The Atmosphere: Structure and Temperature

Atmospheric Characteristics

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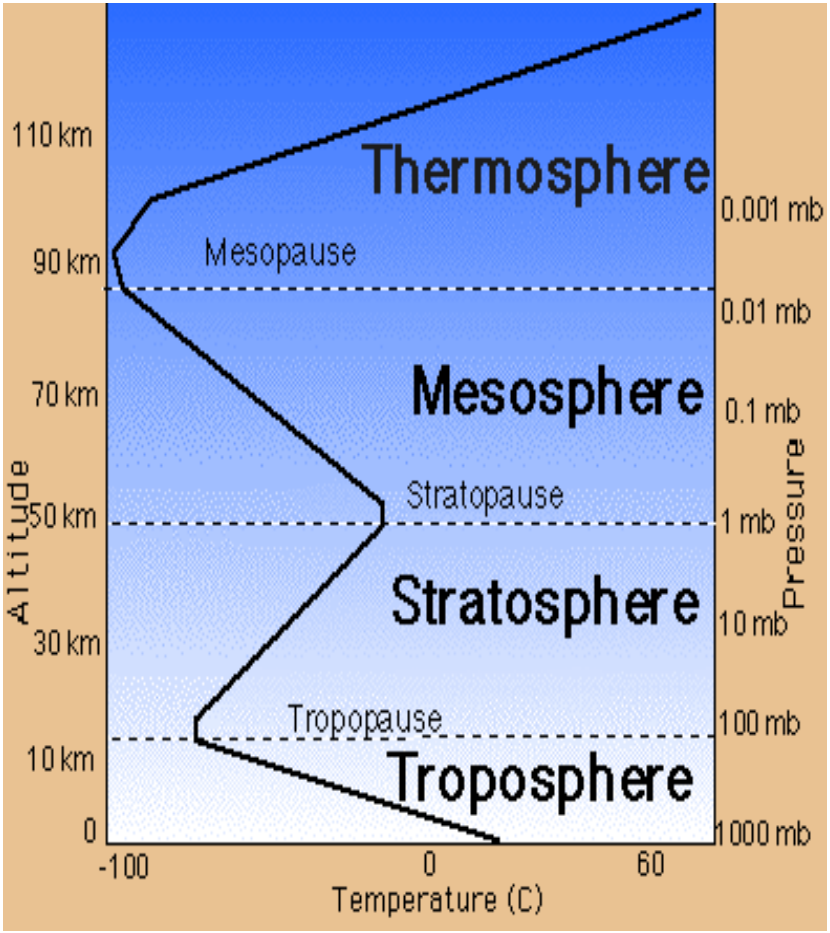
“Weather” vs. “Climate”

- “Weather” is the state of (conditions in) the atmosphere at a given place and time
- Weather is described by current temperature, pressure, humidity, clouds, precipitation, wind direction and speed, etc.

- “Climate” refers to long-term weather patterns, including averages and extreme events
- Climate uses many statistical tools, such as ‘mean,’ ‘maximum,’ ‘minimum,’ and ‘frequency’

Structure of the Atmosphere



- Temperature patterns define four basic layers in Earth's atmosphere
- We live at the bottom in the TROPOSPHERE
- As you go up (in a plane or on a mountain), temperatures become colder

http://www.aerospaceweb.org/question/atmosphere/atmosphere/layers.gif

Composition of the Troposphere

"Dry, clean air" includes:

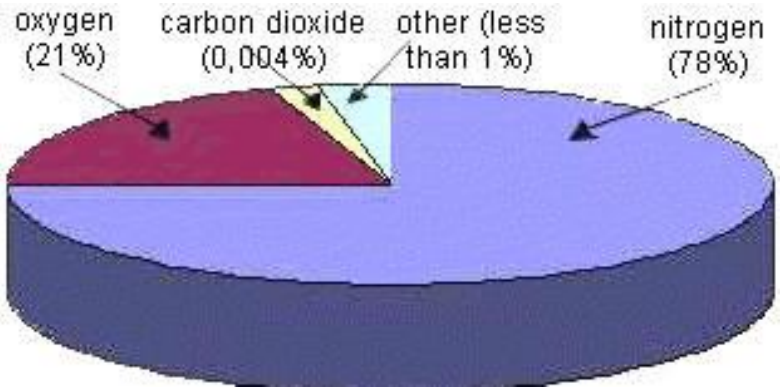
--78% N_2

--21% O_2

--0.93% Ar

--0.04% CO_2

--"trace gases"



