Layers of the Atmosphere

Vocab

atmosphere

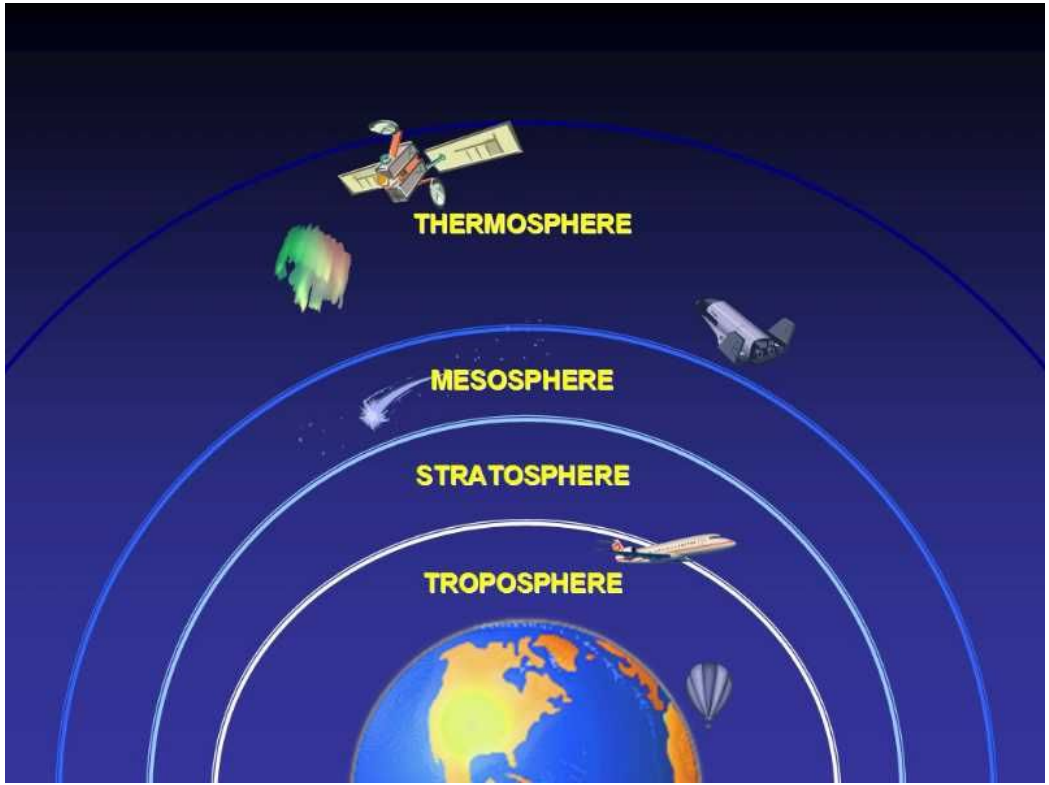
Vocab

ozone


10 to 50 km
STRATOSPHERE
OZONE LAYER
0 to 10 km
TROPOSPHERE
EARTH

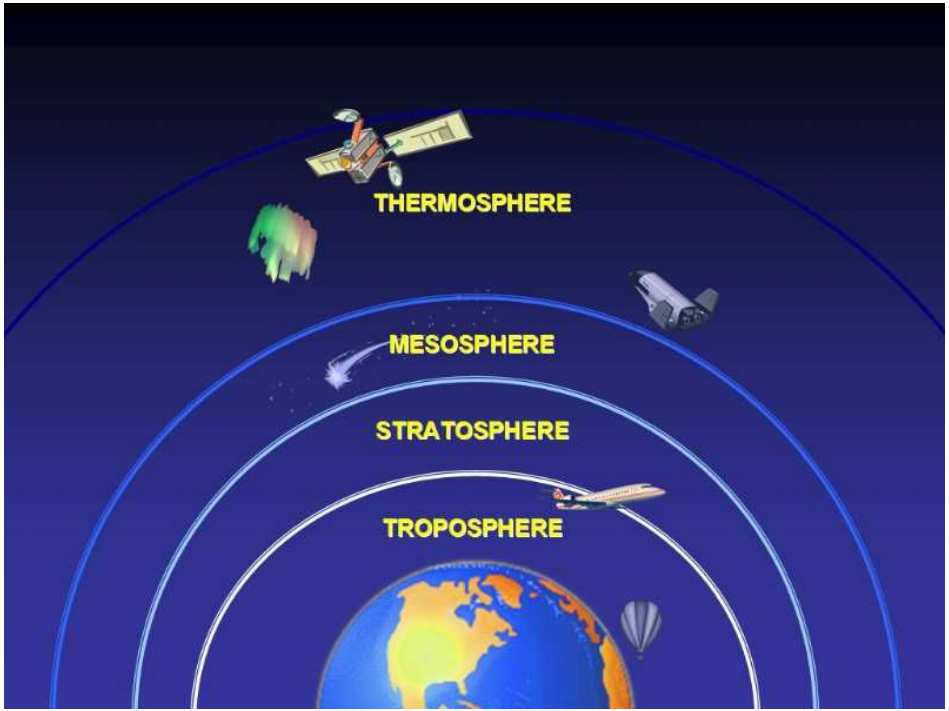
Vocab

troposphere



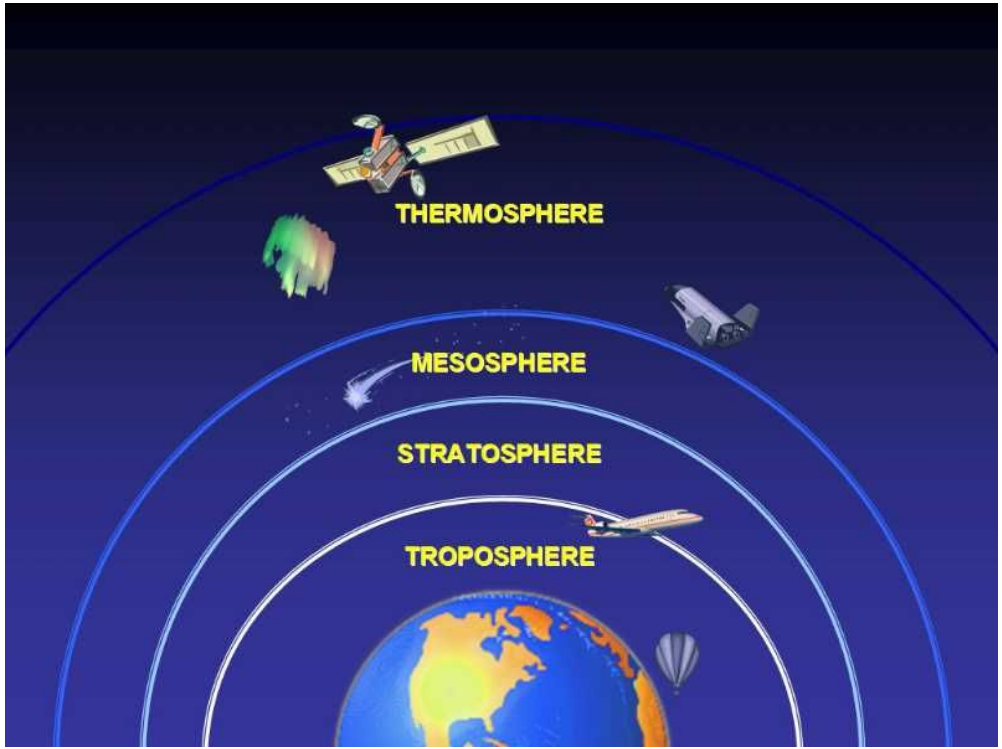
Vocab

stratosphere



