

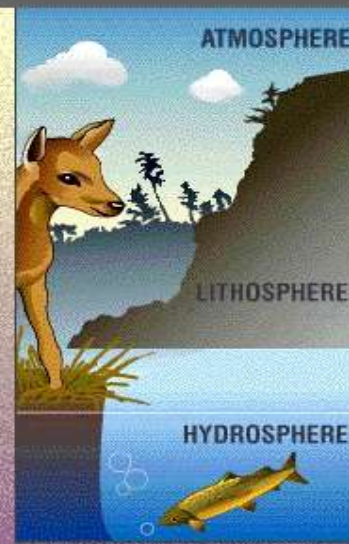
Unit two

The Earth - The Biosphere

- **Atmosphere:** air and moisture that surrounds the Earth. Consists of six main layers (p. 511).
- **Lithosphere:** all land above & below water.
- **Hydrosphere:** ice, snow, surface water, water vapour in the atmosphere.

Sphere of Life

The word "biosphere" describes the layer of the earth where life exists. It consists of the lithosphere (land), the hydrosphere (water), and the atmosphere (air).



Weather - the combination of temperature, precipitation, cloud cover, and wind that we experience each day.

Climate - the long term pattern of weather conditions.

- reflects the weather patterns in a particular region over the long term

Factors that affect climate:

1. Latitude:

As a general rule, temperature decreases as distance increases north or south of the equator. In low latitudes the sun is often directly overhead and hits the equator at 90 degrees. Here, the sun's rays are closest to the earth. The sun's rays hit the poles at an angle, have to travel further and are deflected back into space because of the snow and shiny surfaces of ice. Therefore, the further you are from the equator the colder it will be.

Albedo Effect

- When sunlight shines on something, how much energy is absorbed?
- **Albedo** is a measure of the percentage of light reflected from an object

On a hot day..... Which is cooler?

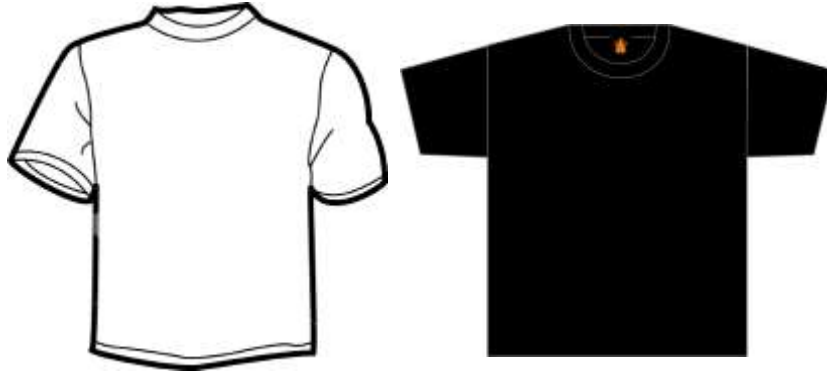


Diagram:

2. Elevation:

The influence of elevation on climate is felt in two ways. First, as the altitude of an area increases, there is a decrease in temperature. (2 degrees for every 1000 ft). Temperatures at the top of the mountain are lower than at the base. Second, mountains affect the distribution of rainfall.

Orographic rainfall is abundant on the windward side and the leeward side may experience a rain shadow or desert area. This is because all the moisture has disappeared from the clouds on the windward side of the mountain.

Diagram:

