

NOTES CH 14 –OCEAN FLOOR FEATURES + SEDIMENTS

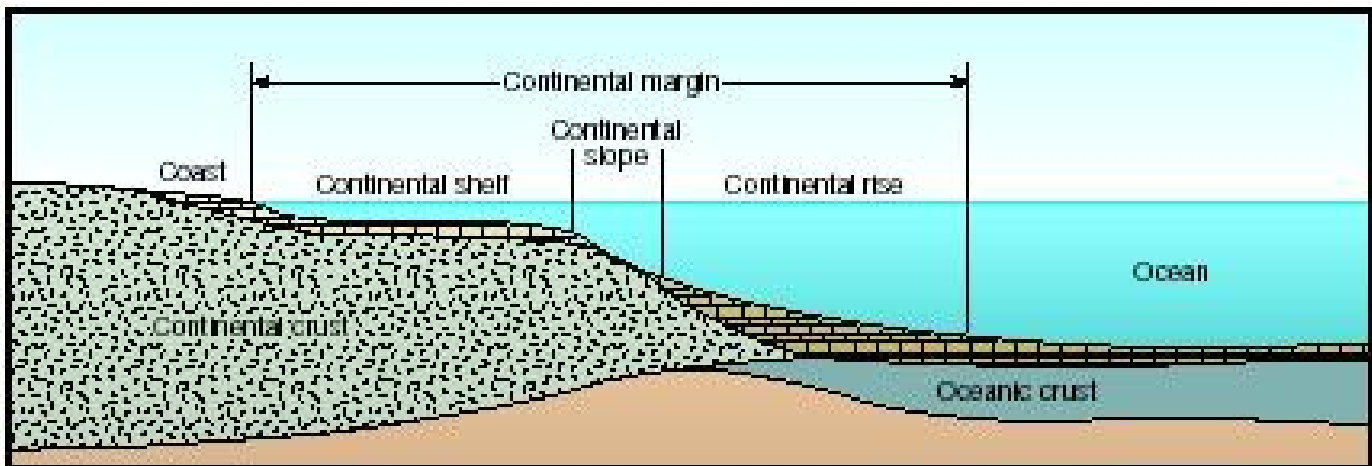
OCEANOGRAPHY - the study of ALL aspects of the ocean

