ForumIAS

GS Foundation 2024

Atmosphere and its composition

Batch D10 - #GEO009

The atmosphere is a thick gaseous envelope which surrounds the earth from all sides and is attached to the earth's surface by gravitational force

Constituents

1. Gases
2. Water vapour
3. Particulate Matter

1. Gases

Nitrogen (78%) and oxygen (21%)
argon (0.93%), carbon
Nitrogen - generally chemically inactive
Co2- GHG
dioxide (0.03%)

2. **Water Vapour**- ranges between zero and 5 per cent by volume.

Climatically important.

1. source - **evaporation** of moisture
2. **Vapour depends on temperature** –> decreases from the equator poleward.
3. The content of vapour **decreases upward**. >**90 per cent** of the total atmospheric vapour is found upto the h**eight of 5 km.**
4. Can absorb both short waves and long waves transmissions
    - **Less transparent for outgoing long wave** terrestrial radiation –> **warms surface and lower portion** of the atmosphere

3. **Particulate Matter–**

The **solid particles** present in the atmosphere include dust particles, salt particles, , smoke and soot. volcanic ashes etc.

- Remains in suspension
- Associated with **Scattering** - blue colour of sky
- Acts as **hygroscopic nuclei**
- **Precipitation**

Classification

1. **Temperature and air pressure**

(1) troposphere, (2) stratosphere, (3) mesosphere, and (4) thermosphere

(1) Troposphere

The **lowermost layer**

almost all of the weather phenomena (e.g. fog, cloud, dew, frost, rainfall etc

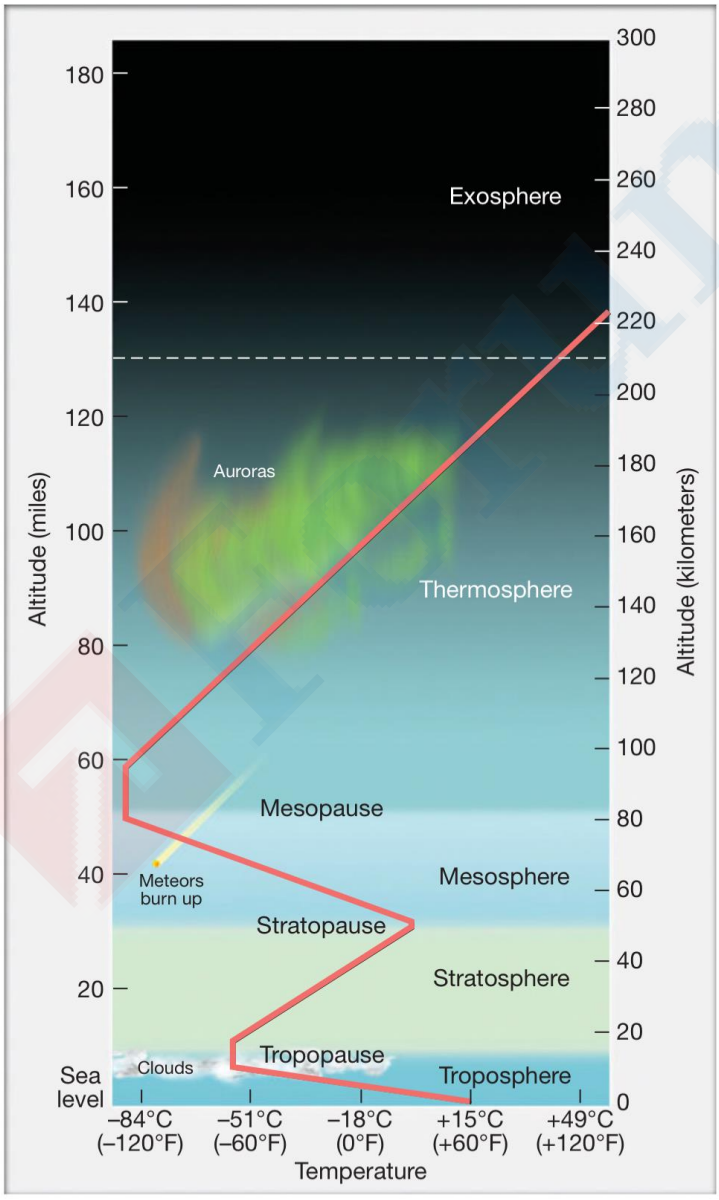
Temperature decreases with increasing height at the rate of 6.5°C per 1000mtr. **Normal lapse rate.**

There is **seasonal and regional variation** in the height of troposphere

- Height of troposphere changes from equator towards the poles (decreases) and from one season of a year to other season (increases during summer while It decreases during winter).