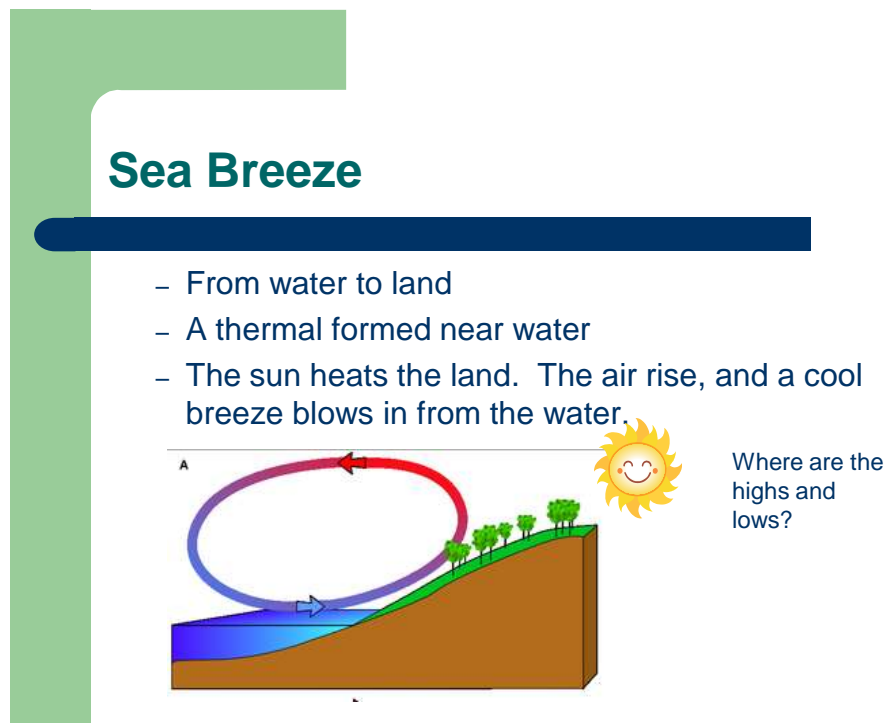
3. Proximity to water:

Ocean holds heat in winter longer after the land as cooled because of its surface area and density. The ocean helps prevent these land areas from experiencing extremely cold temperatures in winter and extremely hot temperatures in summer hence a maritime climate.

Sea Breezes:

Any body of water will influence the temperature of the land nearby. Warm air rises over the land and cool air from the sea rushes in to take the place of the warm air. Because it comes from the sea we call it a sea breeze. It usually occurs in daytime or in summer.

Diagram:



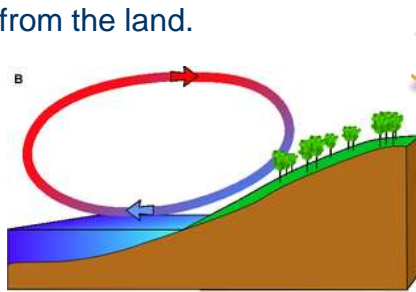
Land Breezes:

Warm air above the ocean rises and cool air from the land rushes in to take the place of the warm air rising. Because the air comes from the land we experience land breezes. It usually occurs in nighttime or during winter.

Diagram:

Land Breeze

- from land to water
 - After sunset, the land cools quickly.
 - Air above the warmer water rises, replaced by air from the land.



Where are the
highs and
lows?

4. Ocean currents:

Like air masses they take on the characteristics of where they originate. The cold Labrador current meets the warm gulf stream. The cold air forces the warm air to rise. As it rises it cools at a rate of 2 degrees for every 1000 ft. Condensation is the result , clouds form and precipitation occur. We experience RDF thus making St. John's the foggiest place in the world.

Diagram:

5. Air masses:

Take on the characteristics of where they originate. For example, if an air mass comes from the arctic it will cool any area that it comes in contact with. Ie. Winnipeg ; making it the deep freeze of Canada and visa versa.

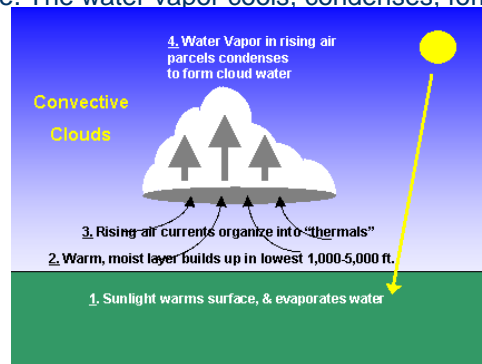
Diagram:

Three types of rainfall:

1.) Convective:

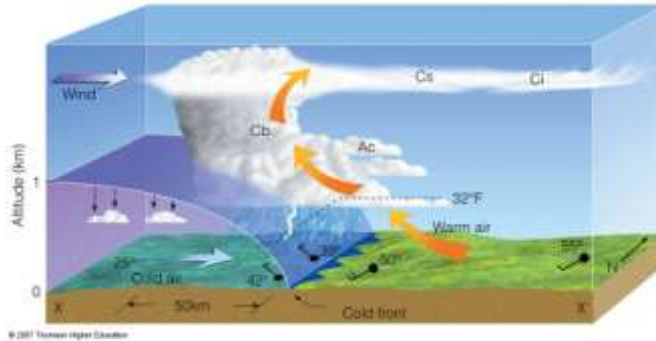
Clouds and Fog (Read pg. 530-533)

- 1. **Convective Clouds** - formed when air near the ground absorbs energy from heated surfaces and rises in the atmosphere. The water vapor cools, condenses, forming clouds.



2.) Frontal rainfall:

- **2. Frontal Clouds** - form where the leading edge, or front, of a large moving mass of air meets another mass of air at a different temperature.



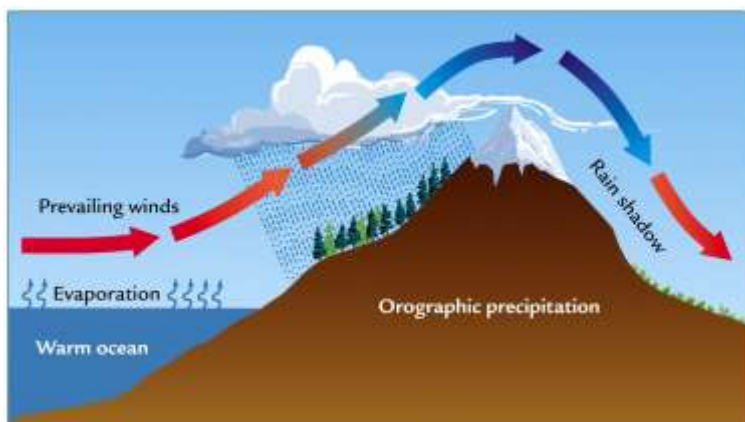
Fog

- A cloud that is formed near the ground when warm and cold air combine



3. Orographic/Relief Rainfall:

3. Orographic Clouds - form when air moves up a mountain, expands at the lower pressure, and cools.



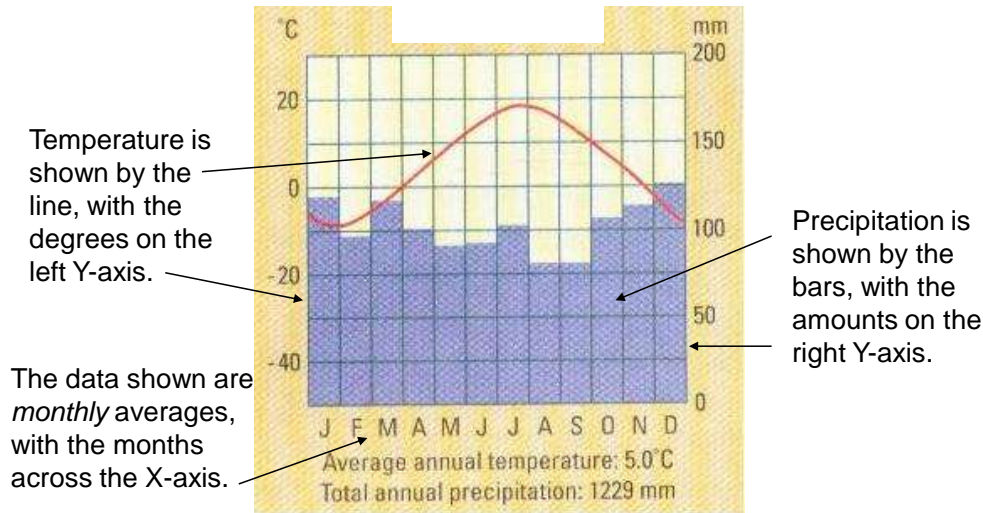
Low Pressure Systems

- Tend to bring cloudy skies and stormy weather
- **Front:** the boundary between a cold air mass and a warm air mass
- **Warm front:** the leading edge of a warm air mass
- **Cold front:** the leading edge of a cold air mass