BATHYMETRY - the study of the ocean's depths and topography

TOPOGRAPHY - the study of the shape and landforms of the ocean

1. OCEAN TOPOGRAPHY

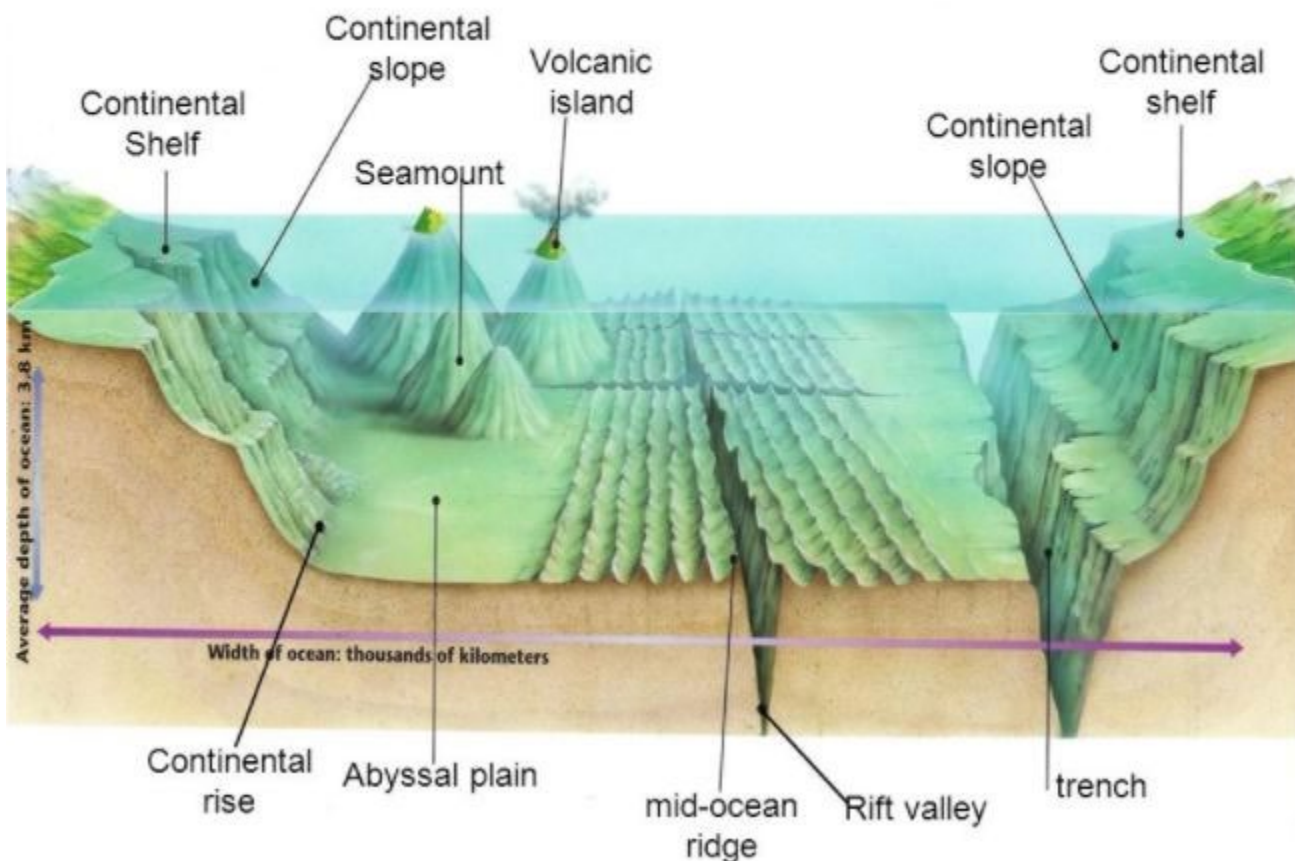
- a. Continental Margin- the transition zone between land's edge and the floor of the ocean (all of the downhill tilt) It can be separated into:
 - i. Continental Shelf- the first gentle slope
 1. Up to 130 meters deep
 2. Light completely penetrates
 3. Can be very small up to 1500 km wide (80 km average)
 4. Ocean fishing happens here
 5. Has oil, natural gas, sand, and gravel resources
 - ii. Continental slope– 5-25 degree slope just after the shelf
 1. 20 km wide
 2. Has submarine canyons- (valley like grooves worn away by turbidity currents)
 3. Turbidity currents - dense sediment filled water that erodes and transports sediment
 - iii. Continental Rise - gentle slope between continental slope and ocean floor
 1. Has many alluvial fans from submarine canyon sediments
 2. May be hundreds of kilometers wide



- b. Ocean Basin Floor- flat zone from continental rise to the mid ocean ridge which contains:
 - i. Abyssal plains- very flat regions
 1. Sediment buries and “flattens out” the rough ocean floor
 2. Flattest places on earth
 - ii. Deep ocean trenches - narrow cracks in the ocean floor
 1. Deepest places on earth
 2. Most are found along the margins of the Pacific Ocean
 3. Many more than 10,000 meters deep
 4. Mariana Trench- deepest 11,022 meters

- iii. Seamount - underwater volcanic mountain
 1. Most of Earth's mountains are underwater
 2. If they reach the surface they make islands
 3. Deep currents that hit the mountains flow up the sides bringing vital nutrients to the surface waters,
 4. Thus creating zones filled with life just above the mountain
- iv. Guyot- volcanic island that eroded flat, then sunk back down underwater
- v. Mid Ocean Ridge - mountain chains underwater
 1. 70,000 km long mountain chain
 2. Wraps around earth like baseball seams
 3. Form at divergent boundaries
 4. New ocean floor forms here
- vi. Hydrothermal vents - underwater geisers of extremely hot mineral rich water
 1. Called black smokers or white smokers
 2. Water is hotter than boiling, but can't due to pressure
 3. Ecosystem here is based on chemosynthesis performed by bacteria

