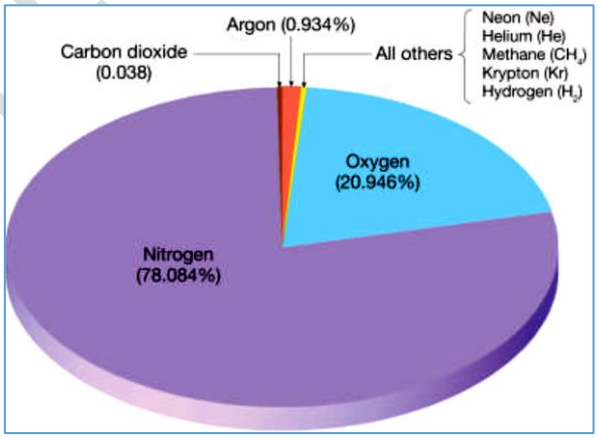
CH-7 –COMPOSITION AND STRUCTURE OF ATMOSPHERE

Key Information

- 99 per cent of the total mass of the atmosphere is confined to the height of 32 km from the earth's surface.
- Oxygen is almost in negligible quantity at the height of 120 km.
- Carbon dioxide and water vapour are found only up to 90 km.
- Water vapours allow the earth neither to become too cold nor too hot.
- Water vapours is responsible for the stability and instability of the air.
- Dust particles act as hygroscopic nuclei around which water vapour condenses to produce clouds.
- Ozone absorbs harmful UV radiation.
- Carbon dioxide is responsible for the greenhouse effect.
- All changes in climate and weather take place in Troposphere layer.
- Radio waves transmitted from the earth are reflected back to the earth by Ionosphere layer
- Stratosphere contains the ozone layer.
- Weather - is what you see outside the window today.
- Climate – is what you expect to see outside on any day based on records of past weather.

COMPOSITION OF THE ATMOSPHERE

- The proportion of gases changes in the higher layers of the atmosphere.
- Major components of clean, dry air include: Nitrogen (N2) - 78%; Oxygen (O2) - 21%; Argon and other gases < 1%. Variable components of air include:
- **1. Water vapour** – up to 4% of air's volume, it decreases with altitude and from the equator towards the poles, absorbs heat energy from Earth allowing the earth neither to become too cold nor too hot. The stability and instability in the air depend on it.

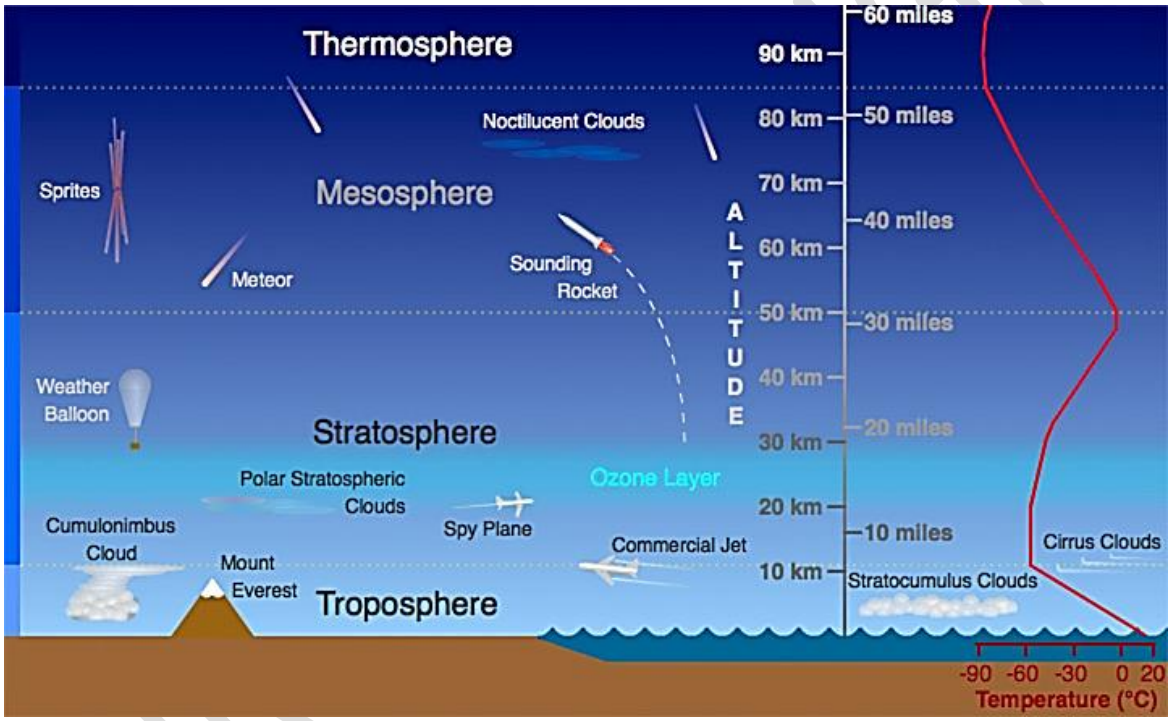


- **2. Dust Particles (Aerosols**) - tiny solid particles of sea salts, fine soil, smoke-soot, ash, pollen, dust and meteors, act as hygroscopic nuclei around which water vapour condenses to produce clouds, reflects sunlight, gives colour to sunrises and sunsets, mostly in the lower layers of the atmosphere and in subtropical and temperate regions due to dry winds.
- **3. Ozone** – molecules composed of three atoms of oxygen (O3) concentrated between 10 and 50 km above the surface where it absorbs harmful UV radiation.
- **4. Carbon dioxide** – absorbs a part of terrestrial radiation and is largely responsible for the greenhouse effect. Its volume has been rising in the past few decades mainly because of the burning of fossil fuels.

STRUCTURE OF THE ATMOSPHERE

Atmospheric layers based on temperature include:

1. Troposphere – the bottom layer (at Earth's surface) is the most important layer for all biological activity.
    a. T° decreases with altitude (environmental lapse rate) at 6.5°C per km
    b. Thickness varies—average height is about 13 km and extends roughly to a height of 8 km near the poles and about 18 km at the equator, Thickness of the troposphere is greatest at the equator because heat is transported to great heights by strong convectional currents. This layer contains dust particles and water vapour.
2. Stratosphere – layer above the troposphere
    a. About 13 km to 50 km above Earth's surface. T° increases with altitude. Outer boundary is named the stratopause. It contains the ozone layer which absorbs ultra-violet radiation.
3. Mesosphere – layer above the stratosphere



    a. About 50 km to 80 km above Earth's surface. T° decreases with altitude and reaches up to minus 100°C. Outer boundary is named the mesopause.
4. Thermosphere (Ionosphere) – layer above the mesosphere
    a. About 80 and 400 km above Earth's surface. Contains electrically charged particles known as ions. Radio waves are reflected by this layer. T° increases with altitude due to gas atoms moving at high speeds.
5. Exosphere – The uppermost layer of the atmosphere above the thermosphere
    a. This is the highest layer but very little is known about it and it gradually merges with the outer space.

Elements of Weather and climate

Elements of weather and climate are the properties regularly measured including: temperature; humidity; cloudiness; precipitation; air pressure; wind speed and direction.