The **average height** -16 km over the equator and 6 km over the poles.

The upper limit - **tropopause** which is abort 1.5 km thick.



Temperature -in tropopause **Lowest over the equator (-70°C)** and is relatively high over the poles.

2. **Stratosphere.**
   upper limit of the stratosphere **50 km.**

M**ore or less devoid of major weather** except- **feeble winds and cirrus cloud**

Ozonosphere height of 15 km to 35 km from sea level
Absorbs almost all of the ultraviolet rays of solar radiation and thus protects the earth's surface from becoming too hot.

Temperature inversion due to ozone

- The main culprits of ozone destruction are **halogenated** gases called chlorofluorocarbons, halons and nitrogen oxides.

These synthetic chemicals are widely used as propellants in spray can dispensers, as fluids in air conditioners and refrigerators etc.

3. Mesosphere

Extends between **50 km and 80 km.**
Temperature again decreases with increasing height.
Rise of temperature with increasing height
M**esosphere (80 km) temperature becomes -80°C.**

4. Thermosphere

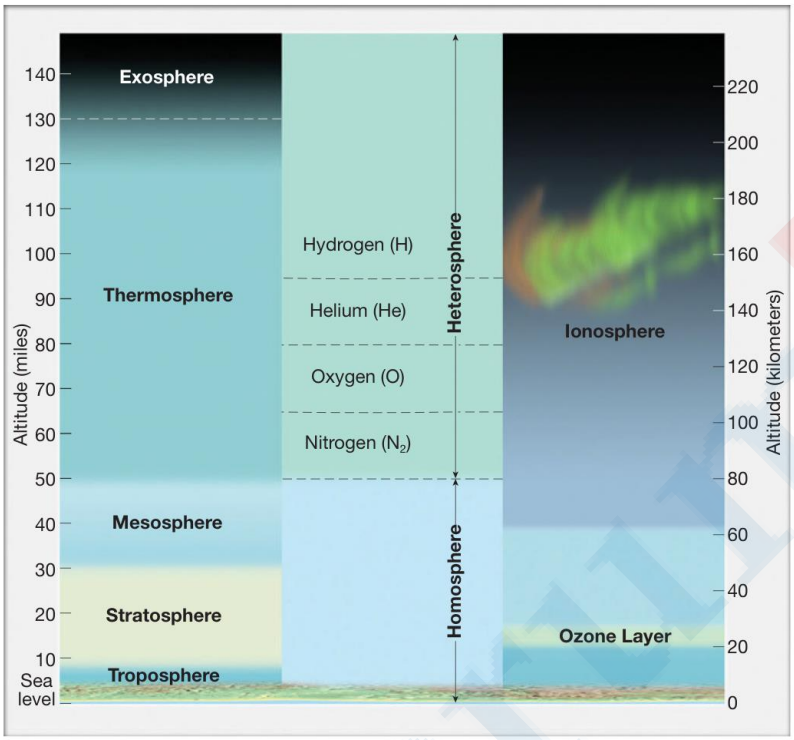
Temperature increases rapidly

Thermosphere is divided into two layers viz.
(i) ionosphere, and (in) exosphere.

Ionosphere extends from 80 km to 640 km.
D layer, E layer, F layer, and G layer.

D layer 60 km - 99 km • Reflects low frequency radio Waves Disappears with the sunset.
E layer- 99 km - 130KM • Reflects the medium and high frequency. • Produced by UV photons + nitrogen and high velocity winds Disappears with the sunset.

F- layer (150 km - 380 km) Reflect medium and high frequency radio waves.
G layer (400 km and above) most probably persists day and night but is not detectable.



(2) Exosphere

- uppermost laver
- beyond 640 km

The density becomes extremely low

Chemical composition

Represents the lower portion of the atmosphere a upto the height of 90 km from sea level.
Homogeneity of the proportion of various gases

Heterosphere 90 km to 10,000 KMs km.
vary in their chemical and physical properties.
four distinct layers