The Ocean Floor



2. Seafloor sediments - particles of various sizes that coat and cover the entire ocean
 - a. Terrigenous sediment - sediment from the land
 - i. Eroded rocks on the continents
 - ii. Transported to the ocean by rivers
 - iii. Accumulates rapidly near the shore
 - iv. Takes a long time to accumulate in the open ocean
 - b. Biogenous Sediments- sediment from living things
 - i. Shells and skeletons
 - ii. Bones, teeth, scales
 - iii. Glass bodies of diatoms
 - iv. Dissolve and break to bits as they sink
 - c. Hydrogenous Sediment - minerals that crystalize from a chemical reaction

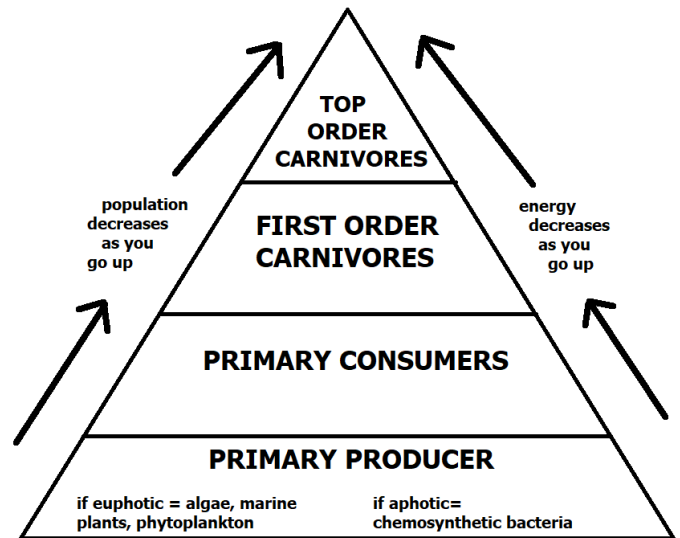
NOTES: OCEAN WATER PROPERTIES CHAPTER IS-I NAME _____ Hr ____

- I. Ocean water has dissolved substances in it
 - a. DISSOLVED GASES—the main dissolved gases are nitrogen, oxygen, and carbon dioxide. The ocean is considered a CARBON SINK because it has dissolved 60x more carbon dioxide than what the atmosphere holds.
 - i. Gases can come in from the atmosphere
 - ii. Gases can come in from rivers entering the ocean
 - iii. Gases can enter by volcanoes going off under water
 - iv. Gases can enter because organisms living in the oceans also release gases
 - b. Temperature affects the amount of dissolved gases
 - i. The colder the water, the more gases can dissolve in it
 - ii. The warmer the water, the less gases can dissolve in it
 - c. Dissolved solids—water is about 3.5% dissolved solids
 - i. Most abundant solids- chlorine, sodium, magnesium, sulfur, calcium, potassium
 - ii. Source of the solids- solids are brought in by
 1. flowing rivers that empty into the ocean
 2. Volcanic eruptions
 3. Chemical weathering of rocks
 4. Chemical reaction between sea water and new sea rocks
- II. Salinity—measure of the amount of dissolved solids in water
 - a. What percent salt does our water have?
 - i. Fresh= .1% salt
 - ii. Ocean= 3.5% salt
 - b. Factors that change salinity
 - i. Freezing- when water freezes, only the water molecule sticks to the ice and the salt is left behind. The ocean is now more saline (more concentrated with salt)
 - ii. Evaporation- if the evaporation rate is greater than the precipitation rate, the salinity increases. Water is flying up in to the air and the salt stays behind in the water. The ocean is now more saline (more salty)
- III. Ocean temperature layers
 - a. What are the temperature layers called?
 - i. Surface- sea level down to 300 meters- it's all about the same temperature due to mixing, and the sun can reach down this far
 - ii. Thermocline- 300 meters down to 500 m- temperature ranges from 22 degrees C down to 5 C.
 - iii. Deep zone- 500 m to bottom of ocean- temperature is near freezing but doesn't change much – 5c to 3 c
 - b. How does temperature affect density?
 - i. Cold water sinks because it is more dense
 - ii. Warm water rises because it is less dense

- I. **ECOLOGY**- the study of how organisms interact with each other and the environment
- II. What is an ecosystem?
 - a. **ECOSYSTEM** – all the biotic and abiotic factors in a particular environment
 - i. **Biotic**- living
 - ii. **Abiotic**- non-living (air, water, temperature, rocks, sediment, weather, etc.)

