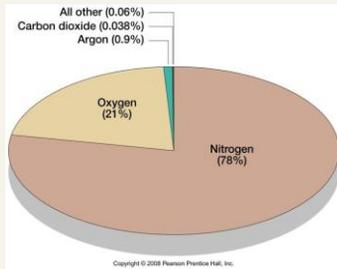


Composition of the Atmosphere

- ❑ Gases
- ❑ Particulates
- ❑ The gases that make up "air".
- ❑ some of these are "greenhouse gases".



Atmospheric Particulates (Aerosols)

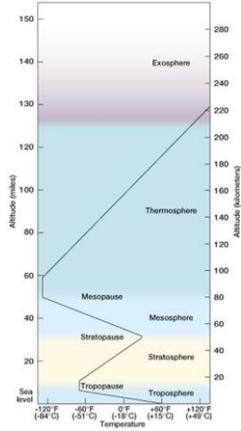
- ❑ Sources include (natural & human):
 - ❑ Ice, pollen, volcanic ash, salt sprayed by oceans, wind-blown soil, meteor debris, smoke from wild-fires.
 - ❑ Emissions (auto & factories), soot, etc
 - ❑ They affect weather and climate in 2 ways:
 - ❑ They are hygroscopic, i.e. they attract water, so water molecules form around them.
 - ❑ They can decrease the amt of solar energy reaching Earth, like ash during a volcanic eruption (see Pompei pictures)
- ❑ Tiny solid and liquid particles (non-gaseous particles)
- ❑ Effects on weather and climate



Vertical Structure of the Atmosphere

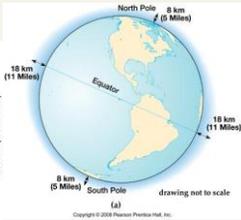
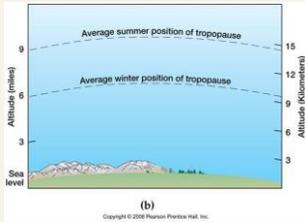
- ❑ Temperature
- ❑ Pressure
- ❑ Composition

Thermal Layers of the Atmosphere



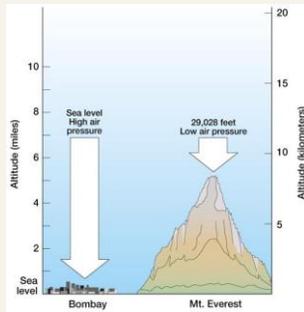
Troposphere

- Where our weather occurs

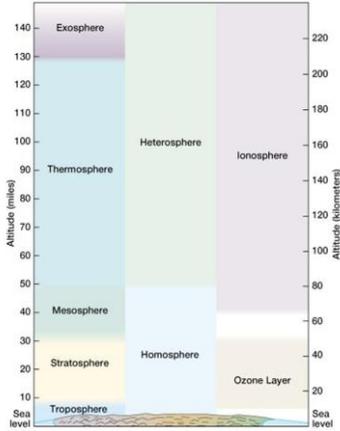


Atmospheric Pressure

- Pressure
 - Decreases with increasing altitude



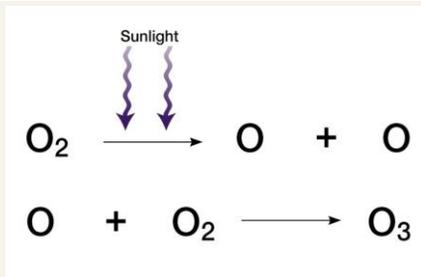
Vertical Structure of the Atmosphere



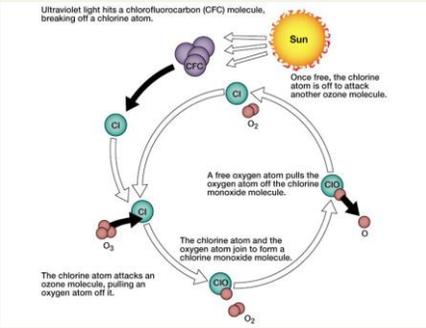
The Ozone Problem

- Natural Atmospheric Ozone
- Destruction of Ozone by Chlorofluorocarbons (CFCs)
- The Antarctic Ozone Hole

Natural Ozone



Ozone Destruction by CFCs



Weather and Climate

- Weather describes temporary atmospheric conditions e.g. current temperature, precipitation, wind speed, etc. for a short period of time.
- On the other hand, Climate is the aggregate of weather conditions, usually over a long period of at least 30 years.
- So weather & climate are related but not synonymous.
- Elements of Weather and Climate
- Controls of Weather and Climate

Elements of Weather & Climate

TABLE 3-3 Major Elements of Weather and Climate

Elements
Temperature
Pressure
Wind
Moisture content

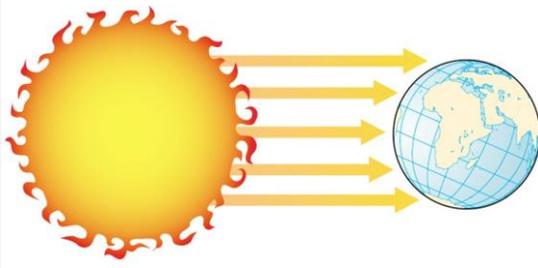
Controls of Weather & Climate

- The reasons why weather & climate vary all over earth.
- Although each is discussed separately, there's a lot of overlap in real life.

