



# Earth's Atmosphere

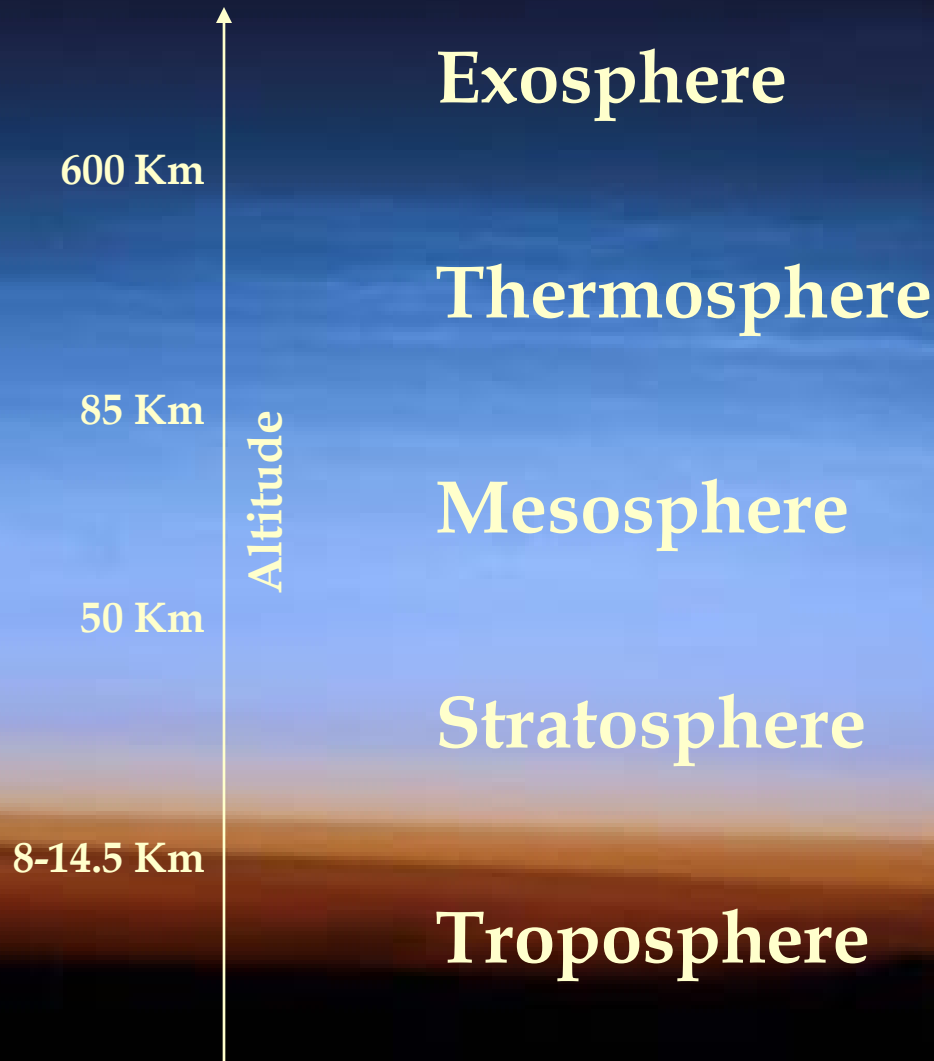
What's Up There?

