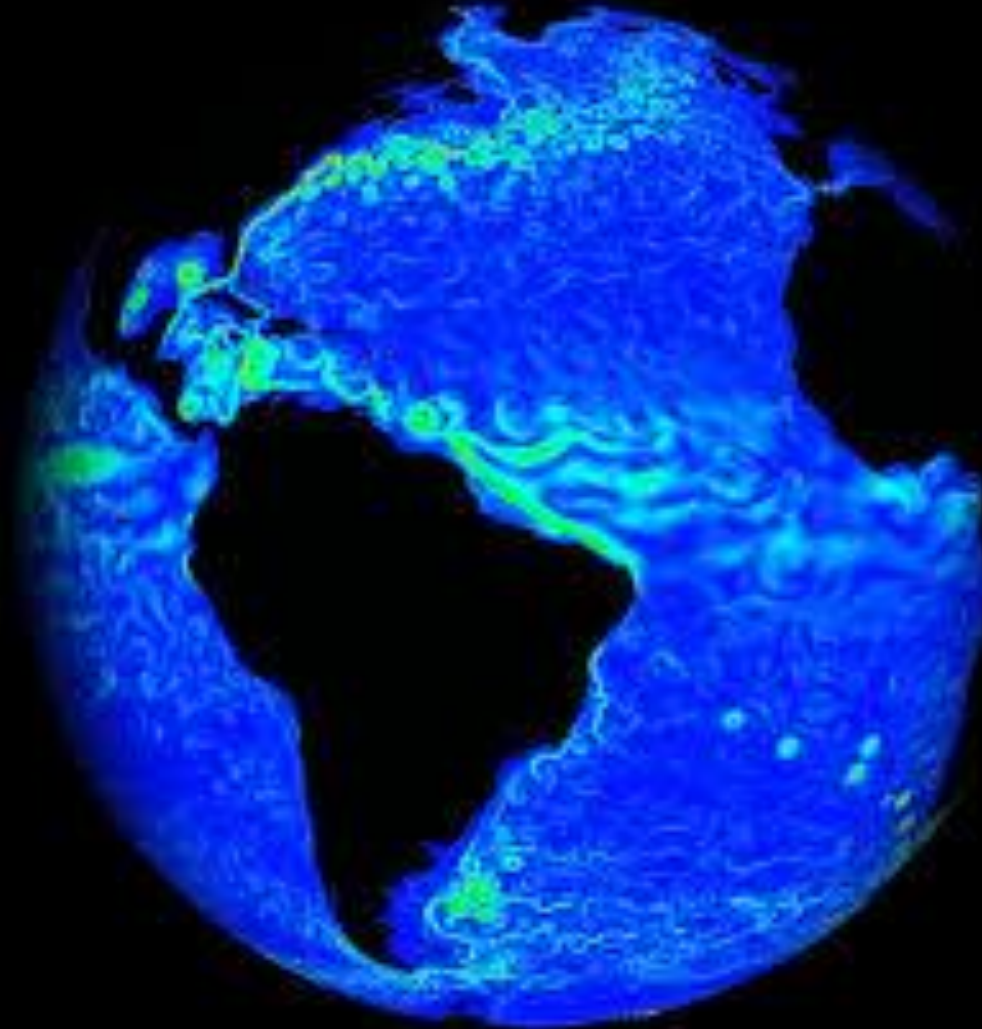




# HYDROSPHERE

# Hydrosphere (Water Sphere): Water of the planet



**71 % of the  
Earth's surface**

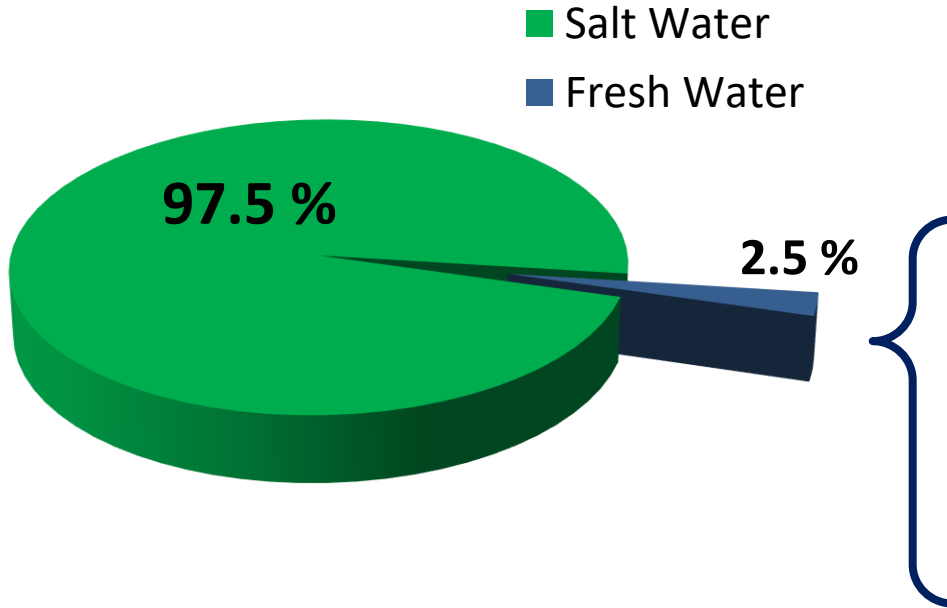
# Distribution of Water

Salt water vs Fresh water

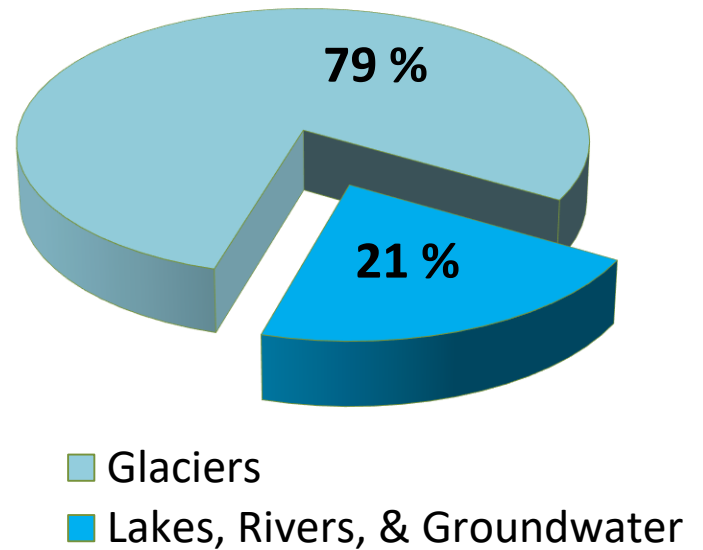


