ground in the atmosphere. Condensation is the common cause of formation of clouds. Moist air gets cooled after reaching considerable height. Water vapour isare changed into tiny droplets of water or snow crystals, when these droplets a crystal rise up or travel across the sky close together, they are called clouds.

The clouds change their shape and appearance almost every second. Sunlight also affects their appearance. Therefore clouds are seen in different sizes. To facilitate classification of clouds, some important types are given below -

**(a) Cirrus cloud -** being at considerable height these clouds are formed of ice crystals. They look like fan -shaped and are rightly called cirrus clouds.

**(b) Cumulus clouds -** with a flat base, they look like domes at the top. In appearance, they look like a cauliflower.

**(c) Stratus Clouds -** They appear like sheets in layers and cover the whole or large parts of the sky.

- Dew, fog, frost, mist, smog and clouds are forms of condensation.
- Frost and some clouds are formed when condensation take place below freezing point
- Clouds are grouped into three types on the basis of their appearance.

### INTEXT QUESTIONS 8.2

1. Write geographical term for each of the following -

(a) Physical process in which liquid like water transformed into vapour or gaseous state _____

(b) At the time of evaporation, heat is absorbed and conserved in water vapour. It is known as _____.

(c) The process of change of water vapour into liquid or solid state _____

(d) Condensation always takes place around some particles that are known as _____.

*Notes*

2. Name three types of fog.

   (i) _____

   (ii) _____

   (iii) _____

3. List any three factors which affect the rate of evaporation.

   (i) _____

   (ii) _____

   (iii) _____

## 8.5 PRECIPITATION

The falling of water droplets, ice crystals and other forms on the ground is called precipitation. It includes drizzle, rain, cloud burst, snow fall, sleet and hail.

When water vapour rises up in the atmosphere, condensation takes place and the tiny droplets and ice crystals form the clouds. These tiny droplets in the cloud ascend further and under certain favourable conditions join together and become bigger and heavy. When they are unable to remain suspended in the atmosphere, these fall on the ground in the form of precipitation.

### Forms of Precipitations

**A.** **Drizzle -** The light rain falling in very tiny drops is called drizzle. These droplets are tiny particles of less than 05 mm diameter. They are so tiny and light that even the light wind may blow them away.

**B.** **Rain -** Rainfall is in the form of drops of water. These drips may vary in diameter from 0.5mm to 7 mm. Sudden and violent rainfall is termed as a shower. The shower drops are large and heavy.

**C.** **Snowfall -** When condensation takes place below freezing point, the water vapour changes into tiny ice crystals. These tiny ice crystals grow in size and form the flakes which become big and heavy and start falling on the ground. This form of precipitation is called snowfall. Snowfall is very common in western Himalayas and mid and high altitude regions in winter.

**D.** **SLEET -** Sleet is frozen rain, formed when rain before falling on the ground passes through a cold layer of air and freezes. The result is the creation of solid particles of clear ice. It is usually a combination of small ice balls and rime.

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**E. HAIL -** The precipitation in the form of hard solidified pellets of ice is known as hail. These pellets may be rounded and small sized like those of peas. The small ice granules may also grow in size and their structure resembles that of an onion and may grow to the size of a tennis ball. In this case bigger granules have frozen layered structure. The bigger granules cause great harm to standing crops. In India, during the months of March to May hail storms are common.

- Falling down of atmospheric moisture on the Earth's surface is called Precipitation.
- The precipitation in the form of tiny droplets of water and bigger water droplets are known as drizzle and rainfall respectively.
- When the precipitation is in the form of big ice balls, it is called snowfall.

When a mass of moist air ascends to altitude it cools down. In doing so, it attains dew point which leads to condensation and ultimately precipitation. Thus the cooling of air occurs mainly when it rises. There are three important ways in which a mass of air can be forced to rise and each of these ways produces its own characteristic precipitation or rainfall.

Based on the ascend of air, rainfall is classified into three types -

**1. Convectional Rainfall -** Excessive heating of the earth's surface in tropical regions results in the vertical convectional currents. These currents lift the warm moist air to higher strata of the atmosphere. When the temperature of such humid air starts falling below dew point continuously, clouds are formed. These clouds cause heavy rainfall associated with lightning and thunder. This type of rainfall is known as convectional rainfall. It is very common in equatorial regions where it is a daily phenomenon in the afternoon at 4 pm throughout the year. For this reason it is also called 4' o'clock rainfall.

