11. ATMOSPHERE: COMPOSITION & STRUCTURE

Atmosphere

- The atmoshpere is a thick gaseous envelope which surrounds the earth from all sides.
- Atmosphere is attached to the earth's surface by gravitational force.
- It filters the incoming solar radiation.
- Its prevents the ultraviolet rays to reach the earth's surface.
- It also prevents the earth from becoming too hot.
- The atmosphere allows the short wave insolation to pass through.
- It becomes opaque for the outgoing long wave terrestrial radiation.
- In this way, it acts as a huge greenhouse.
- Atmosphere maintains an average **15°C** temperature on the earth surface.
- This optimum temperature is very essential for the development and sustenance of life on the earth.

Insolation and Temperature

- The sun is 1.3 million times bigger than the Earth.
- Sun is on an average 150 million km. away from Earth.
- The sun's rays cover this distance with a velocity of **0.3 million km. per seond**.
- The temperatre of the sun's surface is 6000°C
- The sun is radiating its energy continuously in the space, this is called solar radiation.
- This solar radiation reaches the earth surface in the form of short wave.
- The earth receives only 0.0005% i.e. 2 billionth part of the solar radiation.
- The incoming solar radiation on the surface of the earth is called INSOLATION.
- This part of the insolation is responsible for the average 15°C temperature found on the earth's surface.

Hotest Place

- The Al-Azizia region of Libya is the hotest place on the earth.
- It's maximum temperature is 58°C.

Coldest place

- Vostak in Antarctica is the coldest place on the earth.
- It's minimum temperature is –87.5°C.

Isotherm

- Isotherms are the inaginary lines joining the places of equal temperature.
- The horizontal distribution of temperature on the earth surface is represented with the help of isotherm.

Composition of the Atmosphere

- The atmosphere is composed of gases, water vapour and particulates.
- Nitrogen is in the highest amount Among the all gases.
- After the Nitrogen Oxygen , Argon, Carbon dioxide, Neon, Helium, Ozone, hydrozen etc. are in the order.
- Besides these gases, water vapour, dust particles and other particulates are also present in varying amounts.
- Water vapour, dust particles and ozone are very important for the climatic conditions of the world.

Order of gases in the Atomosphere–

Nitrogen–

- It's part in Atmosphere is aprrox 78%.
- It is in large scale within atmosphere.
- Among the atmospheric gases, it is the most important gas.
- It is fixed by the leguminous plants into nitrogenous nutrients.

Oxygen–

- It's part in the atomsphere is approx 21%.
- It's in second place in all gases.
- This is the life-giving gas to the humans and animals.
- Green plants produce it during the process of photosynthesis.

Argon–

- It's percentage is approx 0.93%.
- This is a noble gas.
- Besides it, the other noble gases present in the atmospher are- Helium, Neon, Krypton, Xenon, radon, etc.

- These gases are present in traces.

Carbon dioxide–

- It's percentage is atomospher is 0.03%.
- This is a heavy gas.
- It is permeable for the incoming solar radiation.
- It's opaque for the outgoing terrestrial radiations.
- In this way, by trapping the heat it works as a greenhouse gas.
- It 's increasing amount raises the overall temperature of the earth atmosphere.
- Its total amount was 150 million liters. before the onset of the Industrial Revolution.
- Presently, its amount is 250 million liters.
- It is estimated to be 350 million liters in 50 years from now.
- An International consensus is made to bring down its level by the kyoto protocol (1997).

Ozone–

- Jet planes also degrade this layer by emitting Nox.
- It is present in very less amount in the atmosphere.
- It is an important constituent of the atmosphere.
- It acts as a filer and absorbs the harmful ultraviolet rays.
- If Ultraviolet rays reach the earth's surface, they may cause skin cancer and other diseases.
- A layer of this gas is found at the lower part of the stratosphere.
- The nitrogen oxide, released by the Jet planes and chlorofluorocarbons (CFSs), hydrofluorocarbons (HFCs) used and released by the air conditioners, refrigerators, etc. are very harmful to this layer.
- Montreal Protocol (1987) Was agreed upon to save the ozone layer from depletion.

Water vapour–

- The water vapour content in the atmosphere ranges between 0-4% by volume.
- The water vapour content of the atmosphere decreases from the equator towards the poles, due to decreasing temperature.
- The amount of water vapour decreases with increasing height also.
- The half of total vapour at 2000 mts.
- In polar and desert region, max,vapour is 1%

Structure of the Atmosphere-

- Though the upper limit of the atmosphere is unknown.
- It is considered to be 10,000 km. from the sea-level.
- On the basis of the characteristics of temperature and air pressure, there are five layers from the earth's surface upwards-
  1. Tropospher
  2. Stratosphere
  3. Mesosphere
  4. Ionoshphere
  5. Exosphere

1. Troposphere–

- It is the lower most and the most important layer of the atmosphere.
- In this layer, temperature decreases with increasing height at the rate of 1°C/165 m. or 6.5°C/1000 m.
- The heigh speed winds of this layer is known as jet winds.
- As almost all the weather phenomena occur in this layer.
- The average height of the troposphere is about 16-18 km. over the equator and 6-8 km. over the poles.
- This rate of decreases in temperature is called Normal lapse rate.
- The transition layer between troposphere & stratosphere is tropopause.

2. Stratosphere–

- It is the second layer from the Earth.
- It's height is approx 50 km from the troposphere.
- Temperature ramains stable at the beginning of this layer.
- Ozone layer presents In this layer.
- Ozone layer absorbs the ultraviolet radiations.
- This layer of the atmosphere is almost free from the weather disturbances.
- Hence it is preferred by the pilots to fly their aeroplanes.

3. Mesosphere–

- It is Third layer from the Earth
- This layer extends between 50 km and 80 km.
- In this layer temperature again decreases with inreasing height.

- In this layer temperature reaches upto - 100°C
- It is the minimum temperature of the atmosphere.

4. Ionosphere–

- It is the fourth layer from the earth.
- It extends from 80 km to 640 km.
- Electrically charged or ionised particles are abundantly found in this layer.
- Temperatures increases with increasing height.
- This layer reflects back the radio waves.
- There are number of ionic layers in this sphere.
- The phenomenon of Aurora borialis & Aurora Australis occures in this layer.

5. Exosphere–

- It is the last layer of atmosphere
- It represents the upper most layers of the atmosphere.
- It extends beyond 640 km of height from the sea level.
- It ultimately merges with the space beyond the height of 1000 km.