# Distribution of Water

## World's Water



## Fresh Water



# Inland Waters

All freshwater bodies found on continents



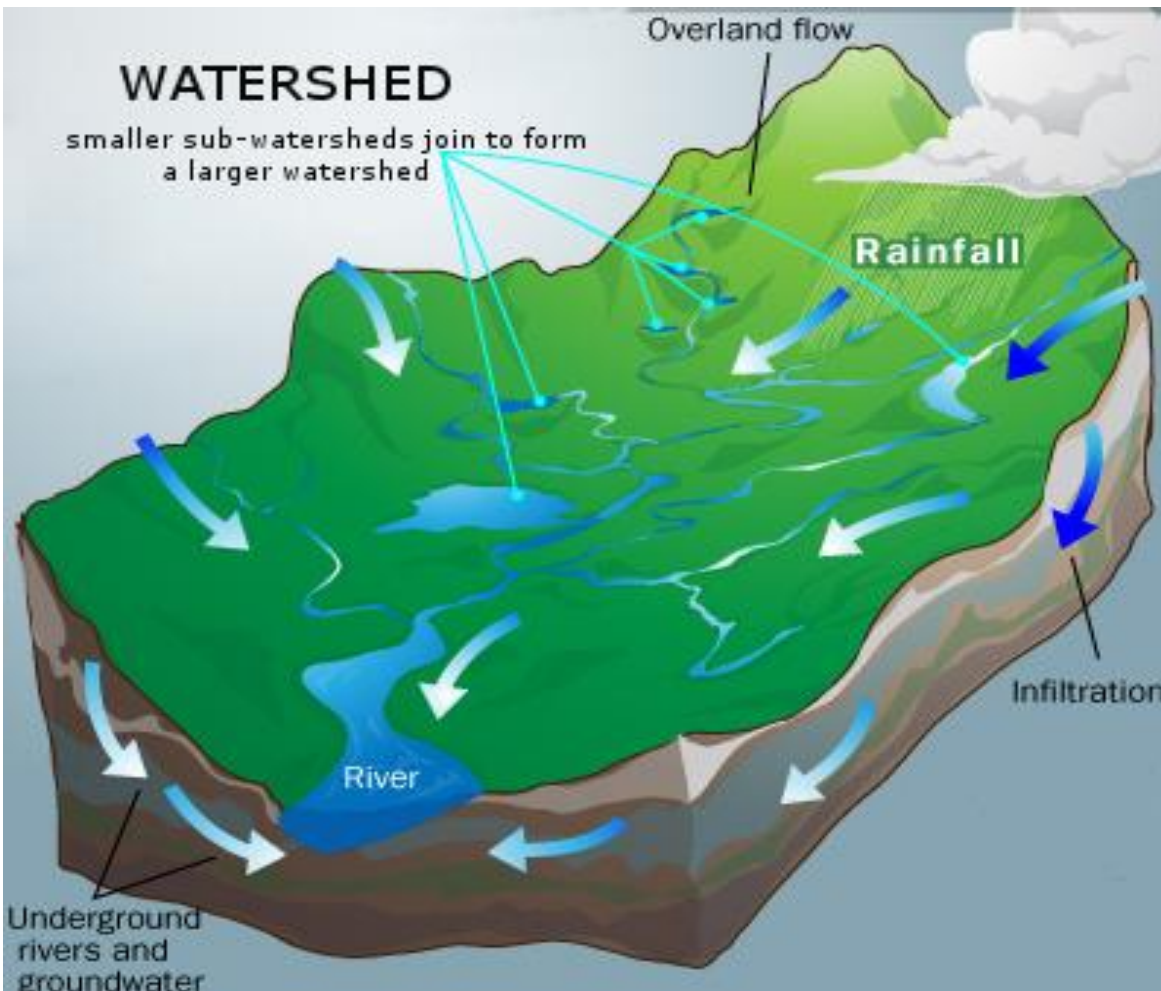
# Inland Waters

All freshwater bodies found on continents  
(includes rivers, lakes, and groundwater)