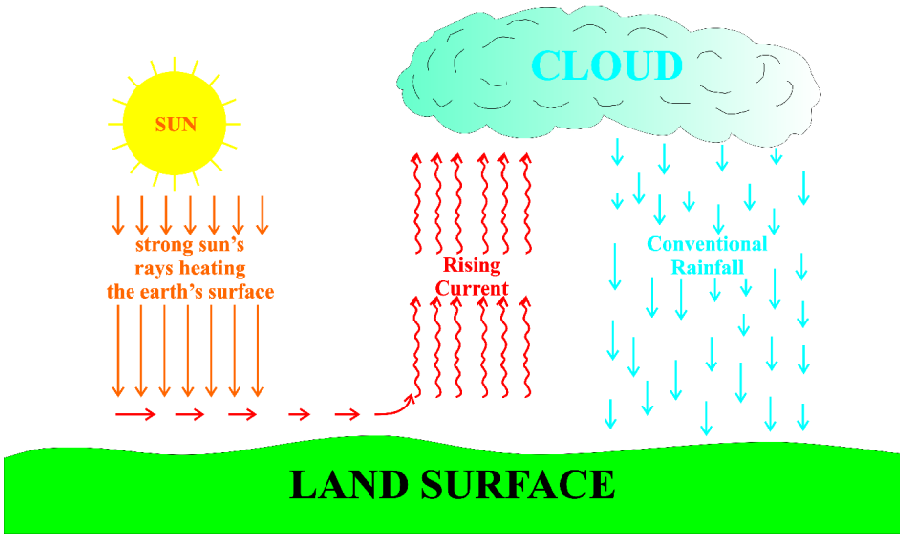


Fig - 8.2 Diagram of convectional rainfall

ii. **Orographic Rainfall -** It may also be called as relief rainfall. It is caused when air is forced to rise up a hill, mountain or hilly plateau. The winds facing the direction of the mountain range ascend and are cooled upon gaining a certain height. On reaching the saturation point condensation starts, and on further cooling rainfall begins. The special feature of the areas of high relief is that the windward side receives more rainfall than the leeward side because the winds shed most of their moisture before crossing the barrier. Not only this while descending on the seaward of the mountain the winds are further warmed and their capacity to hold moisture rises. As a result there is either less or no rainfall. For example Mahabalshwar lying on the windward side of western Ghats receives annual rainfall of about 622 cms against Pune on the leeward side only 70 km. away from Mahabaleshwar receive only 66 cms annual rainfall.

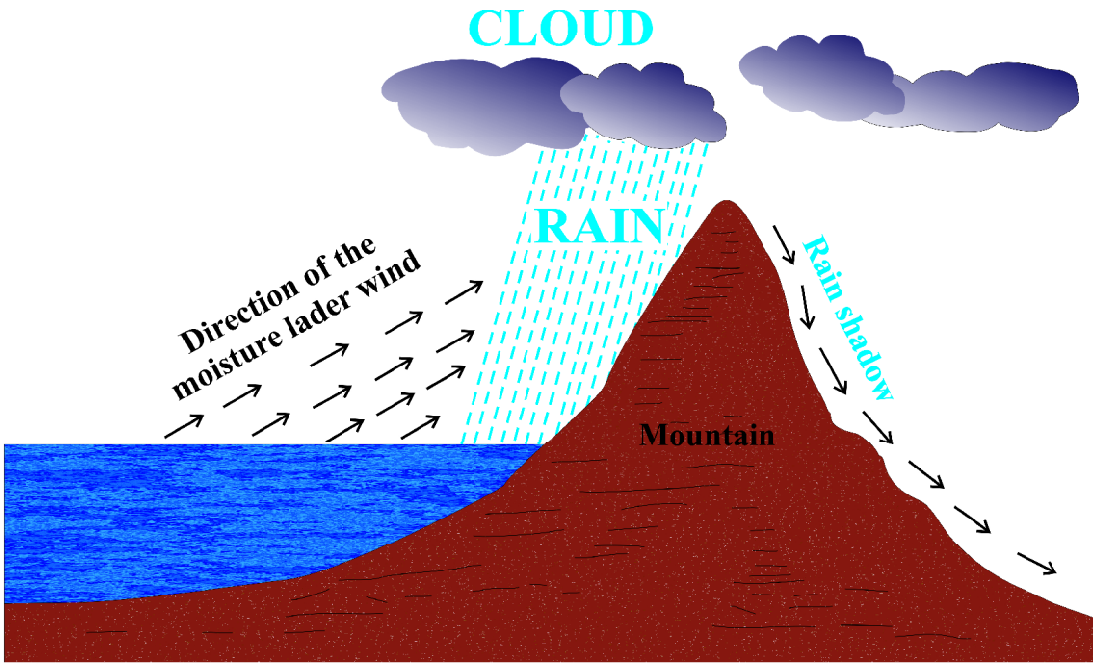


Fig. 8.3 Diagram of Orographic Rainfall

iii. **Cyclonic Rainfall-** When a warm air mass converges with a cold air mass stormy conditions are created. Being lighter, warmlighter warm air mass rises above the cold air mass. The humid and warm air upon ascent is cooled. On becoming cooler below the saturation point condensation takes place and clouds are formed. These clouds are rain bearing cumulus clouds and give heavy rainfall. This type of rainfall is generally received in mid latitudes where comparatively warm westerly humid winds converge with dry polar winds.

