Grade 8 Science

Unit 1: Water Systems on Earth
Chapter 2

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## Origins of ocean water

- Oceans have filled over hundreds of millions of years
- Scientists believe the oceans are more than 3 billion year old.
- Water may have originally been released from volcanic eruptions when the vapour from the eruptions cooled and condensed.
- Some believe the water came from ice comets.

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## Earth's Oceans - pg 38


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There are four processes that lead to the development of ocean basins:

1. Plate Tectonics
2. Volcanic actions
3. Erosions
4. Glaciation

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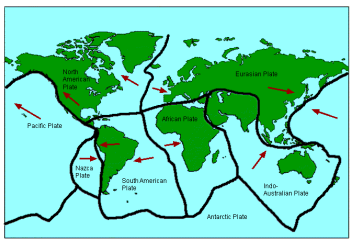
## 1. Plate Tectonics

- Pieces of the land move over the Earth's surface
- Changes position of the continents
- Influenced where ocean basins are located

http://www.youtube.com/watch?v=ryrXAGY1dmE&noredirect=1
http://www.youtube.com/watch?v=TZZGPfVx32M



› http://www.ucmp.berkeley.edu/geology/anim1.html

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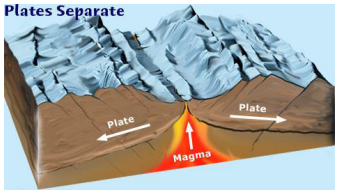
## 2. Volcanic Action

- Underwater volcanoes are generally found at the edges of tectonic plates
- When volcanoes erupt underwater, new oceanic crust (ocean floor) is formed by the hot molten rock slowly cooling and solidifying
- Volcanoes have built ocean floor along mid-ocean ridges in areas where plates separate
- Volcanoes have helped build continental divides in areas where plates have collided and mountain building occurs




http://science.howstuffworks.com/nature/231-how-volcanoes-work-video.htm

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## 3. Erosion

- The process by which the surface of the earth is worn away by the action of water, glaciers, winds, waves, etc.
- Erosion has further developed continental drainage systems as material is removed and deposited into the ocean basins.

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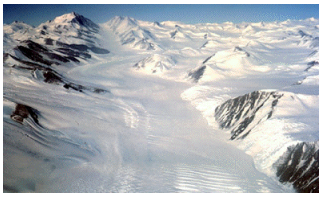
## 4. Glaciation

- A force of erosion in the development of continetal drainage systems.
- When glaciers melt, the water that they release wears away the earth as it flows down to the oceans and other drainage basins.



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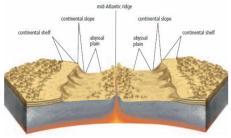
## The Ocean Basins - Page 41

1. The Continental Shelf: from the edge of the water to the "drop-off" zone.

2. The Continental Slope: the "drop-off" (from the pelagic zone to the benthic zone)

3. The Abyssal Plain: the wide, flat areas of the ocean floor, they are made up of sediment from earthquakes that cause underwater landslides, or simply by gravity.

4. Mid-ocean Ridge: ocean ridges are formed when two tectonic plates are pushed apart. magma oozes up through the gap and forms a mountain chain (like a scab). the largest is the mid-Atlantic ridge.

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Examples of Canadian institutions that do research involving oceans:

* Environment Canada
* Federal Fisheries
* Ocean Science Centre
* Centre for Cold Ocean Research C-CORE @ Memorial University


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## Technologies used to research the ocean floor:

1. Sonar
2. Satellites
3. Underwater photography/videography
4. Submersibles
5. Diving

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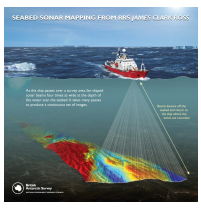
## 1. Sonar:

* Sound waves are sent down from a ship
* Can be used to map underwater mountains, valleys, and canyons on the ocean floor.

http://www.youtube.com/watch?v=-fAAxEIFeLU



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## 2. Satellites:

* Orbit the earth, use radar, infrared light, or other technologies to measure features on the ocean floor.
* surveys large areas of oceans in a short period of time.
* gathers information from buoys about water and air temperature for weather stations.