TABLE 3-4 Principal Controls of Weather and Climate

Controls
Latitude
Distribution of land and water
General circulation of the atmosphere
General circulation of the oceans
Elevation
Topographic barriers
Storms

Latitude and Available Solar Energy

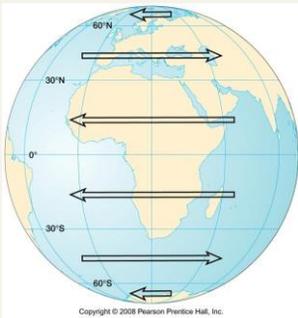


Long vs. short rays

Distribution of Land & Water

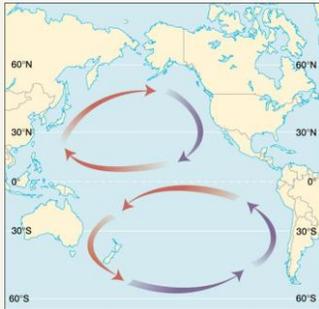
- Oceans heat & cool more slowly than landmasses.
- Maritime (coastal areas) experience milder temperatures than continental areas, in both summer & winter.
- E.g. Seattle, WA vs. Fargo, ND.

General Circulation of the Atmosphere



General Circulation of the Oceans

- Transfers heat and cool water around the globe, and affects neighboring continents
- E.g. The coast of Namibia (Africa) is cold, in spite of it's latitude.



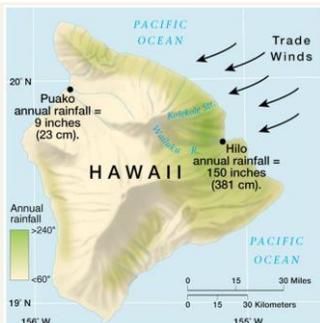
Elevation (Altitude)

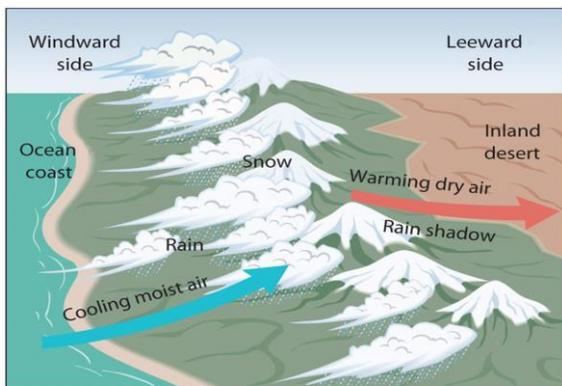
The higher you go, the cooler it becomes, and vice-versa (at least in the troposphere).



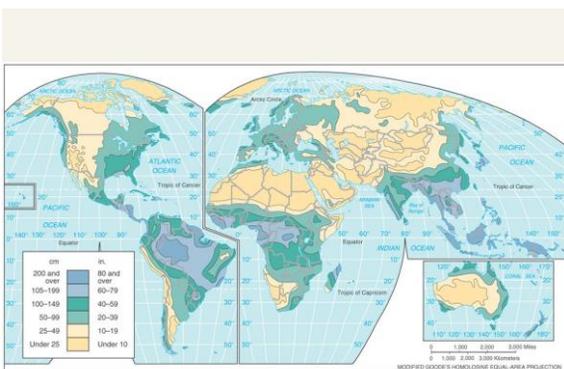
Topographic Barriers

Differences on the same island!





(b) Orographic Precipitation
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Storms

They create specialized weather conditions, so they are regarded as a control



The Coriolis Effect

Because of the Earth's rotation, any object moving freely tends to be deflected to the right in the Northern Hemisphere, to the left in the Southern Hemisphere

- Significance
- Winds
- Ocean currents
- Airplanes, missiles, and even ships



The Coriolis Effect – Summary

- Definition
 - An apparent deflection of any freely moving object from its expected (straight) path
- Four basic points to note:
 - Apparent deflection is to the right in the Northern Hemisphere, to the left in the Southern Hemisphere.
 - Apparent deflection is greatest at the poles, progressively less toward the equator, where there is zero deflection.
 - The effect is proportional to the speed of the object, so a fast-moving object is deflected more than a slower one.
 - The effect influences the direction of movement, not the speed.
- It seems to not have an effect on toilet bowls, sinks, etc.
