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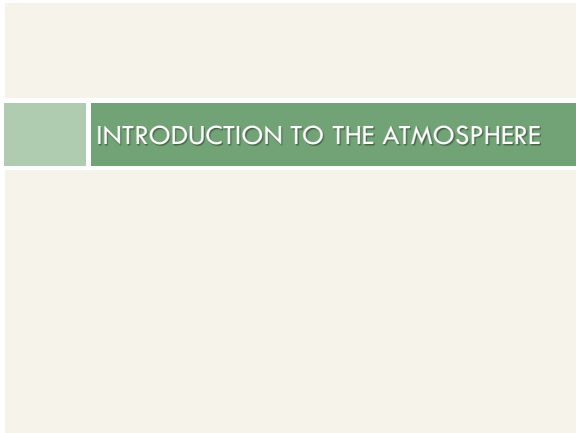
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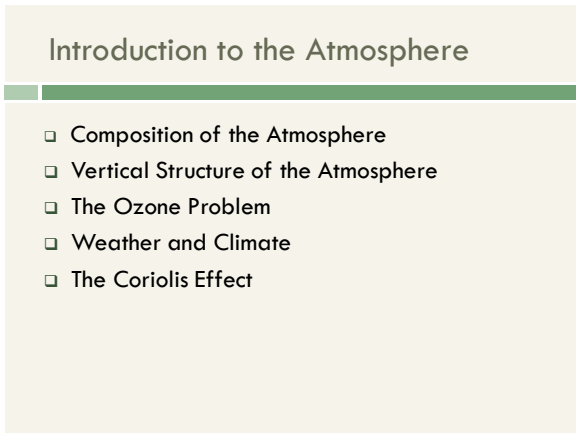
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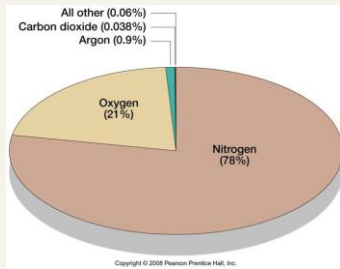
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## Composition of the Atmosphere

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



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## 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



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## Vertical Structure of the Atmosphere

- ❑ Temperature
- ❑ Pressure
- ❑ Composition

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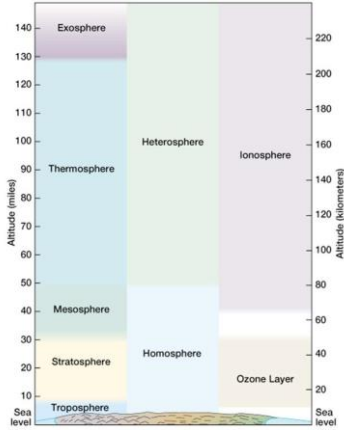
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## Vertical Structure of the Atmosphere




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## The Ozone Problem

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

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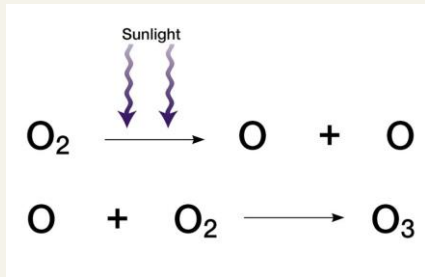
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## Natural Ozone




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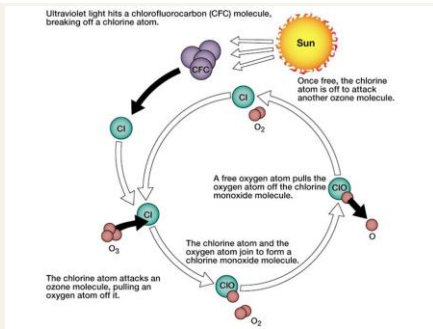
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## Ozone Destruction by CFCs




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## 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

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## Elements of Weather & Climate

**TABLE 3-3** Major Elements of Weather and Climate

*Elements*

Temperature

Pressure

Wind

Moisture content

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## 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

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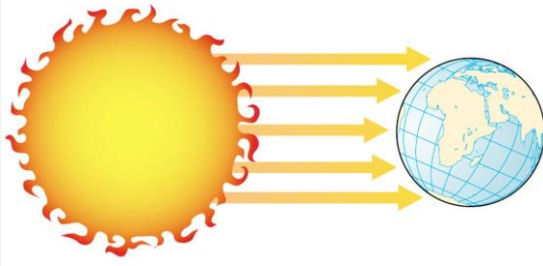
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## Latitude and Available Solar Energy



Long vs. short rays

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## 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.

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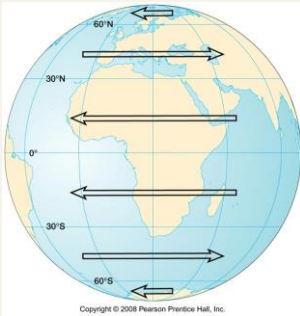
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## General Circulation of the Atmosphere



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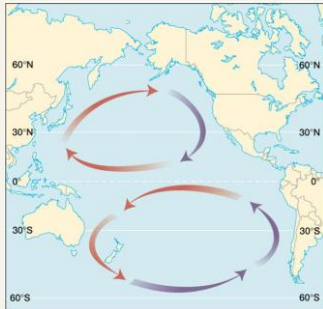
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## General Circulation of the Oceans

- 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.



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## Elevation (Altitude)

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



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## Storms

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



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## 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



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## 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.

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