



21CYM101I: ENVIRONMENTAL SCIENCE

M.Tech Sem: 2 ; Batch: 1

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Unit-1

Environmental segments, air and water pollution

(a) Environmental segments:

Environmental segments, Structure of atmosphere, Composition of atmosphere

(b) Air pollution:

Air pollution sources, effects, acid rain, ozone layer depletion and greenhouse effect, and control measures of air pollution

(b) Water pollution Sources:

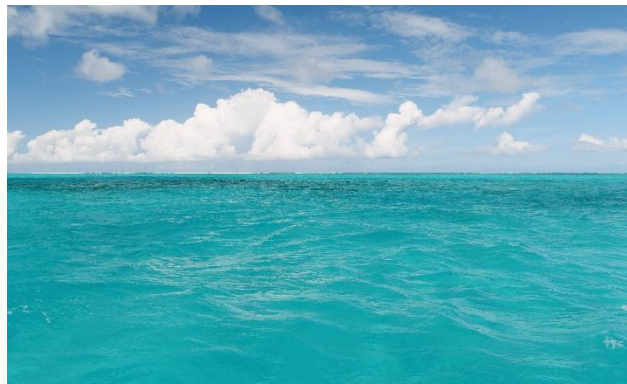
Sources, effects and control measures of water pollution.

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2. Kamaraj. P, Arthanareeswari. M, Environmental Science—Challenges and Changes, 6th ed., Sudhandhira Publications, 2013
3. R.Jeyalakshmi, Principles of Environmental Science, Devi publications, 2nd ed., 2008.
4. Helen P Kavitha, Principles of Environmental Science, Shine Publications and Distributors, 1st Edition, 2013

What is Environment?

➤ **We (Human being) lives in two worlds:** (1) Natural-world (2) Built-world.

(1) 'Natural-world' of plants, animals, air, water, and soil of which human being himself is a part.



Environment

(2) '**Built-world**' of social institutions and artifacts which are created by human being using science and technology, and political organisation.



Definition of Environment...

- Environment is defined as one's surroundings; which includes everything around the organism, i.e, **abiotic (non-living) and biotic (living) environment**.
- Abiotic environment: soil, water, air etc.
- Biotic environment: All other organisms, with which the organism comes into regular contact.
- To an environmental engineer, the word 'environment' may refers to a small localized area in which a specific problem is to be addressed in one hand, or it may take on global dimensions on the other hand.
- The global environment consists of different parts, e.g **atmosphere, hydrosphere, lithosphere, and biosphere**.

Why should we study EVS?

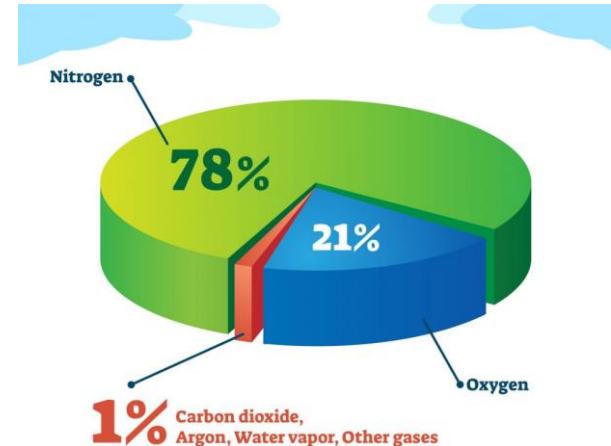
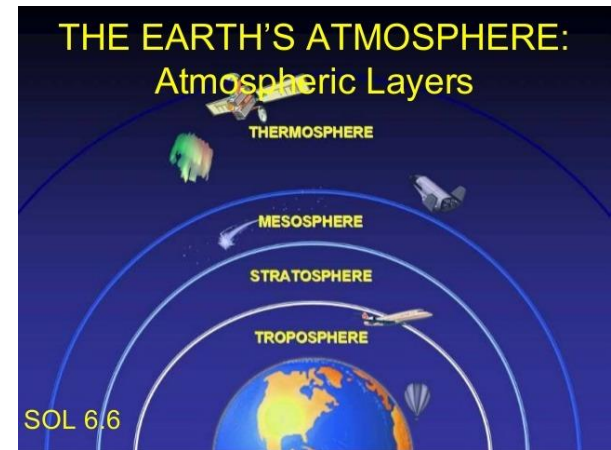
- To gain scientific knowledge/information about four different parts of environment.
- To understand the role and significance of different parts of environment on environment.
- To realize that environmental problems (e.g., global warming, climate change, depletion of ozone layer, acid rains, microplastics) and their negative impact/consequences on environment.
- To know the scientific reasons/causes behind the environmental problems.
- To develop awareness and sensitivity to the total environment and its related problems.
- To be aware on self activities/actions those have bad environmental implications and to gain knowledge to prevent/control further pollution.
- To develop skills for identification and development of solutions to environmental problems.
- To know the way to use and preserve the natural resources,.
- To be aware on the self-role in protecting Mother Nature.
- To motivate people for active participation in environmental protection and improvement.

