Atmosphere

Atmosphere

- The envelope of air that completely surrounds the earth is known as atmosphere.
- 99% of the total mass of the atmosphere is found within 32 km because the atmosphere is held by the gravitational pull of the earth.

Composition of the Atmosphere

1. Nitrogen	78%
2. Oxygen	20.95%
3. Argon	0.93%
4. Carbon dioxide	0.04%
5. Neon	0.0018%
6. Helium	0.0005%
7. Ozone	0.0006%
8. Hydrogen	0.00005%

- Atmosphere is an important constituent of air because it has the ability to absorb heat that keep the atmosphere warm.
- **Water vapour** is very important component of the atmosphere. its quantity varies considerably from practically none to up to about 4% by volume.
- Water vapour is the source of rain, hail storm etc. Water vapour has the ability to absorb heat energy. It also regulates the hydrological cycle.
- **Dust** intercepts and reflect incoming insolation.
- The polluted particles present in the air not only absorb larger amount of insolation but also greatly absorb the terrestrial radiation.

Layers of the Atmosphere:

1) Troposphere

- According to Encyclopedia Britanica, it extends to a height of **18 at the equator and 8 km at the poles.**
- In Troposphere 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 form 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°C.**

2) Stratosphere

- This the **second layer** of the atmosphere. the distance between tropopause and stratosphere is **50 km.**
- Temperature increases due to the absorption of the **ultraviolet radiation** of the Sun by **ozone** present in this layer. The temperature slowly increases to **4°C.**
- This layer is free from clouds and associated weather phenomena. It provides ideal flying conditions for large jet planes.
- the temperature begins to fall again at 50 km. This marks the end of the stratosphere. The end of the stratosphere is called the **stratopause.**

3) Mesosphere

- Above the stratosphere lies the mesosphere.
- It extends to a height of **80 km.**
- the temperature decreases again, falling as low as - **90°C.**
- The end of Mesosphere is known as the **mesopause.**

4) Thermosphere

- The thermosphere lies above the mesosphere.
- According to NASA, Thermosphere extends to a height of about **513 km.**
- In thermosphere temperature rises dramatically, reaching up to **4500°F or 2482.22°C**.
- 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 breakup 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 space. Thus, this layer also helps in long distance communications.
- The thermosphere also protects us from meteors and obsolete satellites, because its high temperature burns up nearly all the debris coming towards the Earth.

5) Exosphere

- This is the outermost layer of our atmosphere, which lies above the thermosphere.
- The exosphere extends beyond the thermosphere up to **960 km.**
- It gradually merges with interplanetary space.
- The temperatures in this layer range from about **300°C to 1650°C.**
- 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.

How the Sun Creates Energy

- **Hydrogen** and **helium** are the predominant gases that constitute the **Sun**. The proportion of hydrogen to helium is 3:1.
- The core of the Sun acts like a gigantic nuclear reactor and converts huge quantity of hydrogen into helium. In this process of **nuclear fusion**, the Sun releases tremendous amount of energy in all directions.
- The Sun radiates energy (both heat and light) in all directions.
- Because of its small size in relation to the Sun, the Earth intercepts only a small part of the Sun's radiant energy.
- Solar radiations are the primary source of heat and light to the Earth.

Insolation

- The incoming solar radiation (energy intercepted by the Earth) is known as **insolation** and it is received in the form of short waves.

Terrestrial Radiation

- The Sun's energy absorbed by the Earth's surface when radiated out into space is called **terrestrial radiation**. It is long - wave electromagnetic radiation originating from Earth and its atmosphere.
- It is the radiation emitted by naturally radioactive materials on Earth including uranium, thorium and radon.

Weather and Climate

- **Weather** is the description of the atmospheric conditions of a particular place at a particular time for a short period of time.
- **Climate** is the composite or integrated picture of the weather conditions over a long period of time.
- **Climatic data** is based on calculated averages of data recorded over a period of 35 years. The classical period is 30 years, as defined by WMO.

Humidity

It refers to the content of water vapour present in the air. Though its amount in the atmosphere is as low as 4% in the volume, yet it plays very important role in the determination of weather and climate of a place.

Humidity Capacity: The capacity of an air of certain volume at certain temperature to retain maximum amount of moisture content.

Saturated Air: The air having moisture content equal to its humidity capacity.

Dew Point: The temperature at which the air becomes saturated is called Dew Point.

Atmospheric Pressure

- Atmospheric pressure is the pressure at any point on the surface of the Earth due to the weight of the column of air above that point.
- **Standard sea level pressure is 76 cm or 29.92 inches** on this scale.
- In drawing weather charts **milli bars (mb) is also used** by meteorologists.
- One bar is divided into 1000 millibars. Millibars are now known as **hectopascals.**

Pressure Measuring Instruments
1. Mercurial Barometer (or Fortin's Barometer)
2. Aneroid Barometer
3. Altimeter or Altitude Barometer
4. Barograph (automatic recording Aneroid Barometer)
5. Micro barometer