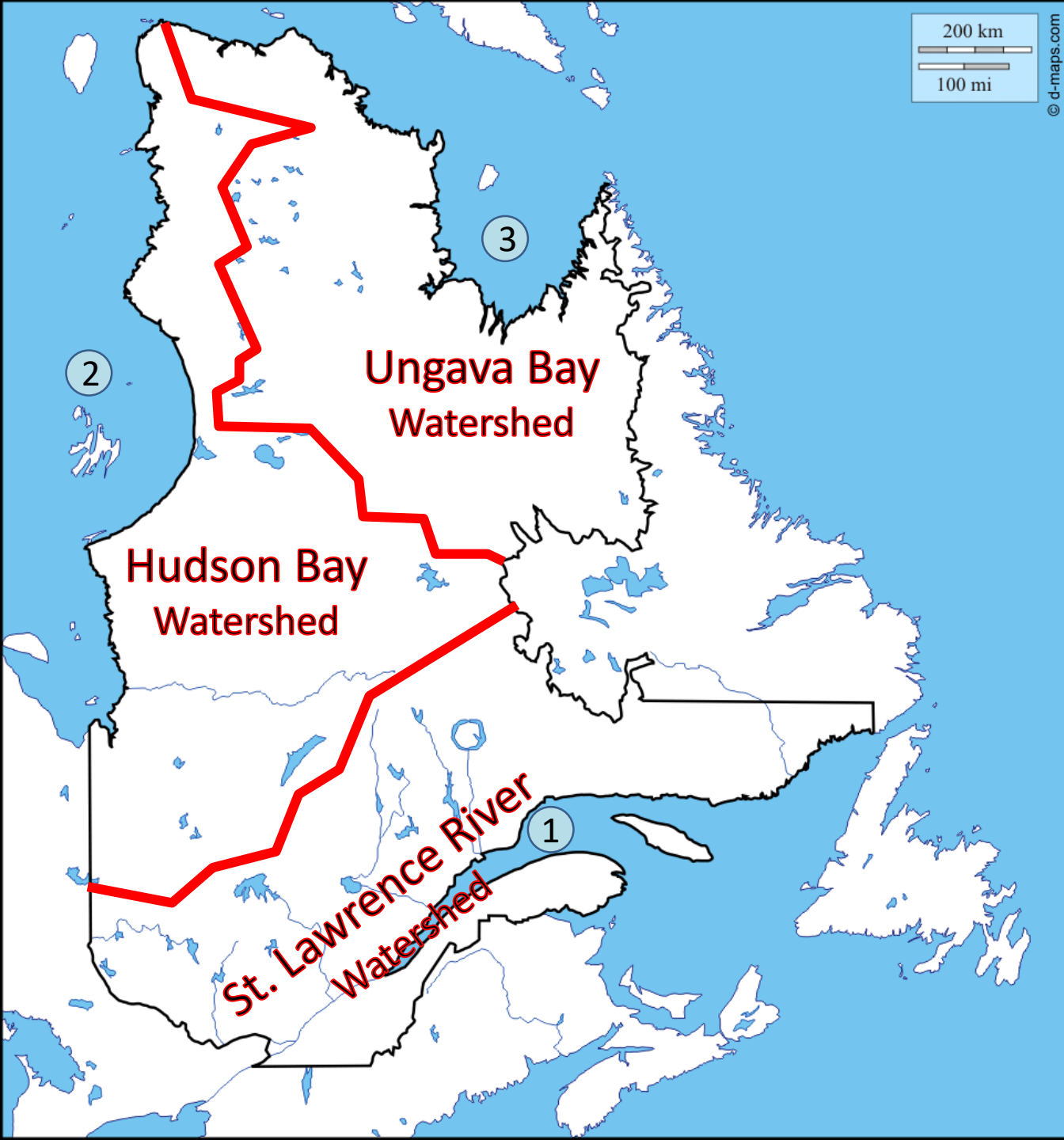


# Watershed (Also known as Catchment area or Drainage basin)

Area of land in which all inland waters drain into a same larger body of water.



The outline of a watershed is defined by natural boundaries (mountains, hills, etc...)



# Quebec Watersheds

**3 major watersheds of Quebec**

Each watershed is made up of many smaller watersheds



## Lake Champlain - Richelieu River watershed



## Quebec Watersheds

**3 major watersheds of Quebec**

Each watershed is made up of many smaller watersheds

# The Oceans



# Oceans of the World

(3)

**ARCTIC OCEAN**

(2)