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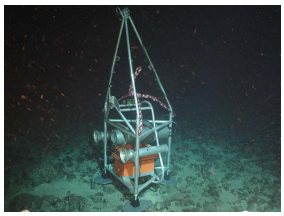
## 3. Underwater photography/videography:

* Cameras take high resolution (clear) underwater photos and videos.
* Can go up to 6000m beneath the surface.



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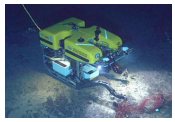
## 4. Submersibles (submarines):

* Small but extremely strong vehicles (because of the high pressure underwater) that are capable of travelling to great depths.

2 Types:

1. Remotely-operated Vehicles (ROV):
   People control it from a ship
   Advantage: Can stay down for long periods of time and go to further depths than manned submersibles



http://www.youtube.com/watch?v=VpFUIXCCOCA

2. Manned Submersibles:
   Carry people inside
   Advantage: People can make their own observations of the deep sea.

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## 5. Diving:

* New technology allows people to dive deeper than ever before, but they still cannot go as deep as other technologies.

Advantage: People can make their own observations.

Although all of these technologies help our understanding, no single data collection method provides a complete picture of the ocean floor.

*undersea adventure activity*

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## Ocean Currents

A large amount of ocean water that moves in a particular and unchanging direction.

http://www.youtube.com/watch?v=4DlqVuNMydk
http://www.youtube.com/watch?v=4sKb741To64


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* There are more than 20 major currents in the world
* Largest: Antartic Circumpolar Current

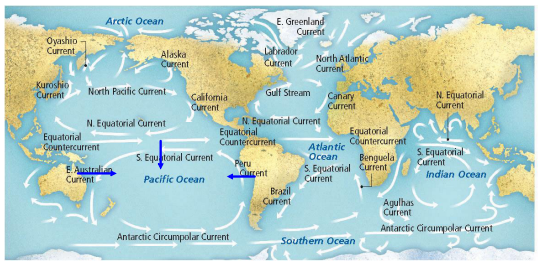


Figure 2.13 There are many different currents on the ocean surface.

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## Local ocean currents:

1. Labrador Current:
   Cold water from near Greenland.
2. Gulf Stream:
   Warm water from the tropics.

These currents run by the Coast of Newfoundland and Labrador through the Atlantic Ocean.

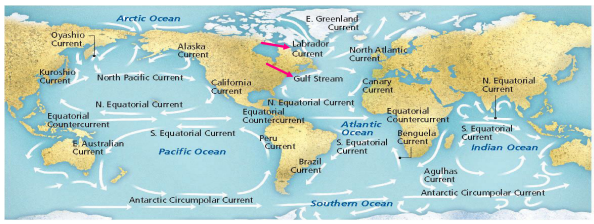


Figure 2.13 There are many different currents on the ocean surface.

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Waves: Large ripples set in motion by steady winds.

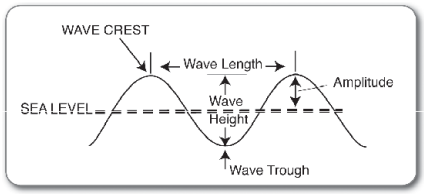
* Waves on the surface of water are the result of a transfer of energy from moving air to the water.

Crest: The highest part of a wave.

Trough: The lowest part of a wave.

Wavelength: Distance from crest to crest OR trough to trough.
i.e length of a wave before it repeats itself.

Wave height: The distance from trough to crest of a wave.




Bill Nye video

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## Tsunamis:

Giant waves that can be sent in motion by earthquakes on the ocean floor, landslides or volcanic eruptions near the shoreline.

Newfoundland had a tsunami in 1929

http://www.youtube.com/watch?v=5-ZFCBCq-8I
http://www.youtube.com/watch?v=dD2oYmCbGuc

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## Erosion & Deposition

Weathered: the breakdown of rocks into smaller particles.

Erosion: the moving of sediment (weathered particles).

Deposition: when eroded material is dropped or left behind.

Erosion and deposition have a huge impact on our shorelines.

http://www.youtube.com/watch?v=Rj8ZYr-S7vo

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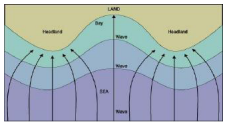
## How waves interact with shorelines

1. The shape of the shoreline.
   * Wave energy is concentrated on headlands and spreads out as it reaches bays.
   * Headlands are the parts of the shore that stick out furthest in the water. Bays are the parts that stick in the most.