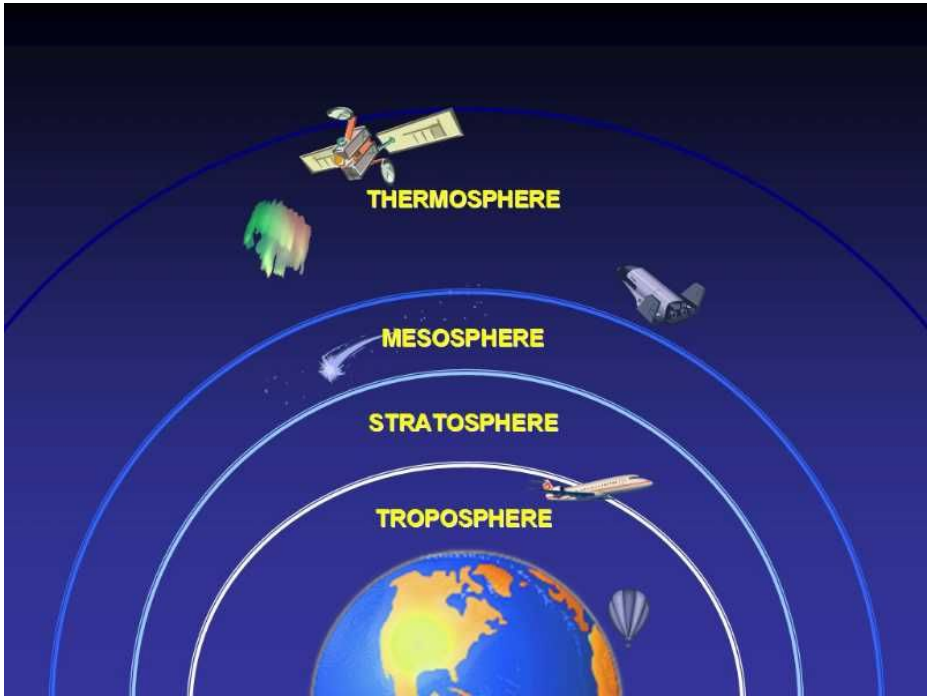
Vocab

mesosphere



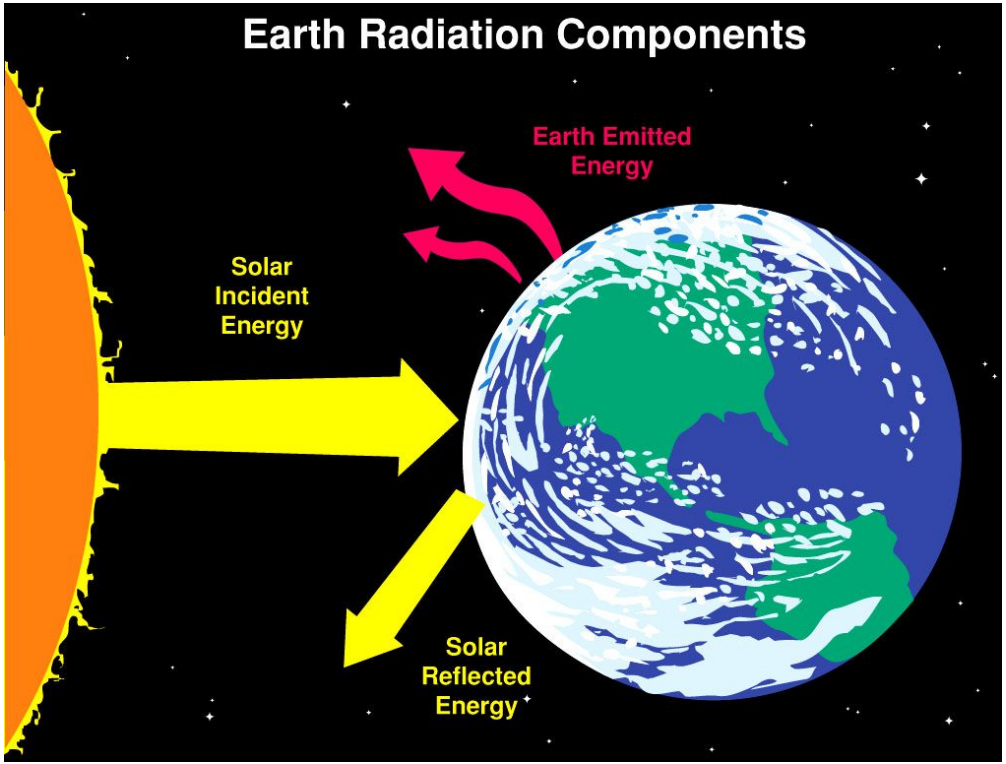
Vocab

thermosphere



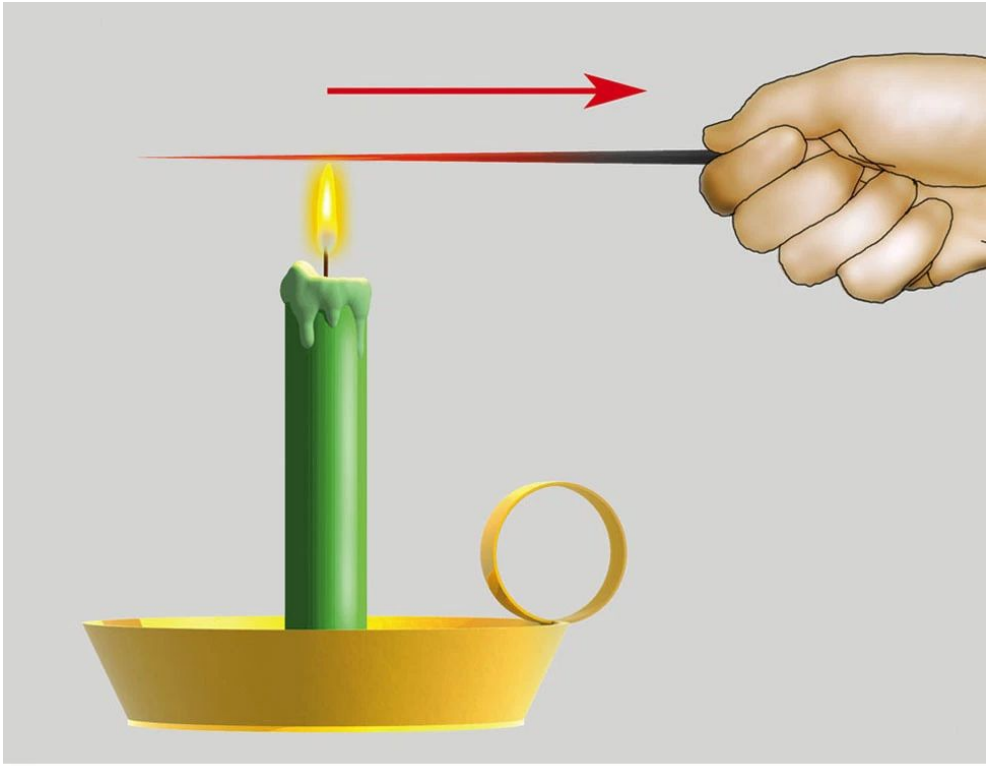
Vocab

radiation



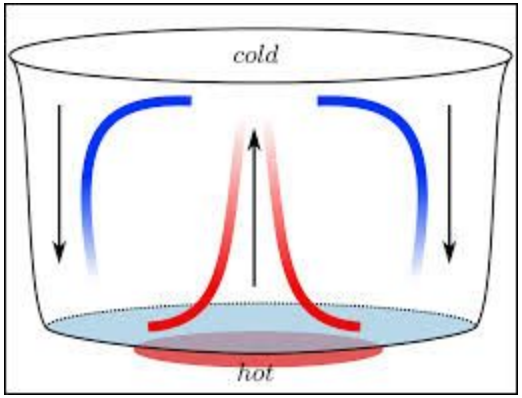
Vocab

conduction



Vocab

convection



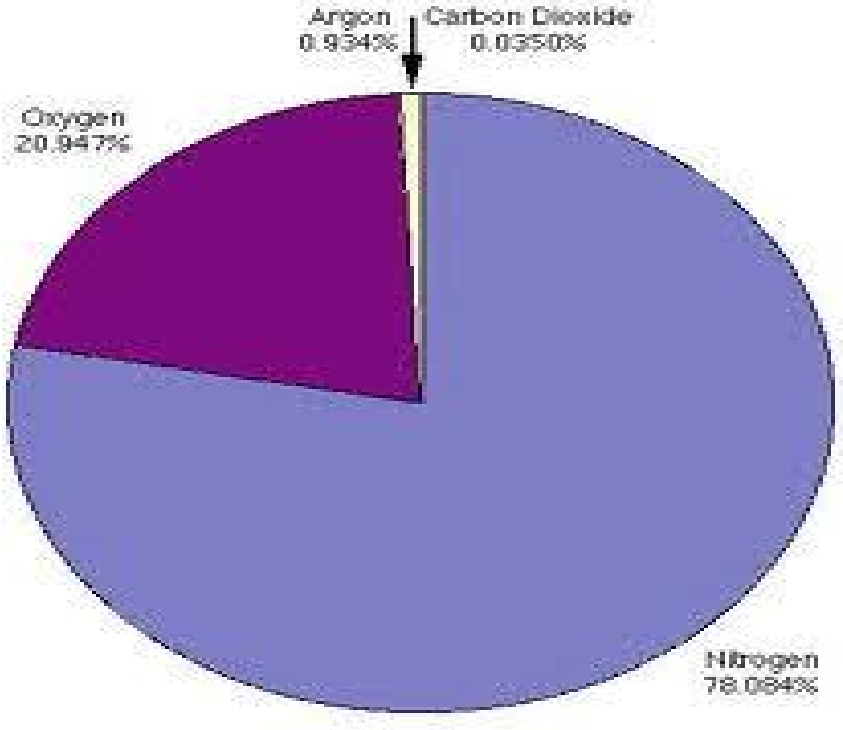
Layers of the Atmosphere