Segments of Environment

- Environment has four segments (1) atmosphere, (2) hydrosphere, (3) lithosphere, and (4) biosphere.

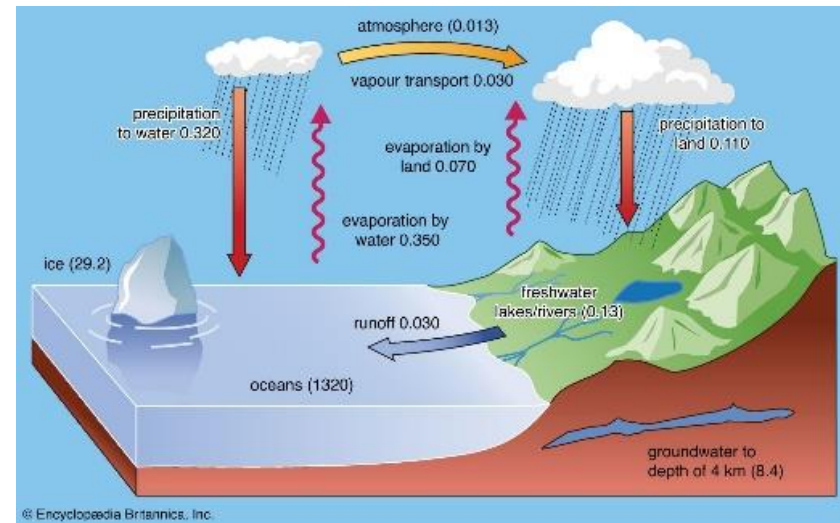
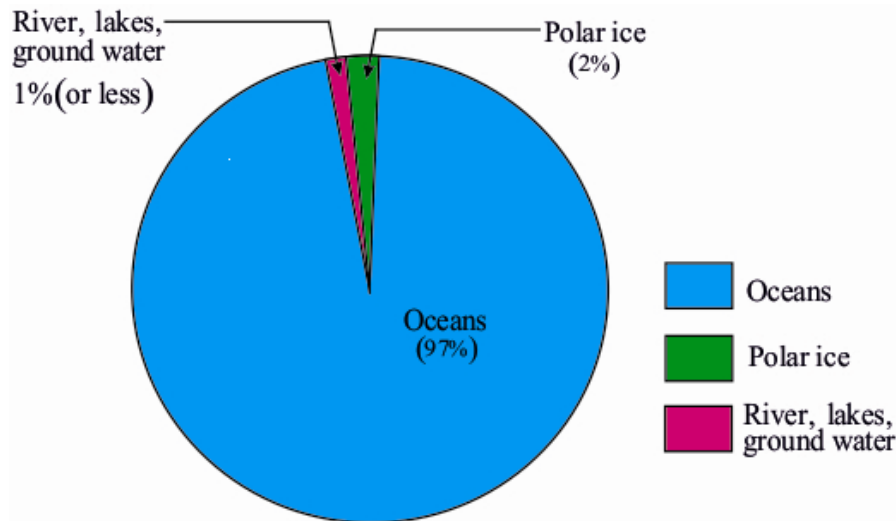
Atmosphere