**PACIFIC OCEAN**

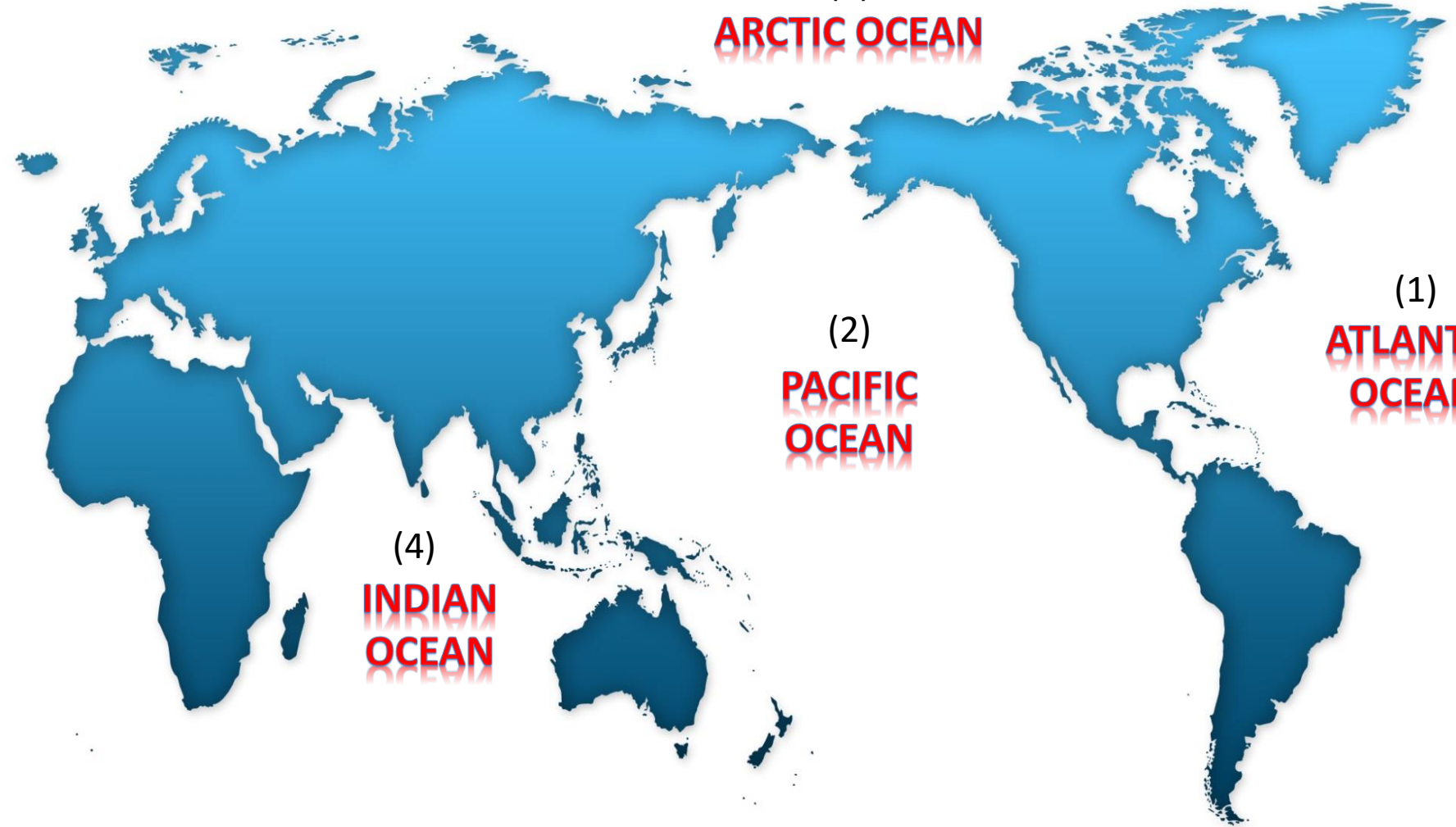
(1)

**ATLANTIC OCEAN**

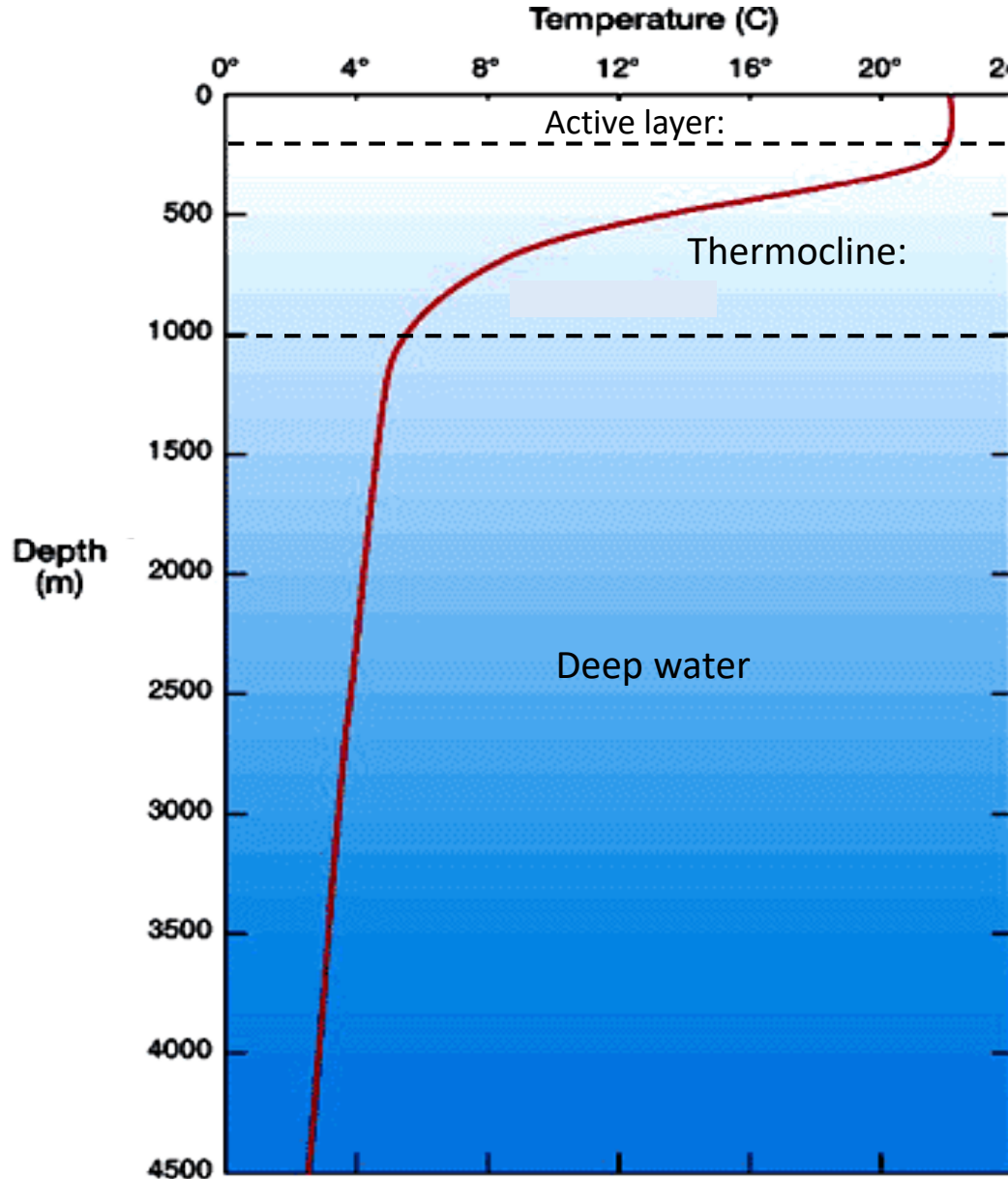
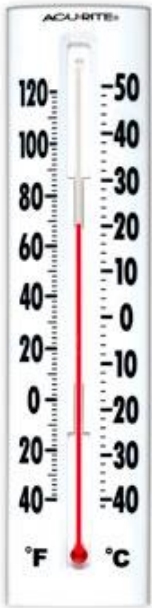
(4)