https://www.youtube.com/watch?v=5sg9sCOXFIk

Layers of the Atmosphere

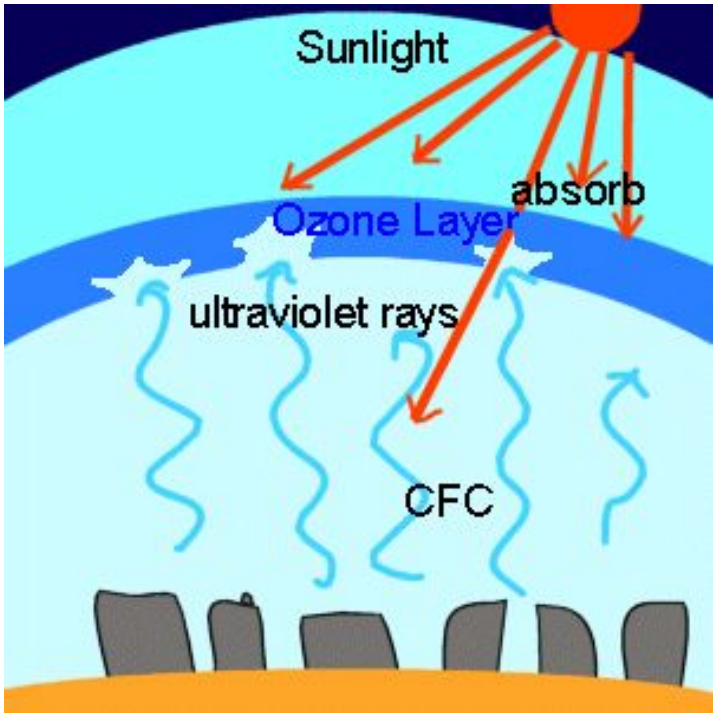
Atmosphere

- The **atmosphere** is the blanket of gases that surrounds the Earth
- The atmosphere contains about:
  - 78% Nitrogen
  - 21% Oxygen
  - 1% other gases such as Argon, Carbon