III. What are the **NICHES** (jobs organisms have) in ecosystems?

- a. **Primary producers**
 - i. the original source of food in the ecosystem
 - ii. All other life depends on primary producers
 - iii. they have the greatest biomass in the community
 - iv. the greatest amount of energy is found in the producers
- b. **Primary consumers**
 - i. get their energy directly from the primary producers by eating
 - ii. get their energy indirectly by living symbiotically with them
- c. **First order carnivores**
 - i. prey on the primary consumers and in turn are eaten by other animals
- d. **Top order carnivores**
 - i. eat other consumers and carnivores but are rarely hunted by other creatures
 - ii. have the smallest biomass in the community
 - iii. have the least amount of energy in their tissues



IV. How are marine life zones categorized?

- a. By the availability of sunlight
 - i. **Photic** – top zone
 - 1. Sunlight fully penetrates
 - 2. The presence of sunlight allows for photosynthesis
 - 3. The bottom of the food chain is therefore **phytoplankton**, microscopic organisms that can do photosynthesis.
 - 4. Zone goes down 100 meters
 - ii. **Disphotic** – aka “the twilight zone”
 - 1. Sunlight is very dim
 - 2. Bright enough to find mates or prey
 - 3. No photosynthesis

- iii. **Aphotic** – bottom zone
 - 1. No sunlight penetrates at all
 - 2. No photosynthesis is possible
 - 3. No plants can grow here
 - 4. No phytoplankton can grow here, but there is **zooplankton**, microscopic organisms that are consumers
 - 5. The bottom of the food chain is **chemosynthetic bacteria** – make their own food by processing toxic gasses coming from deep within the earth

b. By the distance from the shore

i. **Intertidal** zone

- 1. Covered and uncovered by seawater
- 2. Place where tides occur
- 3. Constant changes in temperature, salinity, and moisture

ii. **Neritic** zone

- 1. Found along gently sloping continental shelf
- 2. “rainforest” of the ocean
- 3. Very biodiverse
- 4. Light reaches to the bottom, so lots of photosynthesis

iii. **Oceanic** zone

- 1. Open ocean
- 2. Reaches great depths
- 3. Low nutrients (minerals that are needed from ocean floor)
- 4. Lower populations

c. By the water depth

i. **Pelagic** – open ocean of any depth

- 1. Contains animals that swim or float freely

ii. **Benthic** – any sea bottom, but the slant in particular

- 1. Some parts can be lit if closer to shore
- 2. Animals attach to, crawl on, or burrow into ocean floor
- 3. Scavengers of “ocean snow”

iii. **Abyssal** zone – deep ocean floor

- 1. No light
- 2. Scavengers of “ocean snow”
- 3. **Chemosynthesis** near hydrothermal vents

V. What are the Symbiotic relationships?

- a. **Mutually beneficial**- both species benefit
- b. **Commensalism**- 1 species benefits, and the other is unharmed (or doesn't care)
- c. **Parasitism** – 1 species benefits, but the other is harmed