**INDIAN OCEAN**

(5) **SOUTHERN OCEAN**



# Factors that affect Water Temperature ➤ Depth



(0 – 200m)  
Solar energy is absorbed near the surface.

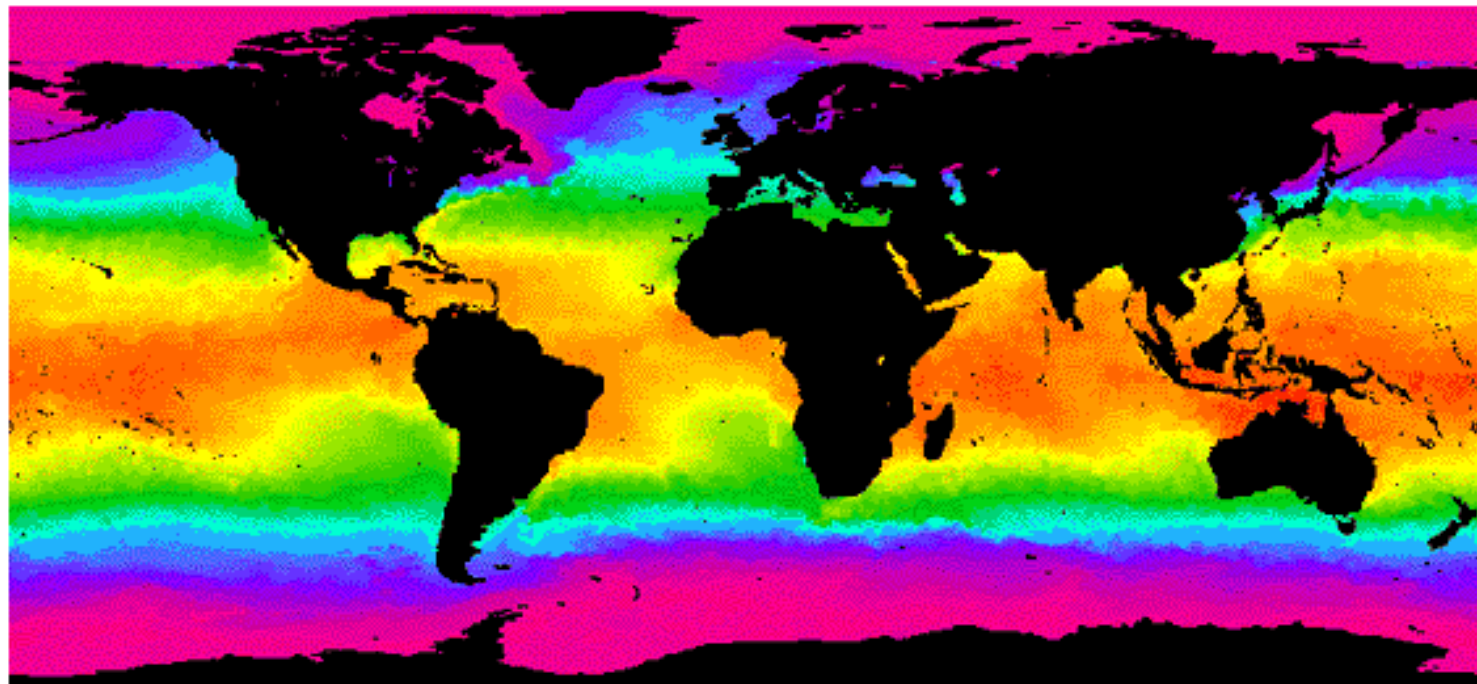
(200m – 1000m)  
Water temperature drops rapidly.