- The atmosphere is a blanket of gases and suspended liquids and solids that entirely envelops the earth.
- It absorbs most of the cosmic rays from outer space and a major portion of the electromagnetic radiation from the sun.
- It transmits only near ultraviolet, visible and near infrared radiation (300 - 2500 nm) and radiowaves while filtering out harmful ultraviolet radiation below about 300 nm.



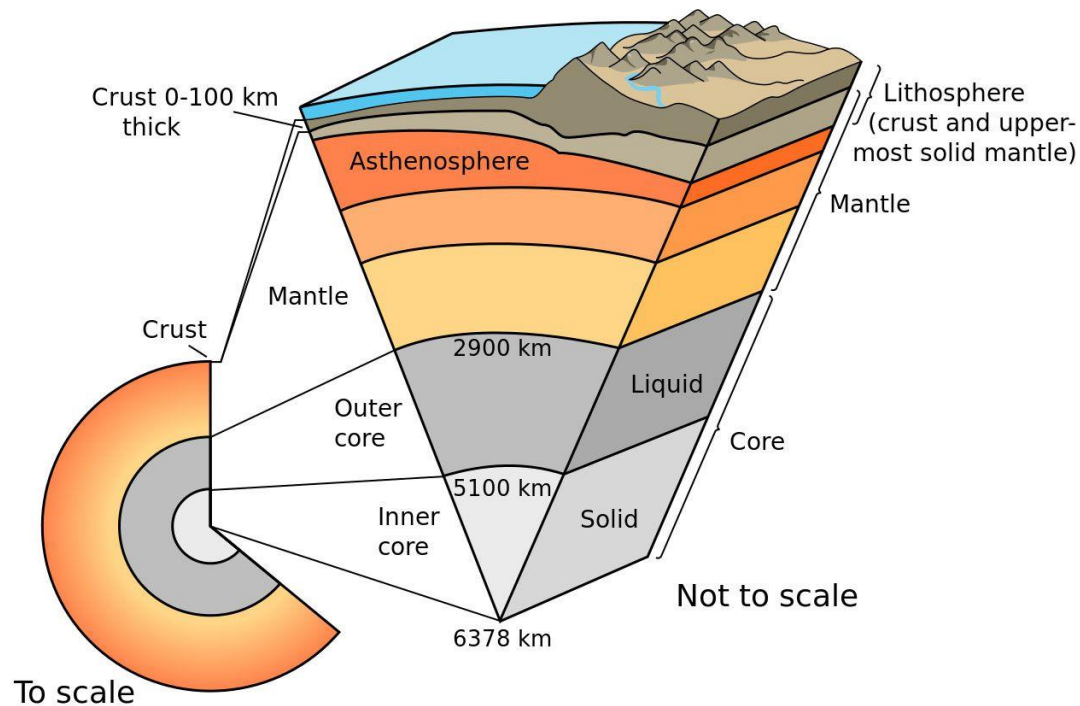
Hydrosphere

- All types of water resources e.g., oceans, seas, rivers, lakes, streams, reservoirs, glaciers, ground water etc. (surface and ground water)