VI. How are marine animals classified? By how they move and where they live

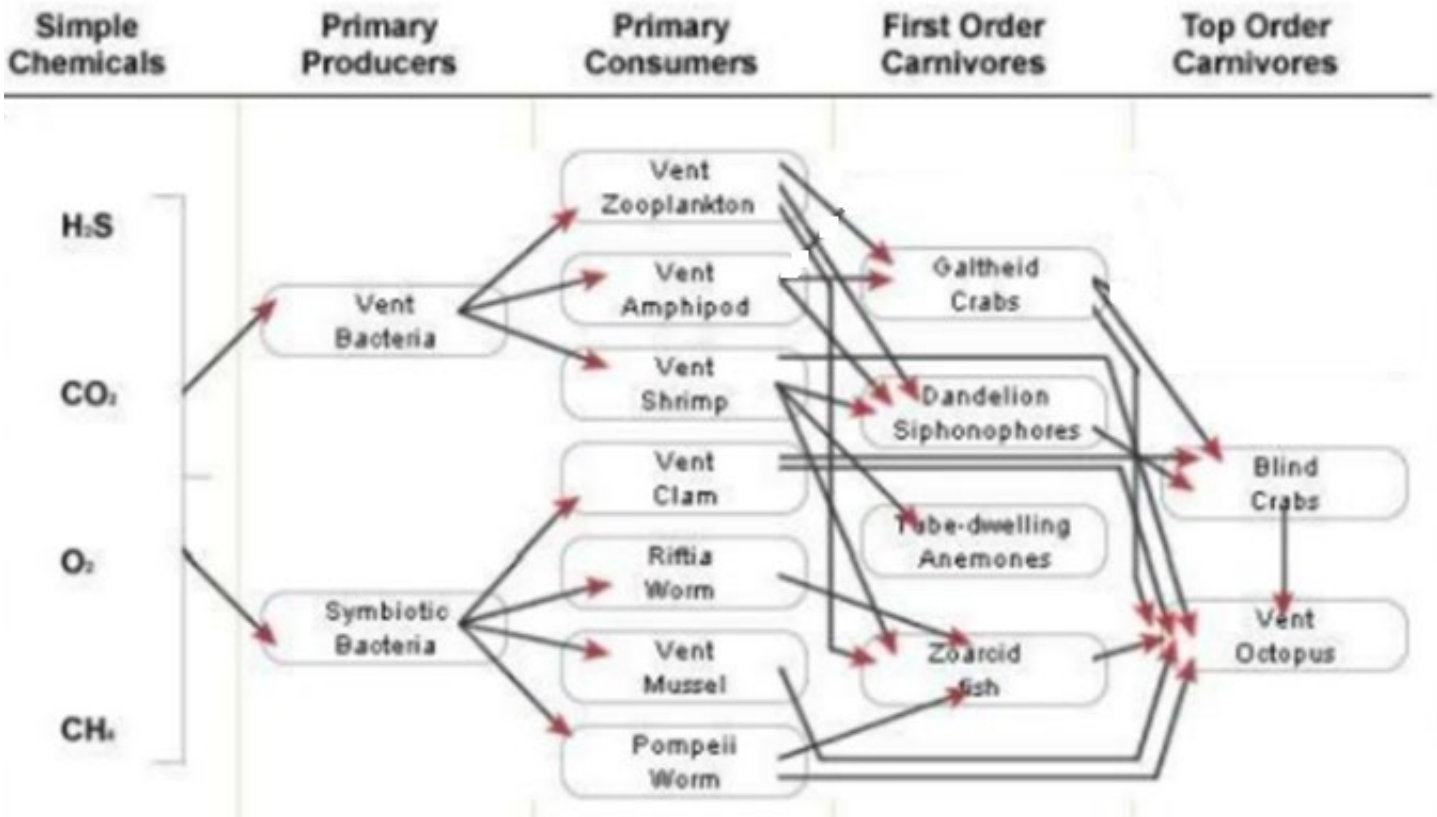
- a. **Plankton** – floaters
 - i. **Phytoplankton**- make their own food by photosynthesis
 - ii. **Zooplankton**- consume their food (eat phytoplankton)
- b. **Nekton** – animals that can swim (independent of ocean currents)
- c. **Benthos**—animals that live on or in the ocean bottom

VII. How is energy flow diagrammed?

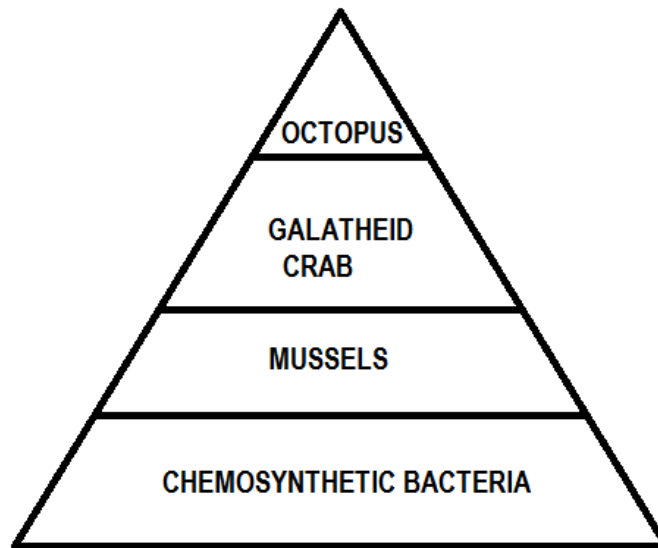
- a. **Food chain**- a simple diagram showing how a single chain of organisms pass their energy into each other