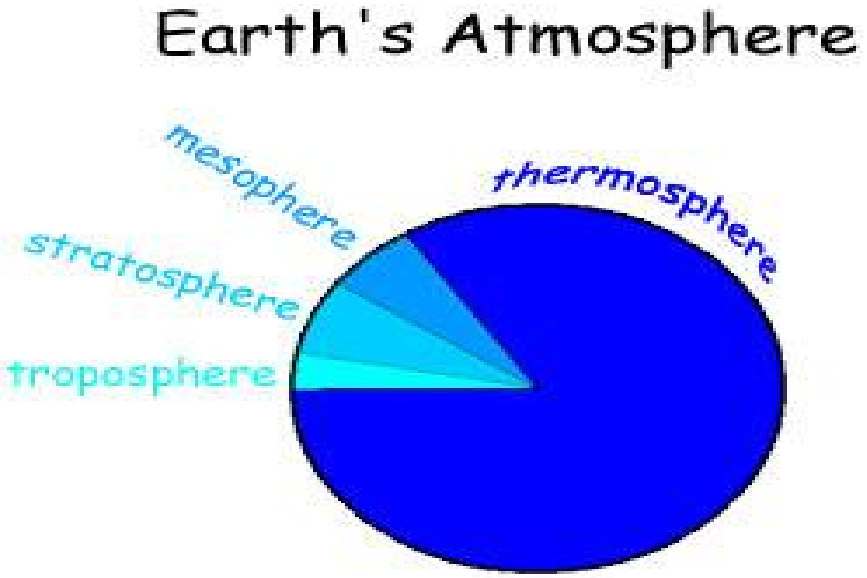
Ozone

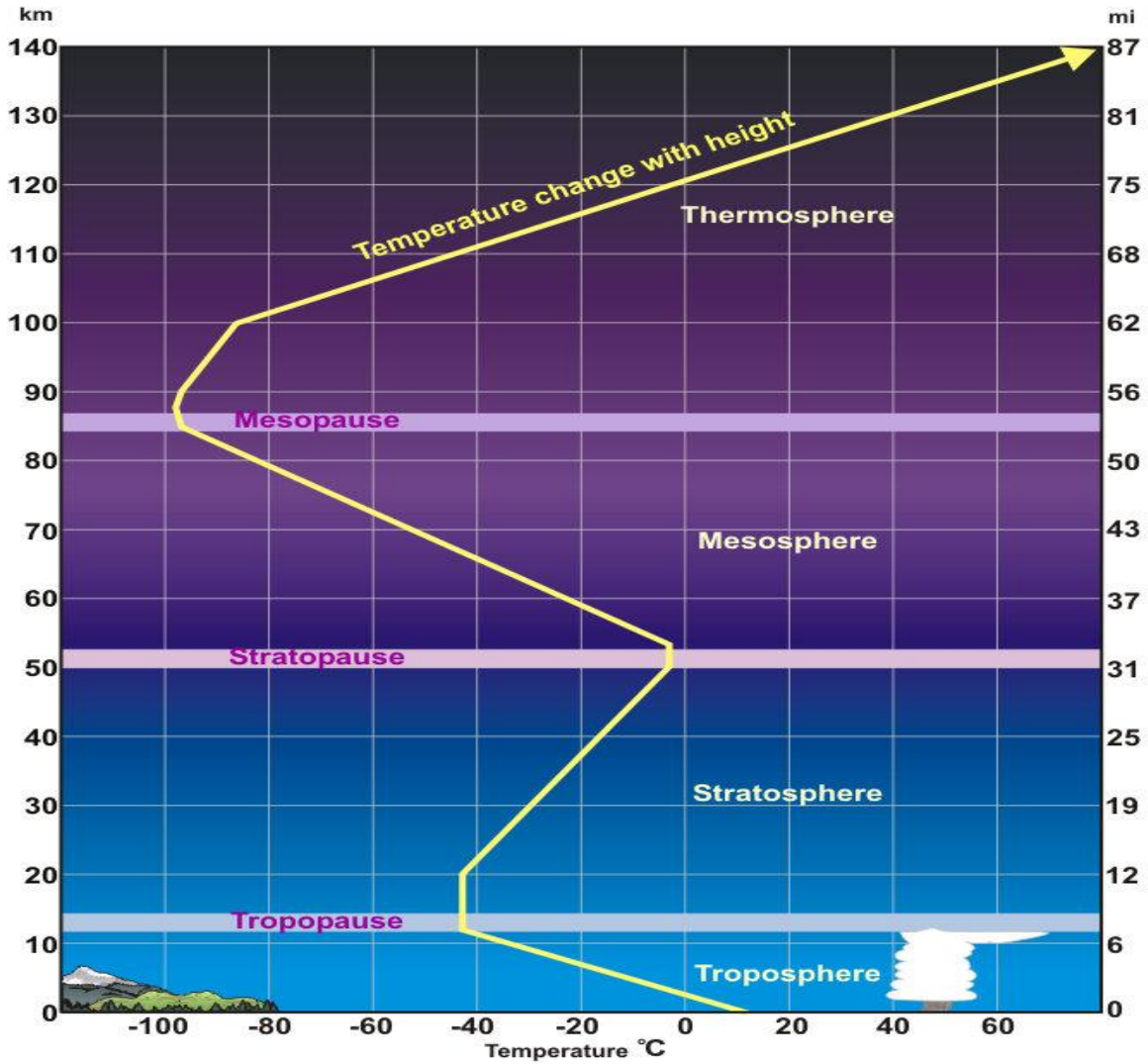
- **Ozone** is formed by the addition of a third oxygen atom to an oxygen molecule
- Protects us from **UV Radiation**
  - **CFC's can deplete ozone**