# Factors that affect Water Temperature ➤ **Latitude**

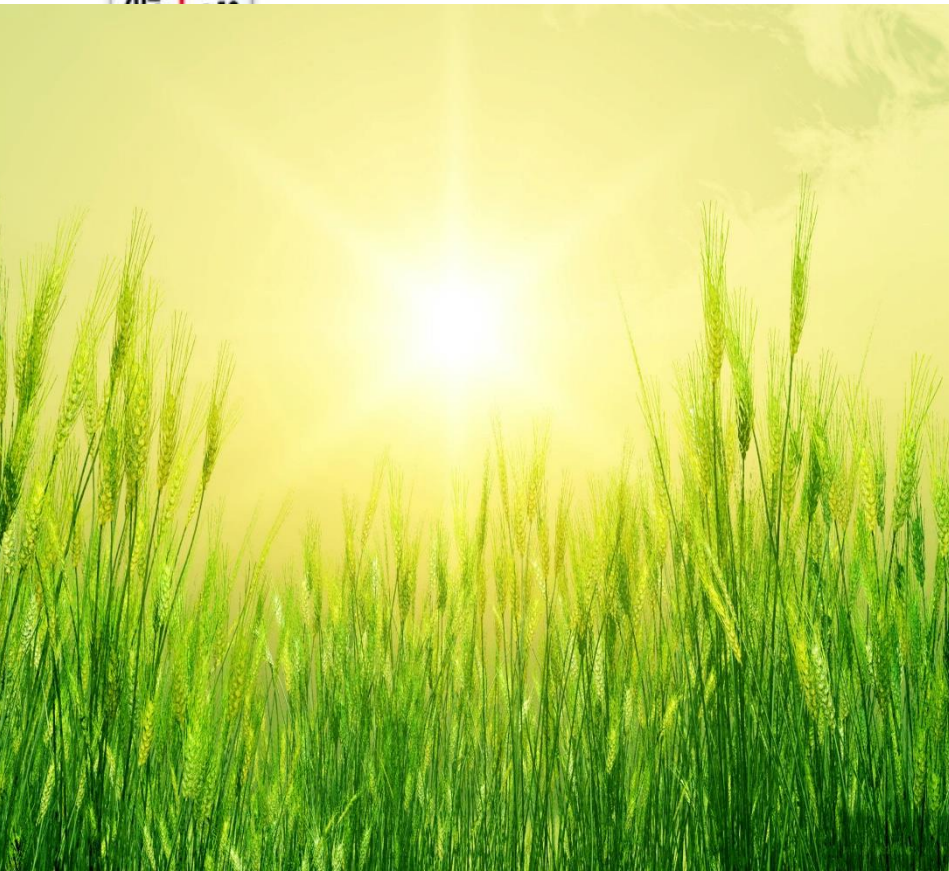
Surface water averages between 25°C and 28°C at the equator, and is colder to the north and south.



**Sea Surface Temperature**



# Factors that affect Water Temperature ➤ Seasons



# Factors that affect Water Temperature ➤ **Seasons**

Surface water temperature will vary from summer to winter.



# Factors that affect Water Temperature ➤ **Seasons**

Surface water temperature will vary from summer to winter.





# Ocean Salinity

Salinity is a measure of the salt concentration in a liquid.

Average salinity of most oceans is around 3.5%.

$$3.5\% = \underline{\quad} \text{ g/L}$$

$$C = 3.5\% = \frac{3.5\text{g}}{100\text{mL}} = \frac{3.5\text{g}}{0.1\text{L}} = 35\text{ g/L}$$