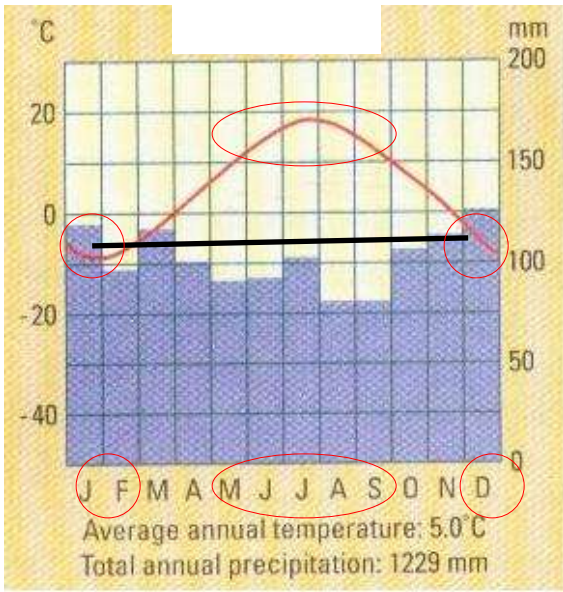
What is a climate graph?

- a type of chart or graph that displays for a place the annual pattern of the two most important climate variables: precipitation and temperature



Of what value are climate graphs?

- Climate graphs can be used to compare the climate of selected locations quickly and simply.
- Especially useful to tell if a place has a **continental** or a **maritime** climate.
- **Continental:** low annual precipitation; large annual temperature range because of no *moderating effect of a large a body of water*.
- **Maritime:** high annual precipitation; low annual temperature range because of the *moderating effect of large a large body of water*.



Low (fairly low) annual temperature range.

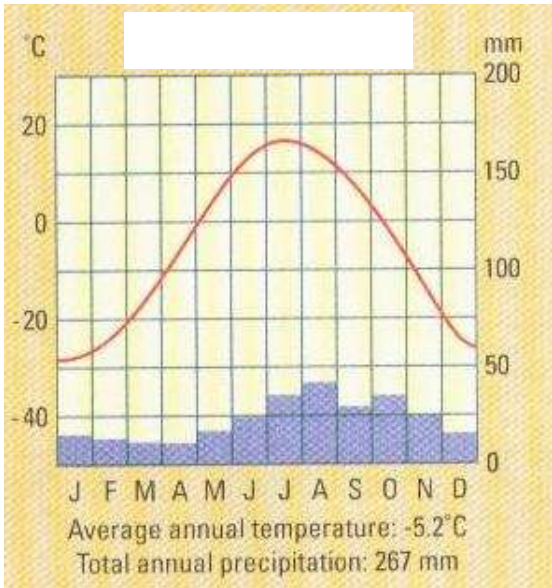
Winters are mild.

Summers are not hot.

High annual precipitation, with no seasonal maximum.

Therefore, it's a **maritime climate**.