Atmosphere

- The **atmosphere** is divided up into 4 different layers:
  - Troposphere
  - Stratosphere
  - Mesosphere
  - Thermosphere




km
mi
140
130
120
110
100
90
80
70
60
50
40
30
20
10
0
87
81
75
68
62
56
50
43
37
31
25
19
12
6
0
Temperature change with height
Thermosphere
Mesopause
Mesosphere
Stratopause
Stratosphere
Tropopause
Troposphere
-100
-80
-60
-40
-20
0
20
40
60
Temperature °C

Troposphere

- The **Troposphere** is the layer closest to Earth
  - Contains most of the mass of the atmosphere
  - Most weather takes place in the troposphere
  - Temperature decreases
  - The boundary marking the end of the troposphere is called the **tropopause**

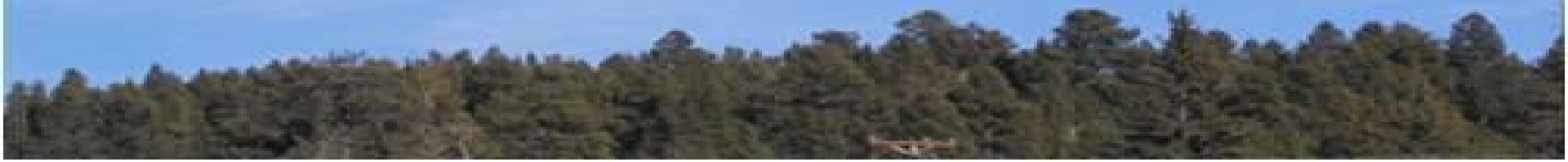
STRATOSPHERE
Air temperature
increases with height due to sunlight absorption by ozone

5 – 8 miles high

TROPOSPHERE
Air temperature
decreases with height

Stratosphere

- Above the **tropopause** is the **Stratosphere**
  - Made up of **ozone**
  - Due to the absorption of radiation temperature in the Stratosphere generally increases
  - **Stratopause**



Mesosphere

- The **Mesosphere** lies above the stratopause
  - Due to a lack of ozone, temperature generally decreases with increasing altitude
  - The **Mesopause** marks the boundary of the Mesosphere

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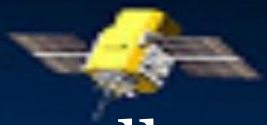
Thermosphere



- The **thermosphere** contains a very small amount of the atmosphere's mass but a lot of it's volume
  - Temperatures can reach 1000 degrees Celsius
  - Contained within the Thermosphere is the **ionosphere** which is an area made up of electrically charged particles and lighter gases

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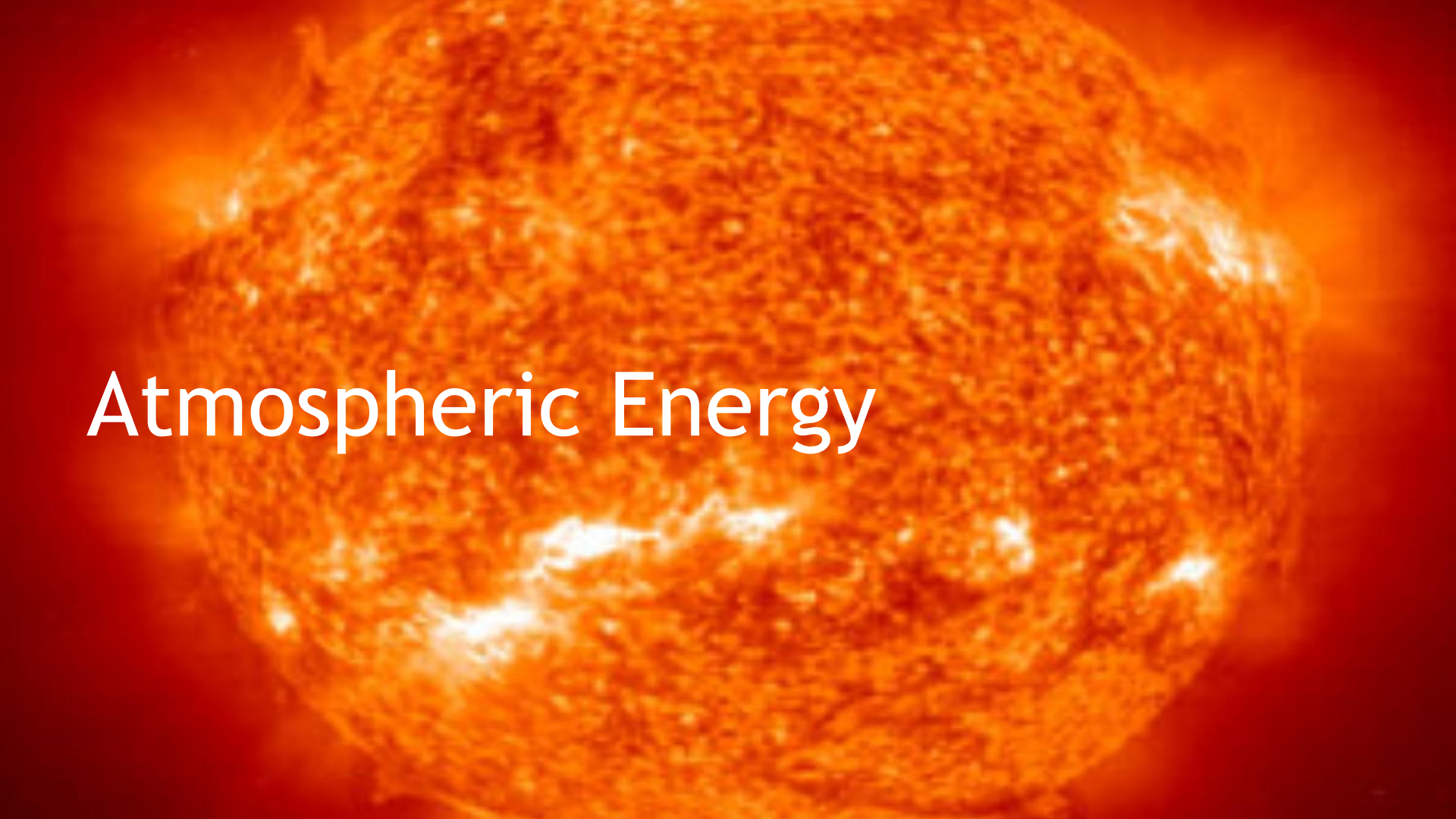
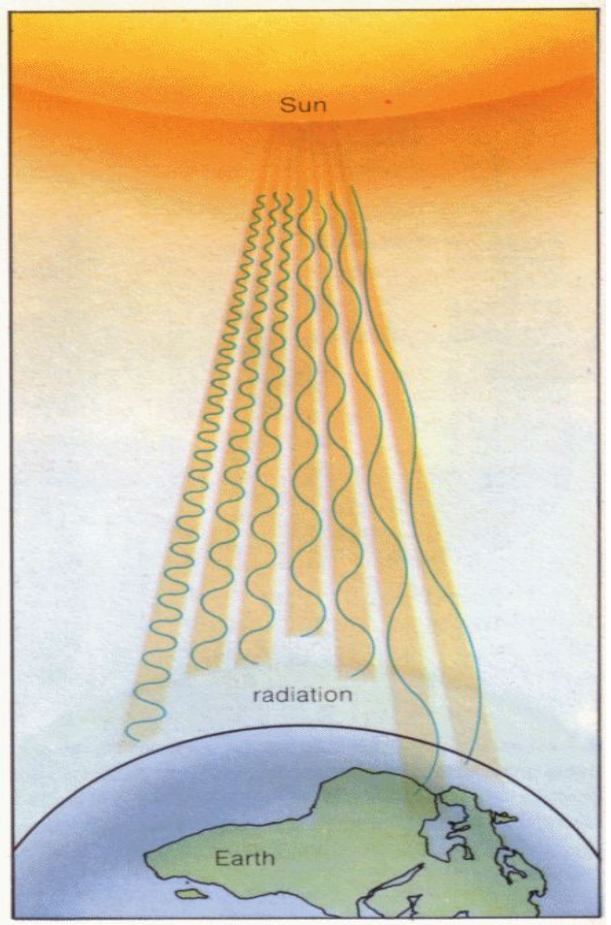