http://www.saburchill.com/chapters/chap0052.html

"Real Air" contains varying amounts of H_2O, dust, and other solids

Water Vapor

- Water vapor $H_2O_{(g)}$ can range from almost 0% to about 4%
- "Condensation" changes $H_2O_{(g)}$ into $H_2O_{(l)}$ to form clouds or dew
- "Deposition" changes $H_2O_{(g)}$ into $H_2O_{(s)}$ to form snow, hail, or frost

http://www.saburchill.com/chapters/chap0052.html

Human Influences

http://www.msnbc.msn.com/id/23587788/

- Air pollution comes from transportation, industry, and other activities
- Smog in cities endangers health
- Chemical reactions in air can produce more pollutants, including photochemical smog

Layers of the Upper Atmosphere

Stratosphere

- temperature increases with height because the ozone layer absorbs UV energy

Mesosphere

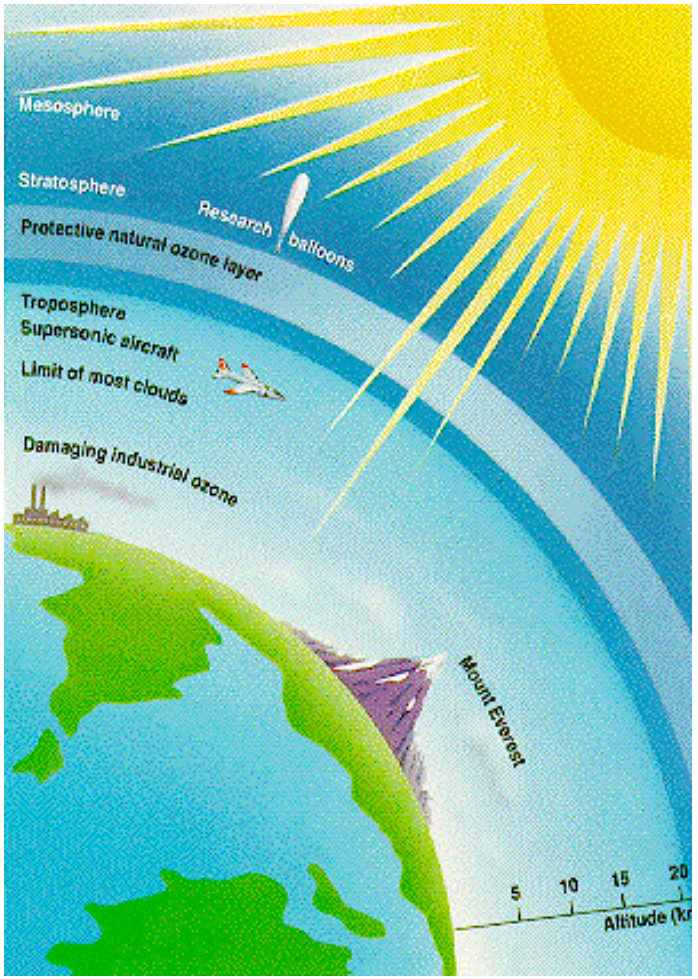
- Temperatures decrease, reaching a minimum of -90^{o} C at about 80 km

Thermosphere (Ionosphere)

- Temperatures increase, but the air is very, very thin and you wouldn't feel any warmth

Ozone O_3

- Oxygen (O_2) molecules 10 – 50 km above the surface are split by ultraviolet (UV) rays from the sun to form Ozone (O_3)
- This gas protects Earth's surface from the harmful UV energy and makes possible Life on land



http://www.ec.gc.ca/ozone/DOCS/KIDZONE/images/ozn_layr.gif