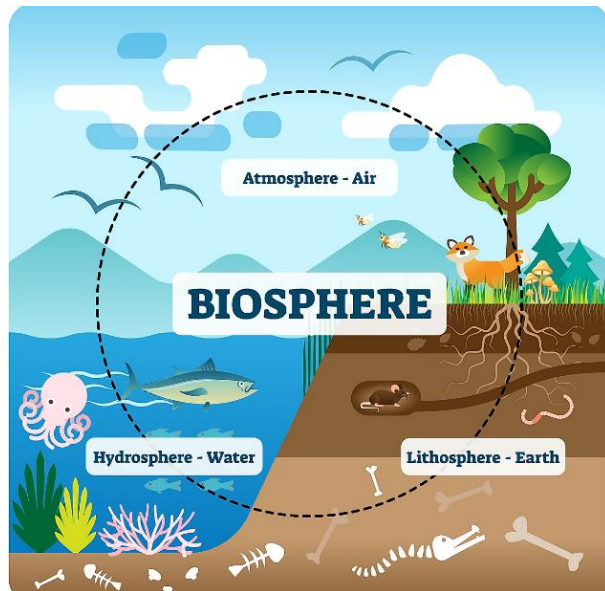
Lithosphere

- This is the outer layer of the solid earth, consisting of minerals occurring in the earth and the soil (organic matter, minerals, air and water).
- The lithosphere covers the crust of the earth and is extended up to 100 km with mantle.

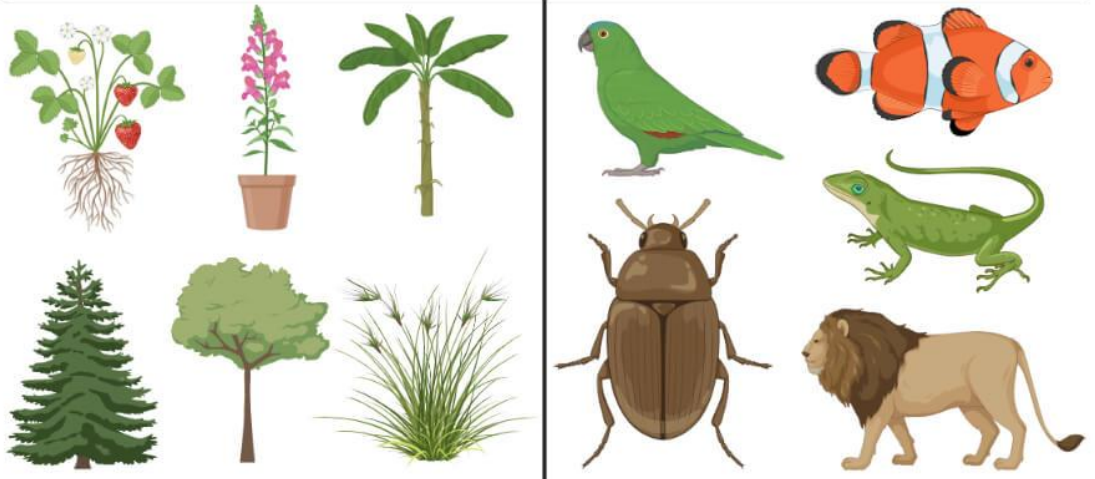


Biosphere

- It includes living organisms and their interactions with the environment e.g, atmosphere, hydrosphere and lithosphere.
- Biosphere is a biological environment where living organisms interact with physical environment, e.g. soil, water and air.