# The atmosphere is a layer of gasses that surrounds our planet

90% of its mass is within about 11 km (6 mi) of the surface

The atmosphere is very thin compared to the size of Earth

# The Atmosphere is Layered



# Atmosphere

(Neutral)

Thermosphere

Mesosphere

Stratosphere

Troposphere

# Ionosphere

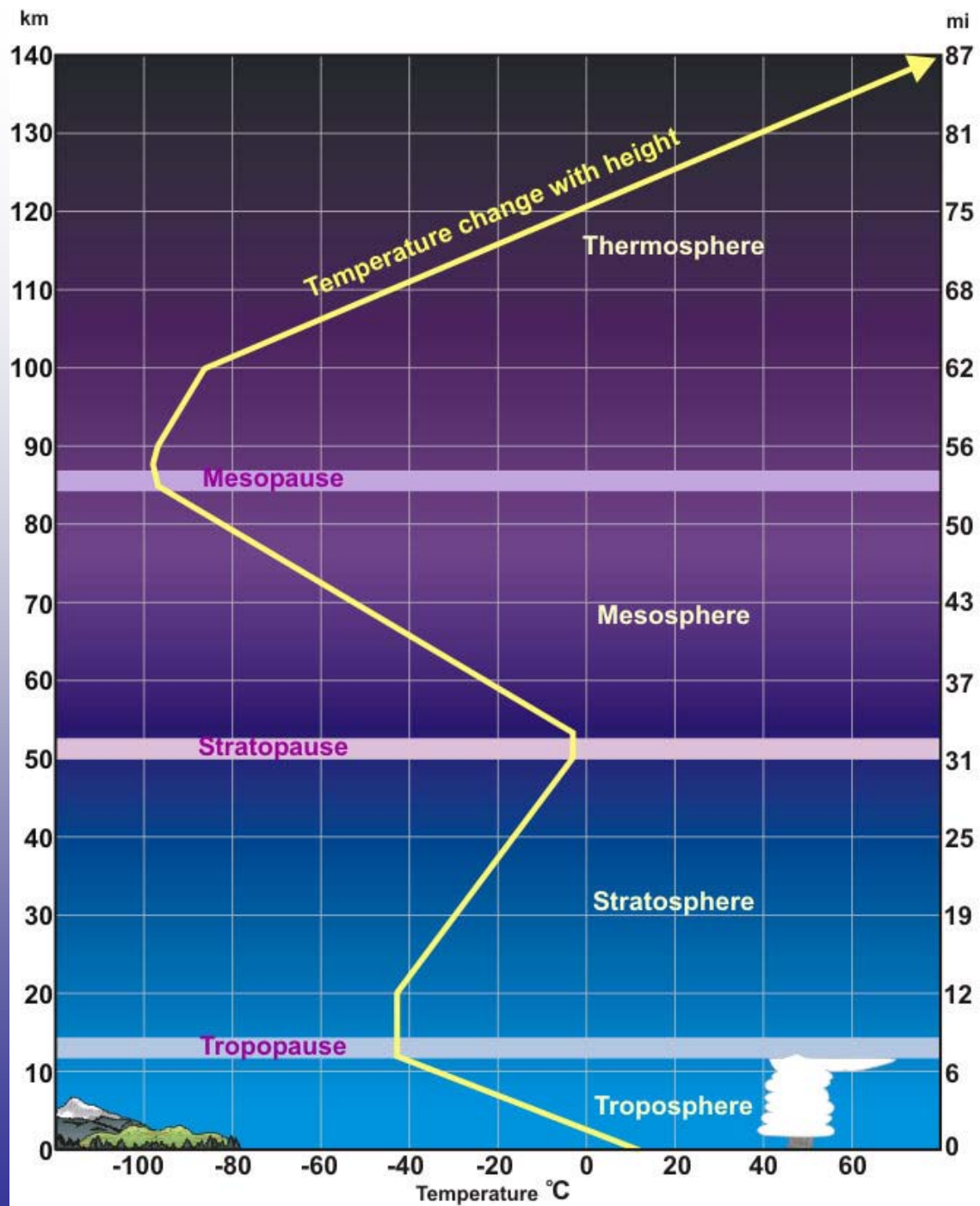
(Charged)