It is on account of this convergence, cyclonic or convergence precipitation occurs in these areas. In cyclonic rainfall air from all sides rushes towards the centre and it then forced to rise upward. On ascent, it cools and the process of condensations begins to

Notes

cause rainfall. The path followed by cyclones gettingget heavy to moderate rainfall on the eastern coasts of India isare its bestit s best example.

## 8.6 DISTRIBUTION OF PRECIPITATION

The spatial distribution of precipitation is not uniform all over the world. The average annual precipitation of the world is 97.5 cms. but the landmass receives areceive lesser amount of rainfall than the oceans. The annual precipitation shows marked difference In the land. Different places of the earth's surface receive different amount of annual precipitators and that too in different seasons. Somewhere it rains torrentially throughout the year, at other places it rains occasionally and those two are very scanty like in deserts. There is a place in the Atacama desert in Chile where no rainfall was received for four years continuously. On the other side Mansynram in Meghalaya is the wettest place on earth. It received 26000 mm (1000 inches) of rainfall in 1985.

The main features of the distribution of precipitation can be explained with the help of global pressure and wind belts, distribution of land and water bodies and the nature of relief features - Now let us first see regional distribution of precipitation

### A. Regional Variations

On the basis of average amount of annual precipitation, the following four precipitation regions can be recognized.

**(i) Region of Heavy Precipitation : -** The regions which received more than 200 cms of rainfall are included in this category. Equatorial coastal areas of tropical zone and west coastal regions at temperate zone are included in this category.

**(ii) Regions of moderate Precipitation :-** The regions receiving 100 to 200 cms. of rainfall are included in this category. Eastern coastal regions of sub-tropical zone and coastal regions of the warm temperate zonegone are included in the category.

**(iii) Regions of less Precipitation :-** These regions tie in the interior parts of the tropical zone and eastern interior parts of temperate zone and receive precipitation between 50 to 100 cms of.

(iv) The areas lying in the leeward side (rain shadow areas) of the mountain range, in interior parts of continents, western margins of continents receive less than 50 cm precipitation.

### B. Seasonal Variations

The regional variations in the distribution of precipitation do not give the correct picture of the nature of precipitation in such regions where seasonal fluctuations in the amount

of precipitation are very common. Therefore it is important to study seasonal variations of precipitation in the world.

Seasonal distribution of precipitation provides us an idea to judge its effectiveness. For example the scanty precipitation during short growing season in high latitudes is more effective than that of heavy precipitation in lower latitudes, precipitation in form of dew, fog and mist in some parts like Central India and Kalahari desert has an appreciable effect on standing crops and natural vegetations.

## C. Factors affecting Rainfall Distributions-

(i) Moisture supply- to the atmosphere is the main factor in determining the amount of rainfall in any region.

(ii) Wind direction - winds blowing from sea to land cause rainfall while bearing lands are dry.

(iii) Ocean Currents - Warm currents help in causing rainfall while cold currents cause no rainfall.

(iv) Preserving mountains across the directions of winds causes more rainfall on the windward side and creates rain shadow on the leeward side.

(v) Pressure belts are closely related with wind direction and rainfall.