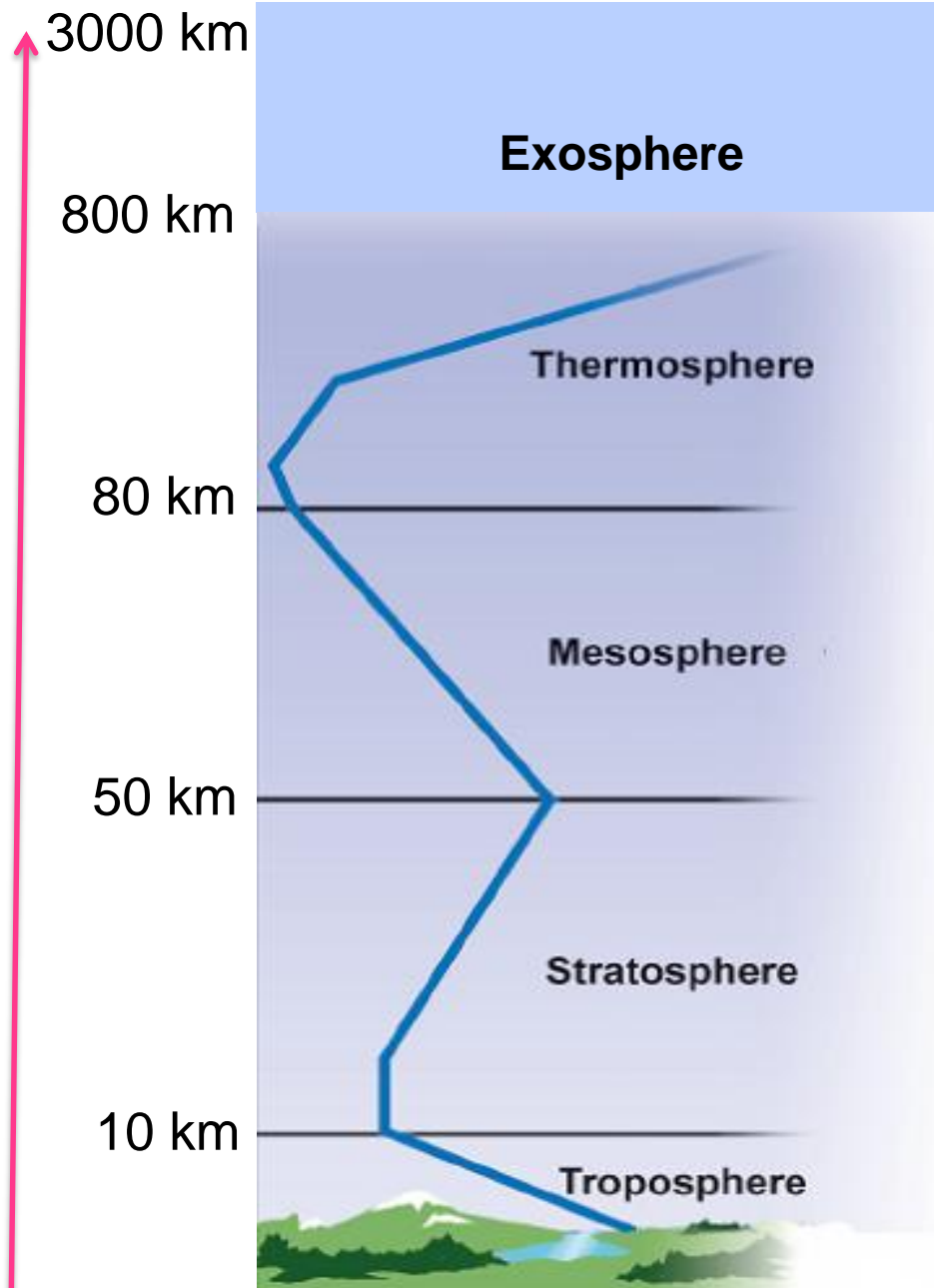
Differences between Flora and Fauna



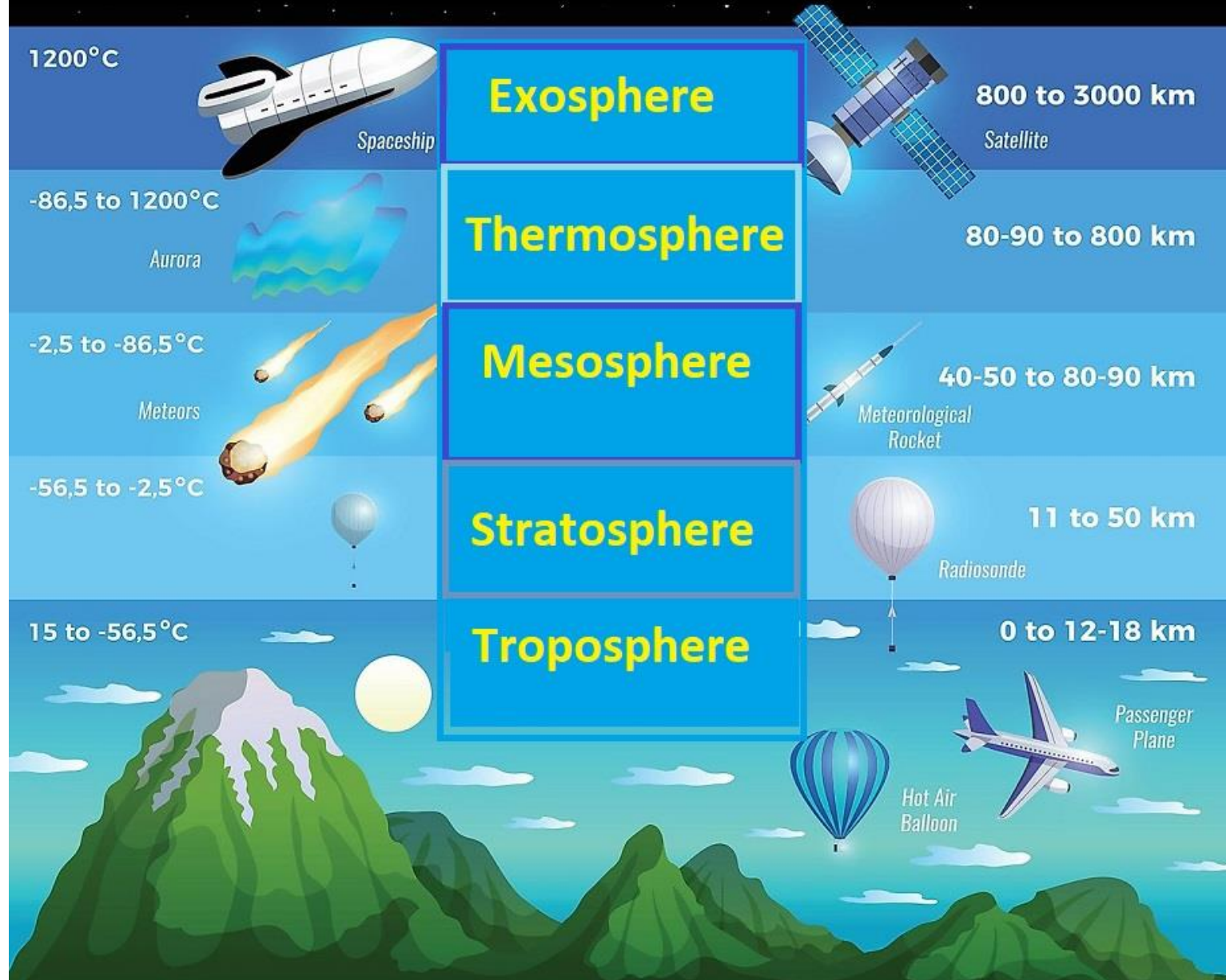
Structure of Atmosphere

The atmosphere has five layers:

- Troposphere (around 0 - 12 km)
- Stratosphere (around 12- 50 km)
- Mesosphere (around 50 - 80 km)
- Thermosphere (around 80 - 800 km)
- Exosphere (around 800 - 3000 km)

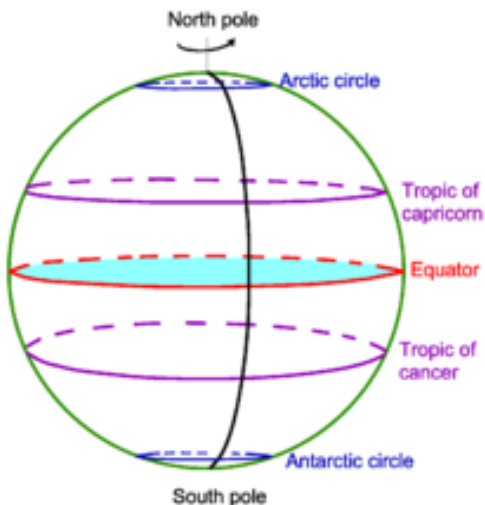


Layers of Earth's Atmosphere



Troposphere

- ✓ It is the lowermost layer of the atmosphere (0-12 km). It contains gases, dust particles and water vapour.
- ✓ The height of this layer is about 18 km on the equator and 8 km on the poles.
- ✓ All kinds of **weather changes** take place only in this layer.
- ✓ The air never remains static in this layer. Therefore this layer is called 'changing sphere' or troposphere.