Atmospheric Energy

The Sun

- The sun is the main source of energy for the atmosphere
- Delivers energy to the Earth through:
  - Radiation
  - Conduction
  - Convection



Radiation

- Radiation-Transfer of energy through space by electromagnetic waves
- Some energy is absorbed by the Earth some is bounced back into space
  - 35 % of incoming energy is reflected back into space
  - 15 % is absorbed by the atmosphere
  - 50 % is absorbed by Earth's surface
- The energy that is absorbed by the Earth is then given off back into the atmosphere

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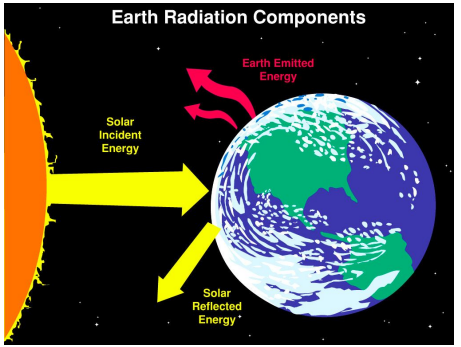
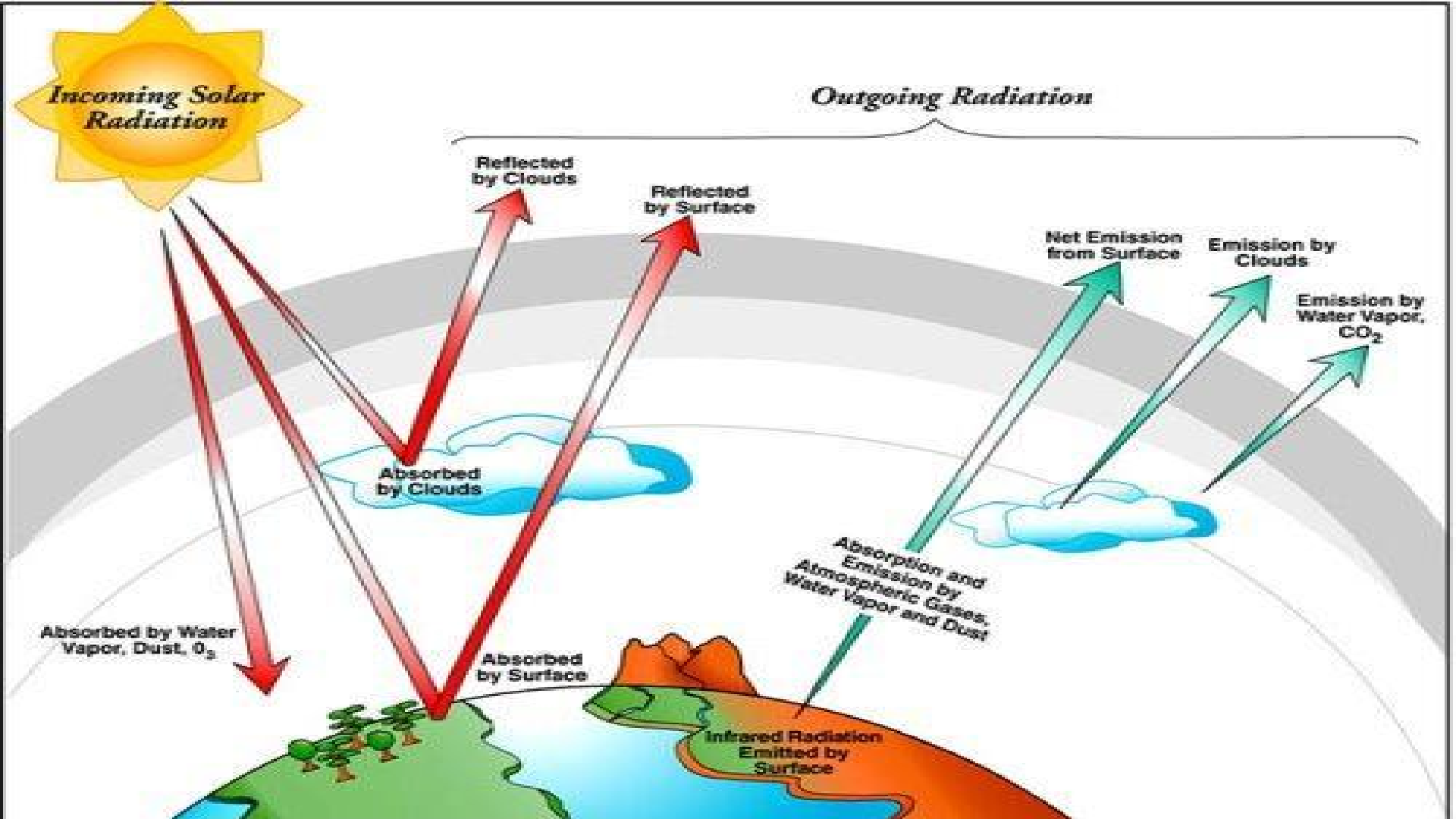
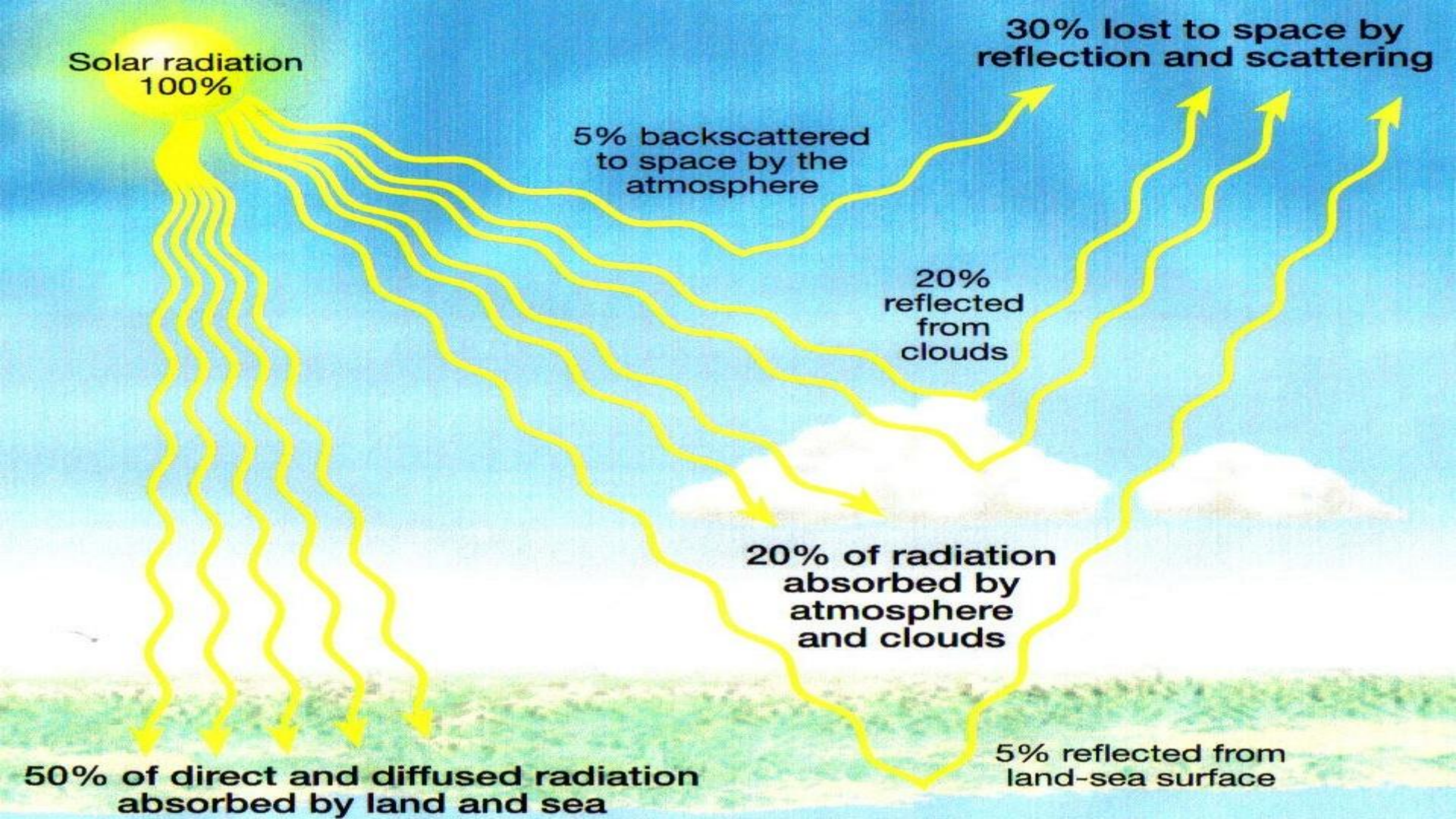
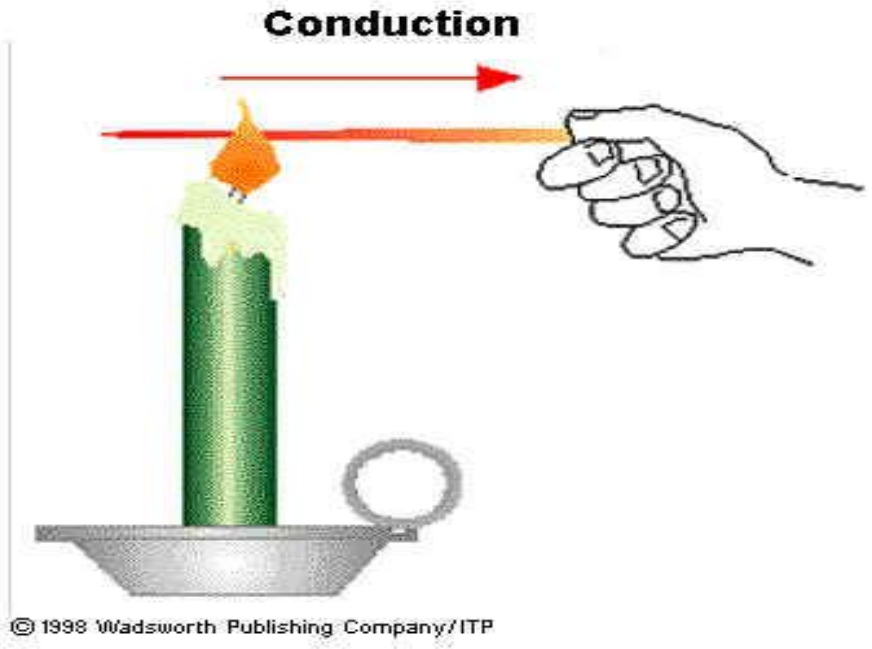



