



Atmosphere

- The envelope of air that completely surrounds the earth is known as atmosphere.
- The atmosphere extends to about 1000 km from the surface of the earth. But 99% of the total mass of the atmosphere is found within 32 km.
- This is because the atmosphere is held by the gravitational pull of the earth.

Composition of the Atmosphere

(i) Nitrogen - 78% (ii) Oxygen - 21% (iii) Argon - 0.93% (iv) Carbon dioxide - 0.03% (v) Neon - 0.0018% (vi) Helium - 0.0005% (vii) Ozone - 0.0006% (viii) Hydrogen - 0.00005%

- **Carbon dioxide** is present in small quantity in the atmosphere.
- It is an important constituent of air because it has the ability to absorb heat and thus keep the atmosphere warm, thereby, balancing the heat of the earth.
- **Water Vapour** is the most significant component of the atmosphere as far as its effect on weather is concerned although its quantity varies considerably from practically none (0) to up to about 4% by volume.
- Water Vapour is the source of all clouds and precipitation (rain, hail storm etc.). Water vapour, like carbon dioxide, has the ability to absorb heat energy. It also reflects incoming insolation.
- **Dust** intercepts and reflects incoming insolation.
- The polluted particles present in the air not only absorb a larger amount of insolation but also greatly absorb the terrestrial radiation.
- Dust in the atmosphere contributes to the red and orange colour of sunrise and sunset.

Layers of the Atmosphere

There are five distinct layers of the atmosphere - (a) Troposphere (b) Stratosphere (c) Mesosphere (d) Thermosphere and (e) Exosphere

Troposphere

- This is the **first layer** of the atmosphere. It extends to a height of **18 km at the equator** and **8 km at the poles**.
- In this layer temperature decreases with height. This is due to the fact that the density of air decreases with height and so the heat absorbed is less. It contains more than 90% of gases in the atmosphere.
- Since most of the water vapour forms clouds in this layer, all weather changes occur in the troposphere ("tropo" means "change").



- The height at which the temperature stops decreasing is called **tropopause**. Here the temperature may be as low as -58 degree Celsius.

Stratosphere

- This is the **second layer** of the atmosphere. It extends from the tropopause to about **50 km**.
- Temperature increases due to the absorption of the **ultraviolet radiations** of the Sun by **Ozone** present in this layer. The temperature slowly increases to **4 degree celsius**.
- This layer is free from clouds and associated weather phenomena. Hence, it provides ideal flying conditions for large jet planes.
- At about 50 km the temperature begins to fall again. This marks the end of the stratosphere. The end of the stratosphere is called the **Stratopause**.

Mesosphere

- Above the stratosphere lies the Mesosphere.
- The mesosphere extends to a height of 80 km.
- Here the temperature decreases again, falling as low as -90 degree celsius.
- The end of this layer is known as the **mesopause**.

Thermosphere

- The thermosphere lies above the mesosphere.
- This layer extends to a height of about **640 km**.
- In this layer temperature rises dramatically, reaching upto **1480 degree celsius**.
- This increase in temperature is due to the fact that the gas molecules in this layer absorb the **X-rays and Ultraviolet radiation** of the Sun.
- This results in the break up of the gas molecules into **positively and negatively charged particles or ions**. Thus, this layer is also known as the **ionosphere**.
- The electrically charged gas molecules of the thermosphere reflect radio waves from the Earth back into the space. Thus, this layer also helps in long distance communication.
- The thermosphere also protects us from meteors and obsolete satellite because its high Temperature burns up nearly all the debris coming towards the Earth.

Exosphere

- This layer lies above the thermosphere.
- The exosphere extends beyond the thermosphere upto **960km**.
- It gradually merges with interplanetary space.
- The temperatures in this layer range from about **300 degree Celsius to 1650 degree Celsius**.

- This layer contains only traces of gases like oxygen, nitrogen, argon and helium because the lack of gravity allows the gas molecules to escape easily into space.