- b. **Food web**- a complex diagram showing the many ways energy flows between organisms



- c. **Energy pyramid**- a diagram that shows amounts of energy and population numbers in an ecosystem
- i. The bottom of the pyramid is wide because
 1. the lowest trophic level has the highest population
 2. the lowest trophic level has the highest amount of energy
 - ii. the pyramid gets thinner as it rises showing
 1. decreasing populations
 2. energy loss with every level jump
 - iii. the top level is smallest because
 1. it has the lowest population
 2. it has the lowest amount of energy



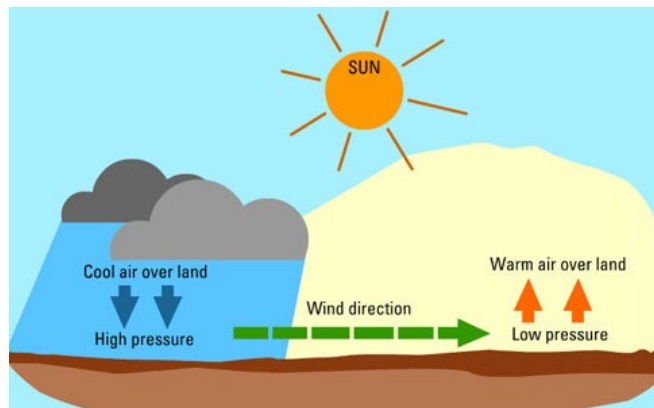
I. Ocean currents = a horizontal movement of water in a well-defined pattern

A. **SURFACE CURRENTS** = a horizontal movement of ocean water at or near the surface of the ocean.

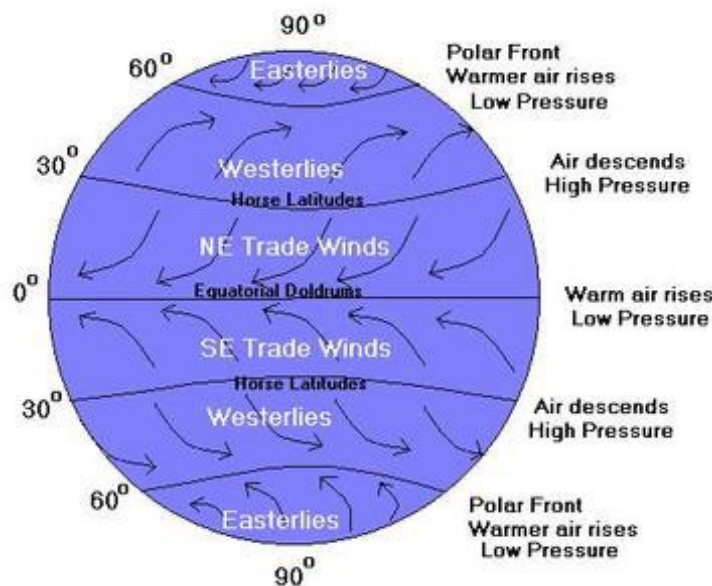
1. Three factors that control surface currents

a) AIR CURRENTS (WIND)

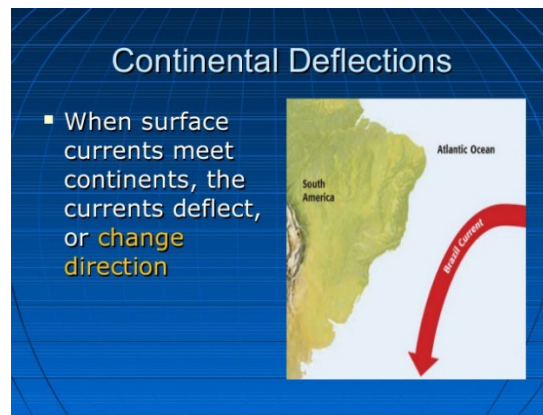
- As air in areas of low pressure rise and air in areas of high pressure sinks, wind is created.
- Air always moves from high pressure towards low pressure.
- The wind's kinetic energy is transferred to the ocean surface water as the air flows over it.