Incoming Solar Radiation
Outgoing Radiation
Reflected by Clouds
Reflected by Surface
Net Emission from Surface
Emission by Clouds
Emission by Water Vapor, CO_2
Absorbed by Clouds
Absorption and Emission by Atmospheric Gases, Water Vapor and Dust
Absorbed by Water Vapor, Dust, O_3
Absorbed by Surface
Infrared Radiation Emitted by Surface


Solar radiation
100%
30% lost to space by
reflection and scattering
5% backscattered
to space by the
atmosphere
20%
reflected
from
clouds
20% of radiation
absorbed by
atmosphere
and clouds
5% reflected from
land-sea surface
50% of direct and diffused radiation
absorbed by land and sea

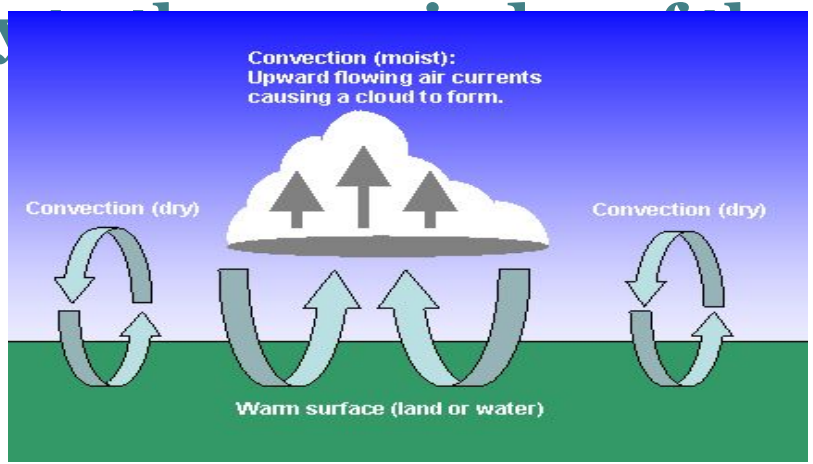
Conduction

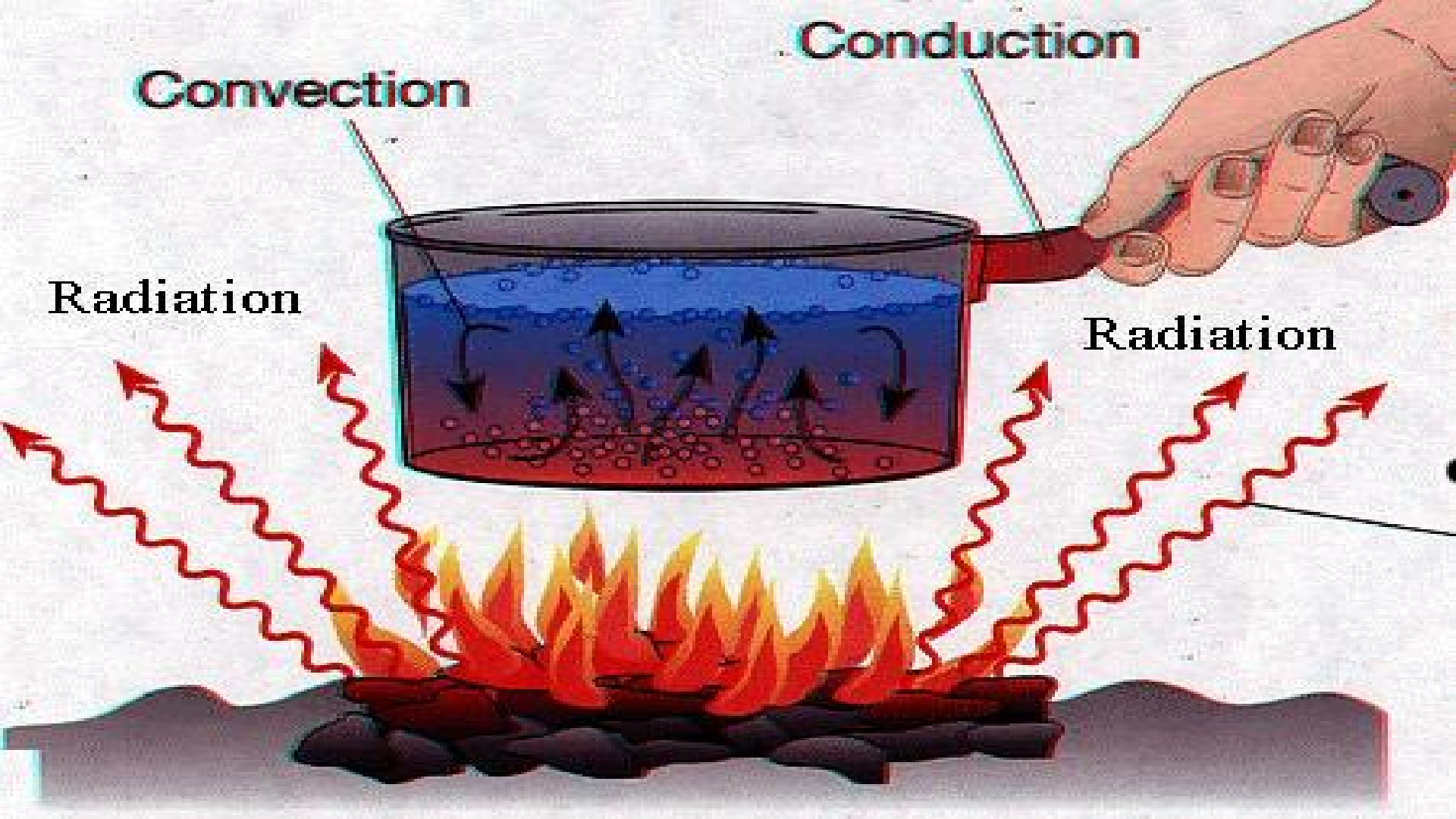
- **<u>Conduction</u>** is the transfer of energy that occurs when molecules collide
- Molecules move from the surface of the Earth to the closest layer of the atmosphere
- **Only heats the lower**



Convection

- Transfer of energy by the flow of a heated substance
- As the remaining energy rises into the atmosphere it cools and sinks back down to Earth until it heats up again
  - **Provides energy**




Conduction
Convection
Radiation
Radiation