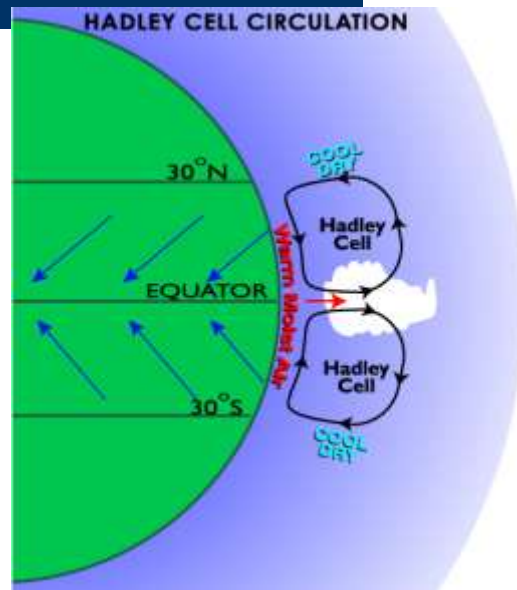
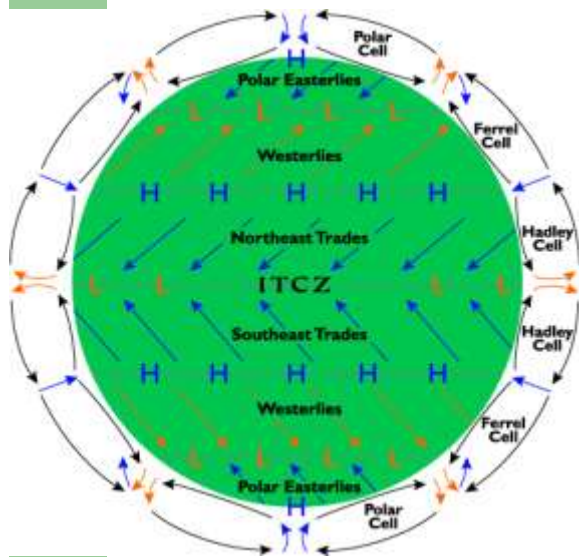




Low annual precipitation
High annual temperature range
Therefore, continental climate.



Prevailing winds



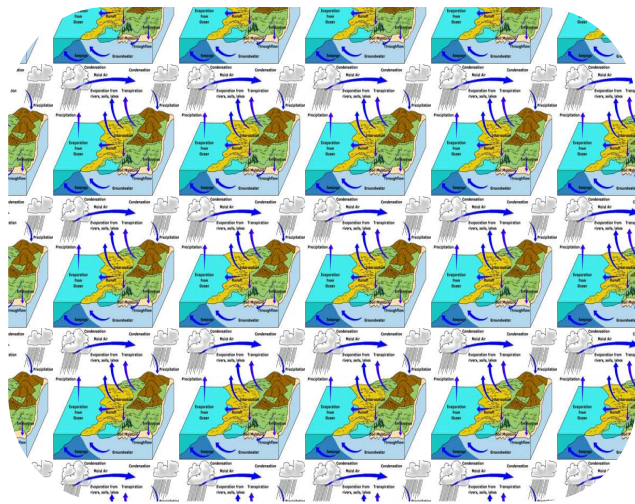
Water

- It is needed by all living organisms.
- Approximately 75% of cytoplasm in cells.
- VITAL TO LIFE.
- Covers about 70% of Earth's surface.
- 97.5% = Salt water
- 2.5% = Fresh water
- Of the fresh water:
 - 87.3% is Glaciers & Ice caps.
 - 12.3% is (under) ground water.
 - 0.4% is surface water.
 - USEABLE FRESH WATER = 12.7%
- $2.5 \times 0.127 = 0.1375\%$ of total water available!

The Water cycle:

Precipitation

- Precipitation: Water that reaches the ground in either liquid or solid form



- When air reaches its *saturation point* and the water vapor in the air condenses to form liquid droplets.
- Droplets join together and become heavy enough to fall to the surface

Type of precipitation depends on conditions in the atmosphere and on the ground

Liquid	Solid



- Hail:
 - created in cumulonimbus clouds
 - Frozen raindrops are circulated up and down
 - Layers of ice are formed
- Dew:
 - Water vapour condenses near the ground as the air cools
 - Cold Days : Frost



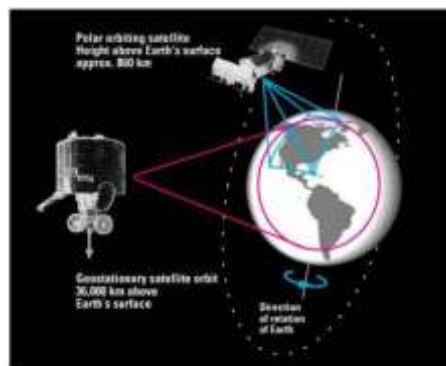
Forecasting Technology

- Up until the 1980's forecasting could only predict about one day.