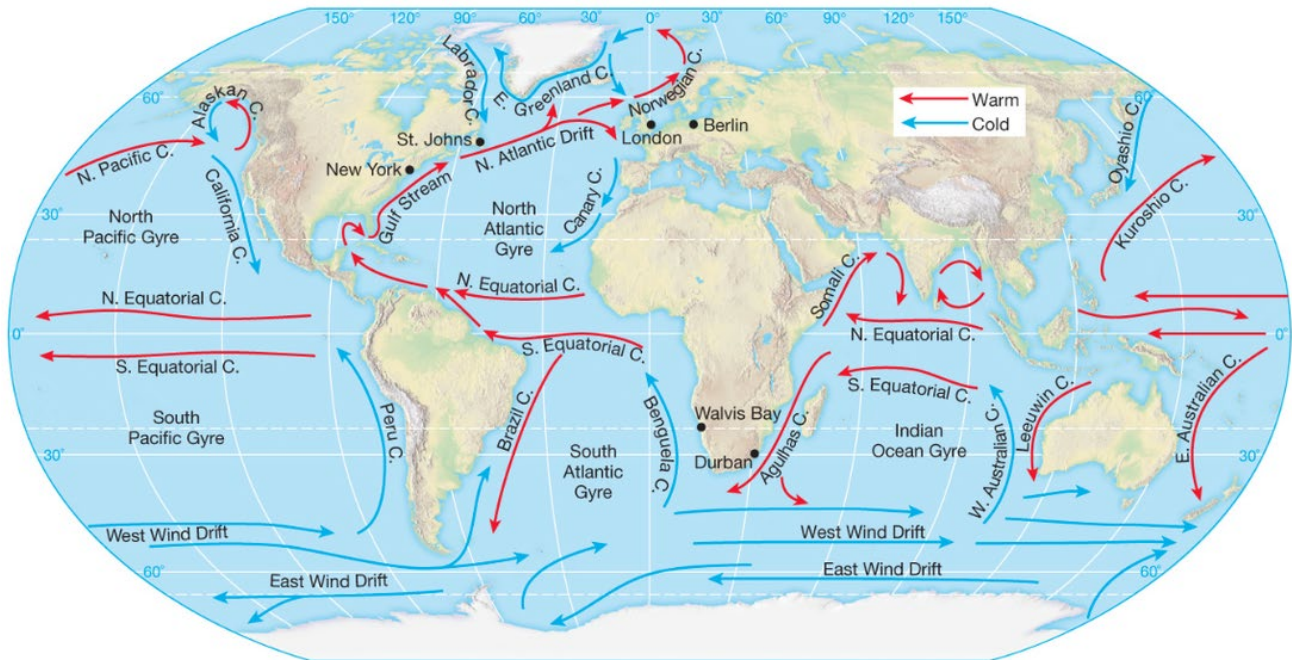
b) EARTH'S ROTATION (CORIOLIS EFFECT) = the curved path wind or water takes due to Earth's rotation. The Coriolis effect forms the global winds that drive ocean surface currents.



c) Location of CONTINENTS



2. Major surface currents

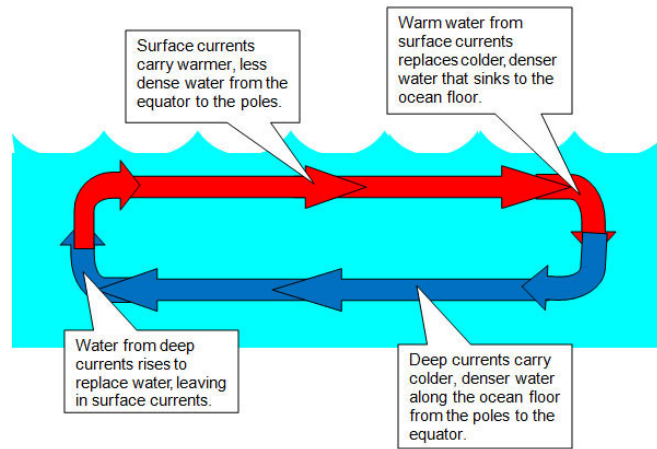


B) Deep currents = a stream-like movement of ocean water far below the surface.