F Layer

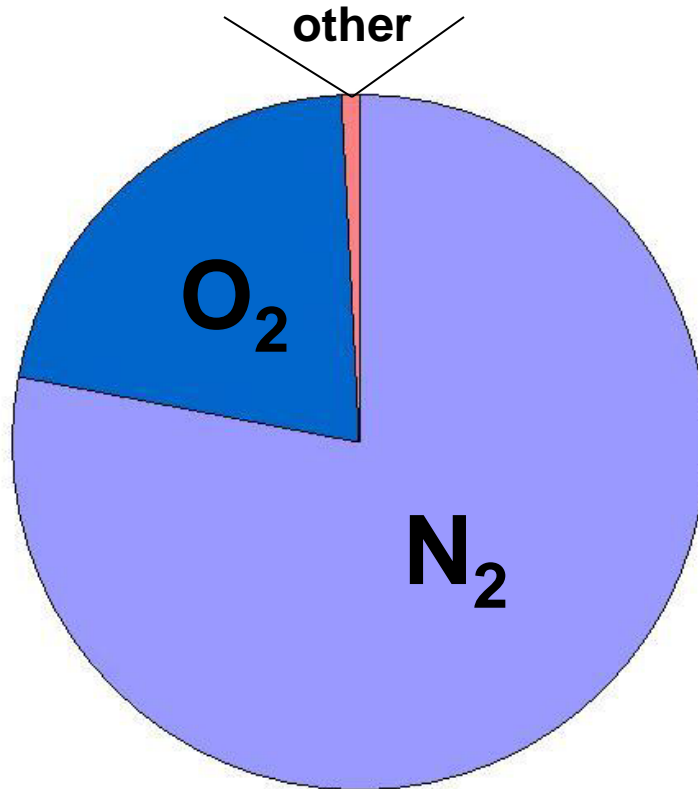
E Layer

D Layer

Neutral layers  
commonly  
defined by:  
**Changes in  
Temperature**



# What's in the Air we Breathe?



- 78% Nitrogen (N<sub>2</sub>)
- 21% Oxygen (O<sub>2</sub>)
- 1% Other
  - Water (H<sub>2</sub>O)
  - Argon (Ar)
  - Carbon Dioxide (CO<sub>2</sub>)
  - Neon (N)
  - Helium (He)
  - Methane (CH<sub>4</sub>)
  - Hydrogen (H)
  - Nitrous Oxide (N<sub>2</sub>O)
  - Ozone (O<sub>3</sub>)

# Troposphere (0 - 15 km)

- Weather happens here
- Thinnest at poles, thickest at equator
- 90% of mass found here
- Warmed by radiation from Earth
- As you go up:
  - Temperature drops
  - Pressure drops

# Stratosphere (15 - 50 km)

- Contains the ozone (O<sub>3</sub>) layer
  - Absorbs harmful ultraviolet radiation (UVC and many UVB rays)
- As you go up:
  - Temperature increases (ozone layer causes this)
  - Pressure drops
- Dry



# Mesosphere (50 – 85 km)

- Coldest layer (coldest place on the planet!)
- As you go up:
  - Temperature drops
  - Pressure drops
- Meteors burn up here

# Thermosphere (85 – 600 km)

- Very few molecules
- Incoming solar energy readily absorbed
- As you go up:
  - Temperature increases
  - Pressure drops
- Space shuttle, International Space Station and commercial satellites orbit here
- Same altitude as most of Ionosphere; auroras occur here

# Exosphere (600+ km)

- Atoms and molecules escape into space
  - $5 \times 10^{25}$  molecules lost every second  
(That's 50,000,000,000,000,000,000,000,000!)