1. Weather Satellite

- An orbiting spacecraft that regularly gathers weather-related data
- *High-orbit satellites*
 - 36,000 km above the equator
 - Provide images that show cloud cover, earth's physical features & amounts of infrared radiation from the atmosphere



- *Low-orbit satellites*

- Orbit about 1000 km above the poles
- Detect changes in temperature and water vapor at different levels of the atmosphere, as well as global wind patterns

http://www.weatheroffice.gc.ca/satellite/index_e.html



2. Weather Balloon

- Helium-filled balloons that are launched 2 or more times per day
- Collect data on temperature, pressure, humidity and ice-crystals
- Also used to determine speed and direction of winds





4. Computer Technology

- Data from satellites, weather balloons and ground-based instruments are gathered, stored and analyzed by computer software
- Computers linked to satellite communication systems allows info to be sent around the world



Geography 1202

Weather Dynamics

Extreme Weather

Thunderstorms and Tornadoes



Floods and Droughts

- Badger Flood





Hurricanes, Typhoons, Tropical Cyclones (119 km/h)

- Katrina





Blizzards



Extreme Heat and Cold



Components of Soil

- From Top to Bottom:
 - Litter:
 - Partially decomposed leaves and grasses
 - Topsoil:
 - Small particles of rock mixed with decaying plant and animal matter (humus)
 - Rich in minerals, air and water
 - Dark soil
 - Subsoil:
 - More stones and rocks than topsoil
 - Small amount of organic matter
 - Large amounts of minerals
 - Bedrock
 - Solid rock, no soil

Soil Diagram

Litter

Horizon A. Topsoil

Horizon B. Subsoil

Bedrock

Parent Material

How does climate affect the type of soil found in a region?

In regions where there is a great deal of precipitation, leaching occurs.

Leaching – when rain and groundwater cause soil and its minerals to move deeper into the ground.

As water moves down through the soil, it carries away the soil's nutrients and the soil that remains is unable to support plant life.

In regions with a very dry climate, moisture from the soil is drawn upward through Capillary action – the movement of moisture upwards in soil that carries minerals closer to the surface.

The water carries with it dissolved salts and minerals and when left behind in the topsoil (surface layer of soil), the water evaporates and creates a thick topsoil rich in minerals.

In extreme conditions, hardened mineral deposits can be harmful to plant growth.

Best soils are those with:

- Enough moisture but not too much
- Rich in humus
- Living creatures such as earthworms (earthworms create air spaces as they tunnel through the ground).

Changes in Soil

- Soil can be changed by 5 different ways
1. Leaching
 - Groundwater seeps downward, taking organic materials and minerals deep into the soil
 - Increase erosion
 - Caused by:
 - Changes in vegetation
 - Changes in water table

Changes in Soil cntd..

2. Pesticide Use
 - Foreign substances introduced into soil
 - Imbalance of natural chemicals
3. Acid Deposition
 - Burning of fossil fuels produce Sulfur Dioxide, forming acid rain
 - Lowers pH in soil
 - Increases leaching in soil by dissolving essential nutrients
 - Fertility of the soil is decreased
 - Plant types can change

4. Fertilizer Use

- Adding artificial compounds to the soil that are high in nitrate, phosphate, and potassium
- Runoff may cause eutrophication

5. Pollutants

- Any toxins spilled can alter soil and affect plants
 - Cars
 - Snow clearing/Salting
 - Sewer
 - Litter
 - Oil Spills
 - Etc.



Pesticides

- Pesticide: a chemical designed to kill a pest
- Pest: any organism that people consider harmful or inconvenient
Ex: weeds, insects, fungi, rodents, etc

Who decides what is a pest or a weed?



Weed?



Vegetable?

Pesticides

- used to kill insects)



Bioamplification

- Results in increasing concentrations of a toxin in the bodies of consumers as the toxin moves up the food chain.
- DDT and many pesticides dissolve in fat, not water. They build up in the fatty tissues of animals. They are not released in urine or sweat.