**10.2 – Water’s Influence on Weather and Climate**

Background

* Weather – The condition of the atmosphere at a specific time during the day.
* Climate – The region’s generalized weather patterns averaged over several decades.
* Factors that influence weather and climate include the following:
  + Earth’s atmosphere
    - Sun is largely responsible for creating Earth’s weather and climate patterns.
    - However, it is the atmosphere that prevents Earth’s climate from being like that of the Moon.
    - The atmosphere moderates the Sun’s effects on Earth, preventing our night temperatures from falling too low and our daytime temperatures from being too high.
    - The atmosphere keeps Earth’s temperatures in a range that allows the planet to be habitable.
  + Earth’s large water bodies
    - Just as the atmosphere moderates the Sun’s effects on Earth, large water bodies, such as the oceans and Great Lakes, moderate the air temperature of the land that is near them.
    - Land near the shores of these water bodies stays much warmer in the winter and at night than do inland areas at the same latitude.
    - Conversely, land near the shores of these water bodies stays much cooler in summer and during daytime than do inland areas at the same latitude.
    - Therefore winters are usually milder and the summers cooler than in areas where there is no water body.
    - Large water bodies release or absorb heat.
    - All materials, not just water, have this capability.
    - Heat Capacity – This is the measurement of how quickly heat is absorbed or released by the materials.
    - It is this capability of water that is responsible for its moderating influence.
    - The heat capacity of water is approximately five times higher than that of dry land.

Example

* There are two places in Canada which are both the same distance away from the equator:
  + Timmins ON
  + Victoria BC
* However, they may be the same distance far from the equator but, Victoria has a warmer climate in the summer and a cooler climate in the winter.
* Timmins on the other hand has a hot climate in the summer and a cold climate in the winter.
* That’s because Victoria is located next to the Pacific Ocean which is a gigantic body of water.
* Timmins has no ocean or a great lake near it so its climate is not that great.
* Large water bodies have an effect on the temperature around it.
* This makes it so that in summer the temperatures are not that high and in winter the temperatures are not that low.

How Water Moderates Air Temperature

* The earth is surrounded with an atmospheric layer.
* In this atmospheric layer, it has the earth’s gasses, and water vapour.
* This is many kilometers above earth.
* The sun's heat waves passes through the layer and radiates heat. (p. 291, Fig. 10.16)
* The land and bodies of water on earth absorb the heat.
* So the heat radiates off the land and bounces back off the atmospheric layer.

Heat Capacity

* Heat capacity is the ability of materials to absorb heat.
* Many scientists use this term when testing to see how long it takes for different materials to absorb heat and to cool down.
* Also, water has a higher heat capacity than land.
* This is because the water can keep more heat for longer and releases it over a longer period of time.
* That is why sometimes on a summer night a pool would be warmer than the air above it.

Moderation in Action

* Water does take longer to absorb heat but it can absorb a lot more heat than land.
* If there are large bodies of water like oceans or lakes it will result in enormous amounts of heat being released constantly into the atmosphere.
* This “moderates” the areas nearby in two different ways. (p. 292, Fig. 10.17)
  + In the summer when the sun is out the land gets a lot hotter than the water nearby.
  + When the warm air from land raises the cooler air from the water and blows it and replaces the heated air from land.
    - This keeps the coast at a lower temperature then areas farther away from inland. The exact opposite happens in winter.
      * The warmer air from the ocean replaces the cooler air from land.

Water Bodies and Regional Climate

* In every single part of the world, the existence of large bodies of water changes the climate in the region.
* The great lakes are noted to have big changes on the areas around them.
* The water keeps the temperature both in summer and winter considerably moderate.
* The large bodies of water also give off a lot of moisture.
  + This moisture turns into snow in the winter.

Microclimates

* The great lakes are the cause of small areas of microclimates.
* A microclimate is a small area which has a different climate than the one in the surrounding regions.
* Microclimates happen in small areas.
  + For example, they can be inside a greenhouse. (p. 293, Fig. 10.18)
    - The climate inside the greenhouse would be warmer than the one outside the greenhouse.

Water Bodies and Global Climate

* Bodies of water affect climate at a regional scale, but their influence is also felt on the much larger global scale.
* When you look on a globe or a world map, you may have noticed that the world’s continents are not equally distributed between the two hemispheres. (p. 294, Fig. 10.19)
  + The northern hemisphere is 39% land and 61% water, but the southern hemisphere is only 19% land and 81% water.
* The greater amount of water on the southern hemisphere causes the moderating effect on the southern hemisphere’s climate to be significantly greater than on the northern hemisphere’s climate.
  + In the southern hemisphere, the annual average temperatures vary by only about 7.3OC from summer to winter.
  + While in the Northern hemisphere the temperatures vary by about 14.3OC.

Coastal Storms

* Dramatic weather events such as hurricanes or costal storms happen when air moves across warm bodies of water.
  + For example, hurricanes start out as a storm over warm ocean waters.
  + As its air mass begins to swirl rapidly its winds take on speed until it reaches speeds of at least 119 km/h, which now classifies the storm as a category one hurricane.
* If a hurricane reaches land, the damage can be horrible such as what happened when Hurricane Katrina or Hurricane Sandy hit. (p. 294, Fig. 10.20)
* Certain parts of the world often get hit by hurricane and tropical/costal storms.
* Although most hurricanes don’t get very far inland before they breakup, their after effects can be felt very far inland.
  + Some hurricanes do make it far inland, like Hurricane Hazel which struck the Toronto area in late 1954.
* The Great Lakes are well known for the winter storms they can help create.
  + When cold weather from Alberta reaches the Great Lakes, it reaches there by about the same time when storm systems from the US reach there.
  + As they both pass over the lakes, the air and water interactions create high winds and large amounts of precipitation.