1. Three factors that control deep currents

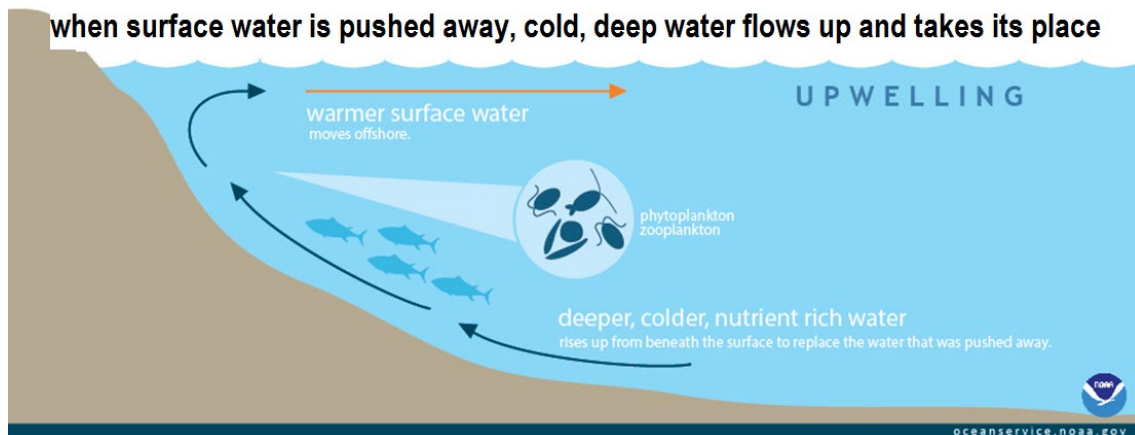
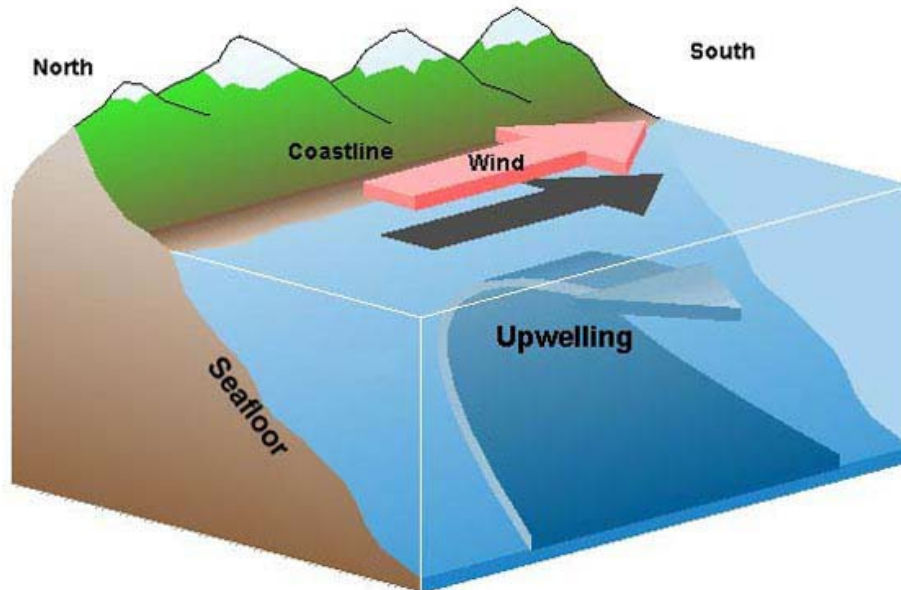
a) temperature

- cold, dense polar water sinks and flows below
- warm, less dense equatorial water rises and flows above
- in general, cold deep water from the poles flows toward the equator, and
- warm shallow water from the equator flows toward the poles



b) wind at surface- surface winds can create an **UPWELLING** – a deep current that flows up to the surface along a coastline. How it works:

1. when wind blows along a coastline, it pushes water 90 degrees in the other direction.
2. The water moves away from the coast and out to sea.
3. Deep, cold water from below rises up to take its place.



c) **Salinity** – how salty the water is

- water that is more **saline** sinks because it is more dense
- water that is less saline stays on top because it is less dense

C) Turbidity current = a strong current caused by an underwater landslide