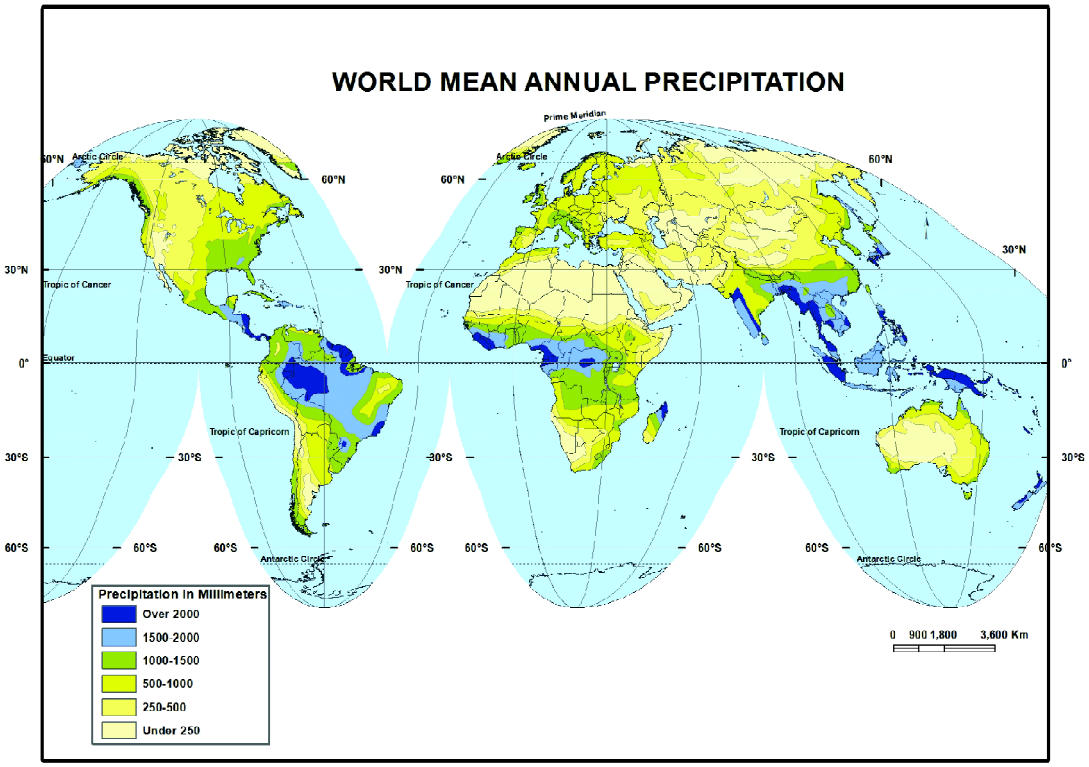


Fig 8.4 Distribution of mean precipitations in the world

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## INTEXT QUESTIONS 8.3

1. Give a geographical term for each of the following.

   (a) The process in which water vapour is changed into water _____.

   (b) Leeward side of the mountains or hill receive less rainfall _____.

   (c) The Ascent of humid and warm air and its contact with colder air results in _____.

   (d) The light rain falling in very tiny drops is called_____.

2. List any four forms of Precipitation.

   (a) _____ (b) _____

   c) _____ (d) _____

3. Name three types of rainfall.

   (a) _____ (b) _____

   c) _____ (d) _____

## WHAT YOU HAVE LEARNT

- Water vapour is an important element of the atmosphere. It is responsible for global heat balance, atmospheric phenomena and sustaining plant, animal and human life and earth.
- The water vapour present in the atmosphere is called humidity which can be expressed in two ways - absolute humidity and relative humidity.
- Relative humidity is the most reliable measure for forecasting weather.
- Water vapour enters into the atmosphere through a process called evaporation.
- Temperature of the air controls the capacity of holding moisture at a given volume.
- The air which holds the moisture to its full capacity is called saturated air and the temperature at which it reaches saturation point is called dew point.
- Condensation is a process of changing of water vapour into liquid or solid state. It happens where the temperature of an air falls below dew point condensation occurs

*Notes*

near the ground as dew, mist of fog and at higher levels of clouds.

- Falling down of atmospheric moisture is called precipitation. Drizzle, rainfall, snowfall, sleet and hail are various forms of precipitation.
- There are three ways in which rainfall occurs - convectional, orographic and cyclonic.
- The spatial distribution of precipitation is not uniform all over the world. The landmass receives less rainfall than oceans.

## TERMINAL QUESTIONS

1. Explain the importance of water vapour in the atmosphere.
2. Define, humidity
3. On which factors does evaporation and its rate depend?
4. When and how does condensation take place?
5. Explain forms of condensation.
6. Condensation begins only after saturation of air elaborate this statement.
7. Distinguish between each of the following -
8. "With changes in temperature relative humidity also changes". Explain the statement.

9 Describe any five factors affecting rainfall distribution.

## ANSWERS TO INTEXT QUESTIONS

**8.1**

1. (a) humidity (b) dew point
   (c) 100 percent
2. (a) Absolute humidity
   (b) Saturated air (c) humidity
   (d) dew point (e) specific humidity

*Notes*

**8.2**

1. (a) Evaporation (b) Latent heat
   (c) Condensation (d) Nuclear
2. (i) Radiation fog
   (ii) Advection fog
   (iii) Frontal fog
3. (i) Accessibility
   (ii) Temperature
   (iii) Air moisture
   (iv) Wind
   (v) Cloud cover (any three)

**8.3**

1. (a) condensation
   (b) less rainfall
   (c) cyclonic rainfall
   (d) drizzle
2. (a) Drizzle
   (b) Rain
   (c) Snowfall
   (d) Sleet
   (e) Hail

3 (a) Convectional
(b) Orographic or Relief rainfall
(c) Frontal or cyclonic rainfall