*(About 10x higher concentration than in a salt water swimming pool)*



# Ocean Salinity

Salinity is lower near the poles

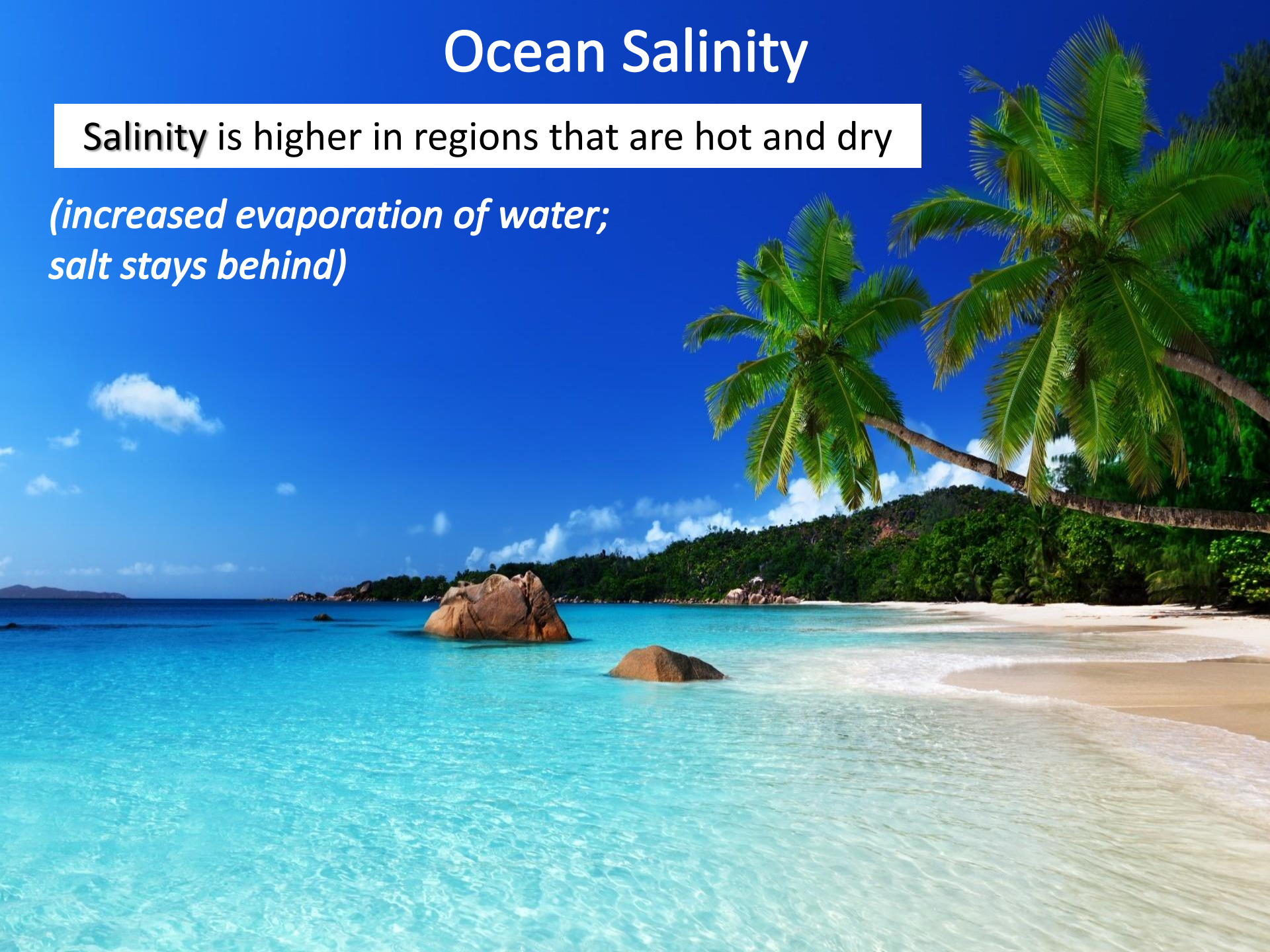
*(melting glaciers and pack ice dilute the water)*