View of troposphere layer from an airplane's window.

- ✓ The environmental temperature decreases with increasing height of the atmosphere ($6^{\circ}\text{C}/\text{km}$, is called **Normal Lapse Rate**).
- ✓ The zone separating troposphere from the stratosphere is known as **tropopause**.
- ✓ The air temperature at the tropopause is about -80°C over the equator and about -45°C over the poles. The temperature here is nearly constant, and hence it is called **tropopause**.



View of troposphere layer from an airplane's window.

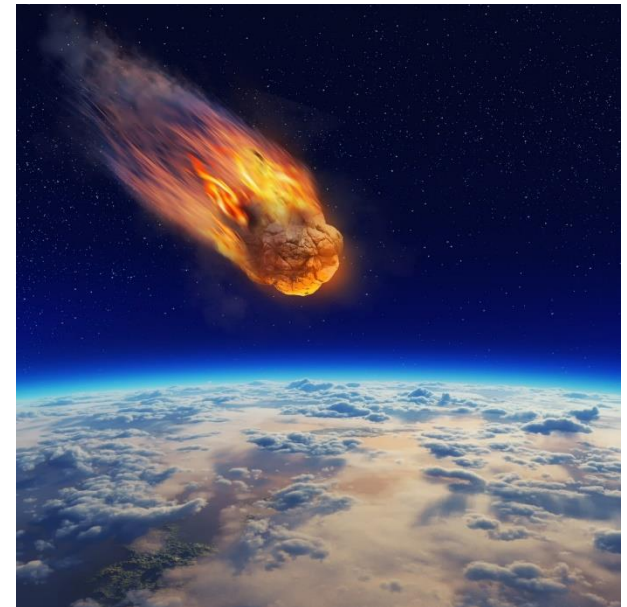
Stratosphere

- It is found just above the troposphere up to 50 km (12 – 50 km).
- The temperature remains almost the same up to the height of 20 km. After this, **the temperature increases slowly** with the increase in the height (due to the presence of ozone gas).
- The air blows horizontally here. Therefore this layer is considered ideal for flying of aircraft.
- The upper limit of the stratosphere is known as stratopause.
- It contains a **layer of ozone gas**, is mainly found from approximately 20 to 30 km above the earth's surface.
- It is the region of the stratosphere that absorbs most of the sun's ultra-violet radiations.



Mesosphere

- It is the third layer of the atmosphere spreading over the stratosphere.
- It extends up to a height of 80 km.
- In this layer, the temperature starts decreasing with increasing altitude and reaches up to $-100\text{ }^{\circ}\text{C}$ at the height of 80 km.
- It is the **coldest layer of atmosphere**
- **Meteors or falling stars** occur in this layer.
- The upper limit of the mesosphere is known as **mesopause**.



Thermosphere

- This layer is located between 80 – 600 (or 800) km above the mesopause.
- Absorbs solar radiation (short wave radiations), breaks the gaseous molecules and produces ions.
- It contains electrically charged particles known as ions, and hence it is known as the **ionosphere**.
- As the density of air is so low in this layer, the energy is not easily transferred; hence the hotness is not felt.
- Radio waves transmitted from the earth are reflected back to the earth by this layer and due to this, **radio broadcasting has become possible**.
- The temperature here starts increasing with heights. (1200 °C).



Exosphere

- The exosphere is the uppermost layer of the atmosphere, above 600 (or 800) - 3000 (or 10000) km.
- Gases are very light in this sphere due to the lack of gravitational force. Therefore, the density of air is very less here.
- **Satellites orbit in this layer.**



Image credit: istockphoto.com/lnok