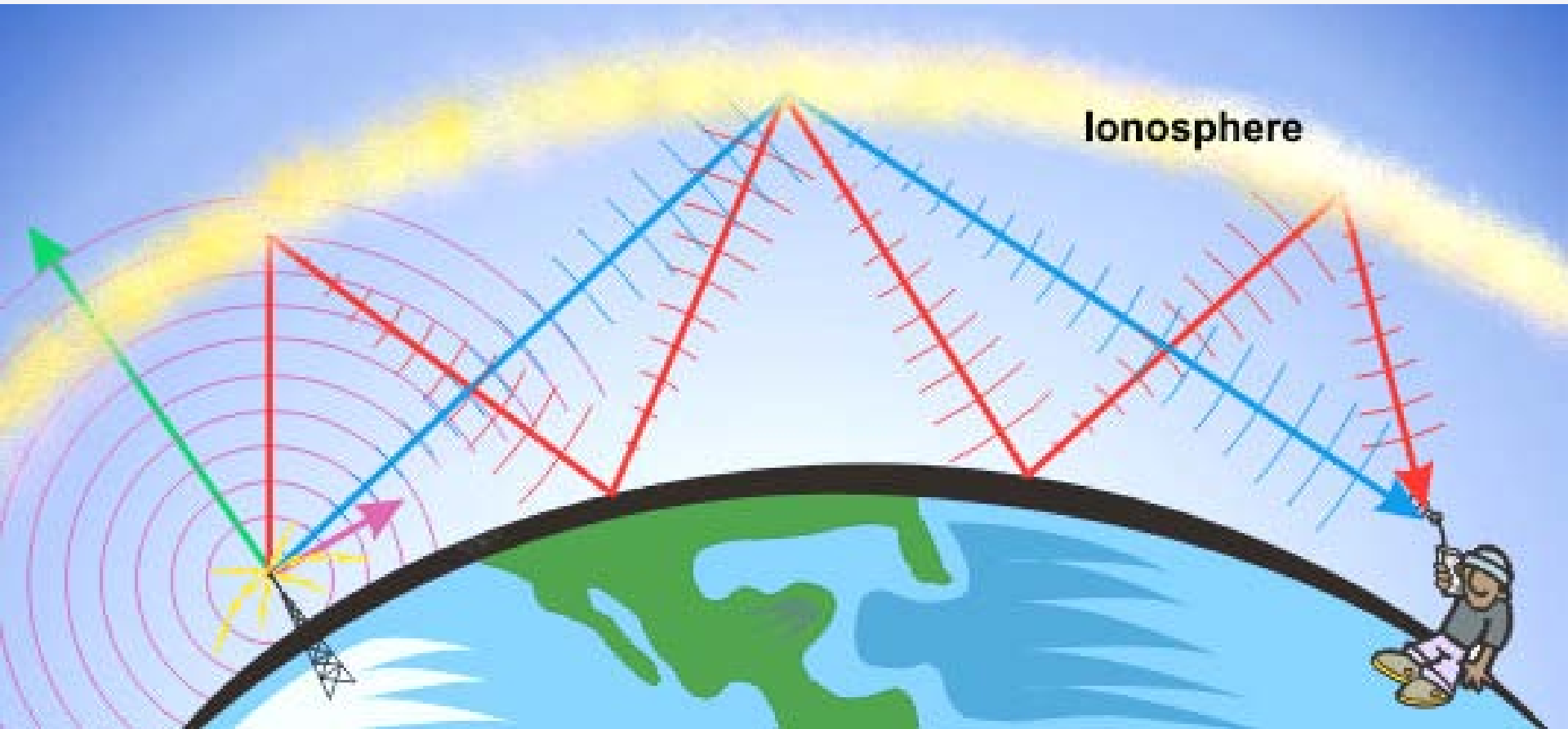
Don't worry: atmosphere should last several more billion years

- Upper limit not well defined

# Ionosphere

- Region of charged ions (positive) and electrons within Thermosphere. Ionosphere represents only about 2% of Thermosphere.
- Electrons are torn off atoms by sunlight of short wavelengths (called ionization)
- Electrons don't recombine easily because the distance between molecules is large at high altitudes and collisions are not frequent

# Ionosphere Discovery



In 1901 Marconi received a radio signal from North America in Europe. It must have bounced off something in the atmosphere, otherwise it couldn't have reached around the curve of the earth!