2. The slope of the shoreline
   * As rocks rub against each other in the wave water, fragments of rocks are smoothed out and ground down to smaller pieces (pebbles/sand).
   * If the shoreline has a steep slope, the fragments will get washed out to sea, leaving a very rocky shoreline.
   * If the shoreline has a more gradual slope, the rock fragments will build up, creating a sandy beach.

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## How erosion and deposition affect...

### Beaches
* Sand and sediment are always being removed (eroded) and deposited by waves. Sediments are deposited by size.

### Shoals & Sand bars
* Deposition of sediments resulting in localized shallowing of the water.

### Sea Caves
* Headlands are eroded all the way through the headland.

### Sea arches
* Occurs when a sea cave is eroded all the way through the headland.

### Sea stacks
* Occurs when the top of a sea arch becomes weak and caves in (erosion).

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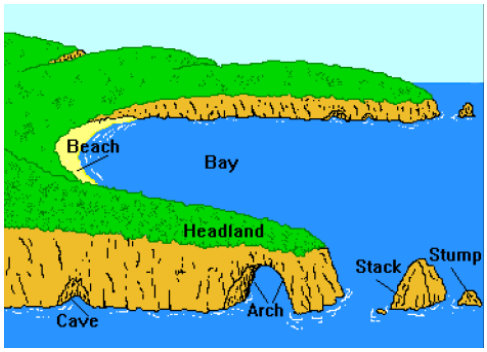


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3. The type of rock material
   - Depending on the type of rock that the shoreline is made of, the waves can erode the shoreline more quickly.
   - Softer rock, like sandstone, will erode at a faster rate than more resistant types, such a shale.
   - Ex: the red rocks found in St. George's erode faster than the cliffs of Bell Island in Conception Bay.
   - If a shoreline is made of both types of rock, you will see uneven erosion. This is how headlands and bays are formed.
   - Headlands are always made of a harder material than bays are.

4. The wave energy:
   - Higher wave energy will erode a shoreline more quickly than lower wave energy will.
   - Places that have more wind will have stronger waves with more energy.

http://www.bbc.co.uk/schools/riversandcoasts/coasts/change_coast/pg_05_flash.shtml

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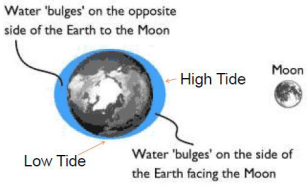
## Tides

The slow rise and fall of the water level of the ocean.

The upper and lower edges of a beach are determined by the high-and-low tide mark.

Connected to the motion of the moon and spinning of the earth

Moon exerts a greater force of pull than sun since it is closer to the earth.




Tidal Range: the difference between high and low tides

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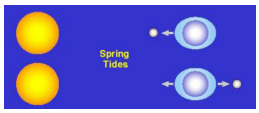
## Types of Tides:

1) Spring Tide:

Occurs twice a month when Earth, Sun and Moon are in a line.

Tidal Range is greatest.

Causes extra high and low tides.




Extra pull means extra tidal difference

2) Neap tides:

Occurs twice a month when Sun and Moon are at right angles to one another.

Water is getting pulled in two directions, which cancels out the overall effect.

Tidal range is smallest.


http://www.youtube.com/watch?v=KFYF_jt4615

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## Technologies designed to contain damage due to waves:

1) Breakwaters:
A barrier that protects a harbor or shore from the full impact of waves.

2) Jetties/Wharves:
A structure (pier), that projects into a body of water to influence the current or tide or to protect a harbor or shoreline from storms and erosion.

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3) Vegetation:
Plants along the shoreline can keep erosion from affecting shoreline.

In image, roots of the trees block erosion forces from damaging coast.

4) Sea Walls:
Protective structures of stone or concrete.

Extend from shore into water to prevent beach from washing away.

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Use your notes and text book to answer these questions:

Page 77: #'s 1, 3, 4, 5, 8, 10, 11

Page 78: #'s 2, 3, 4, 6, 7, 11, 12, 13, 14, 15, 17, 21, 22, 24

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## Attachments

 Waves.avi