# Ocean Salinity

Salinity is higher in regions that are hot and dry

*(increased evaporation of water;  
salt stays behind)*



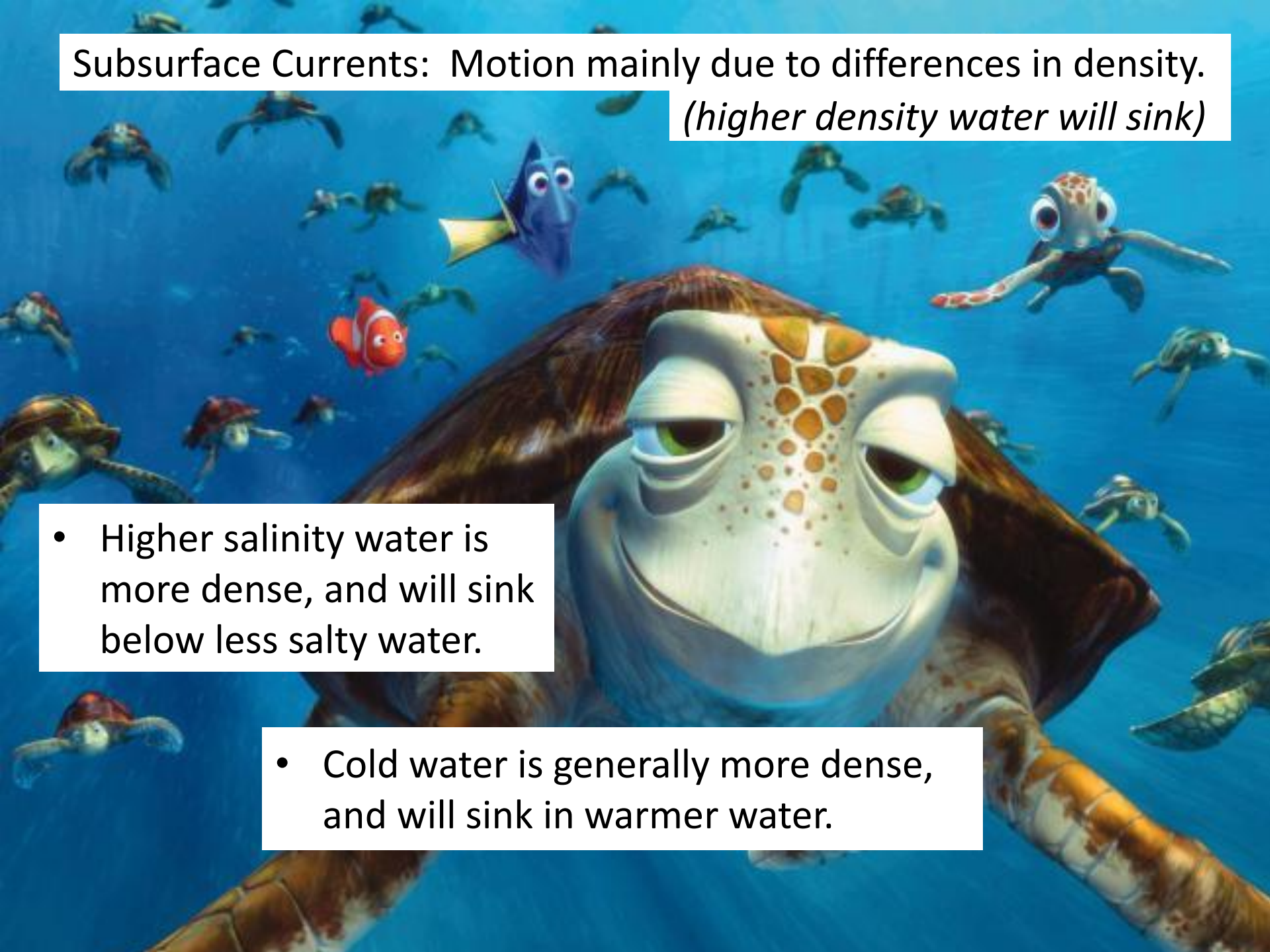
# Ocean Currents

The movement of seawater in a certain direction

2 types of currents:

➤ **Surface Currents: Mainly wind driven; horizontal.**





Subsurface Currents: Motion mainly due to differences in density.  
*(higher density water will sink)*

- Higher salinity water is more dense, and will sink below less salty water.

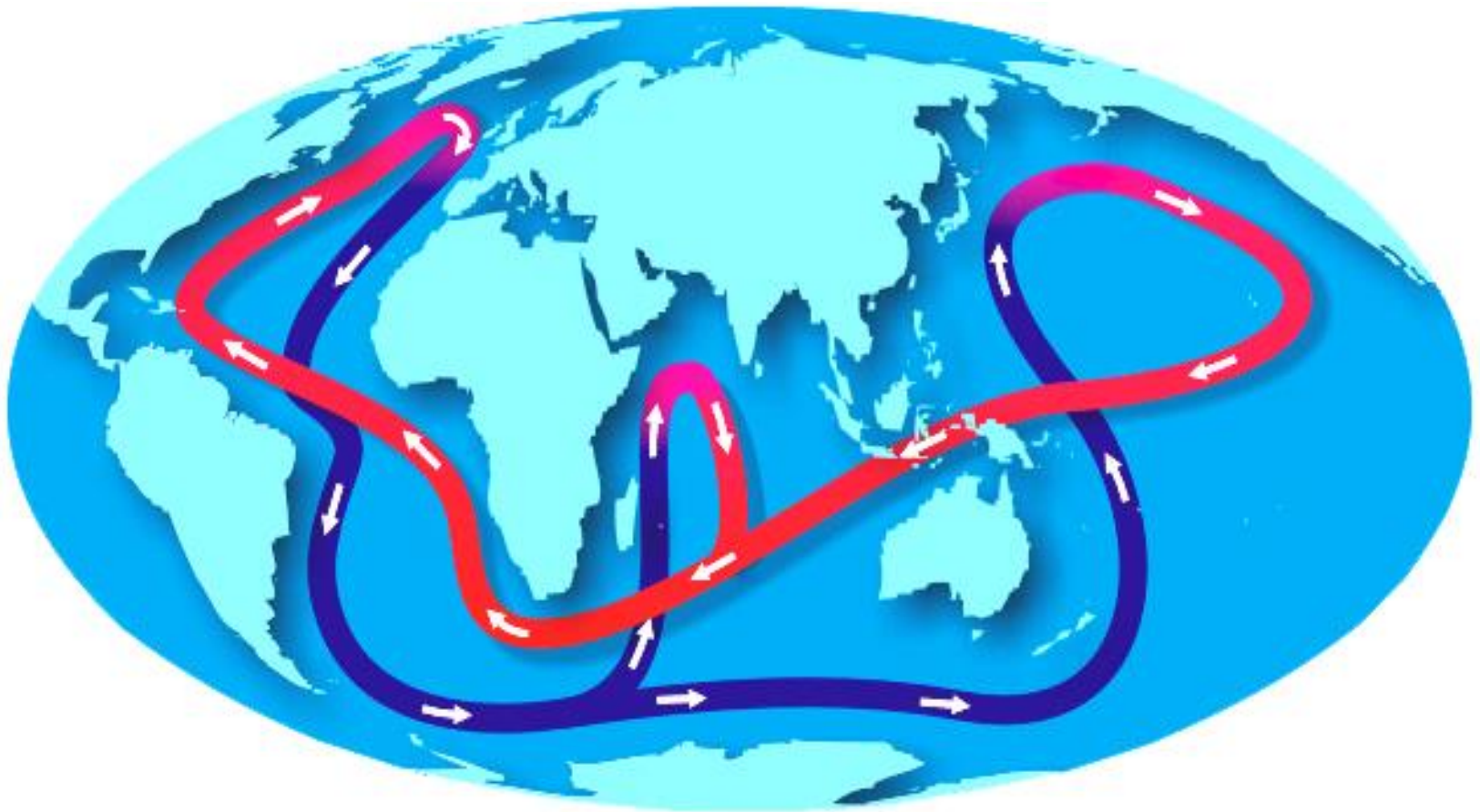
- Cold water is generally more dense, and will sink in warmer water.

# Ocean Circulation

The combined effect of all the currents in the oceans

**Thermohaline Circulation:** Surface and subsurface currents are connected together and circulate around the world.

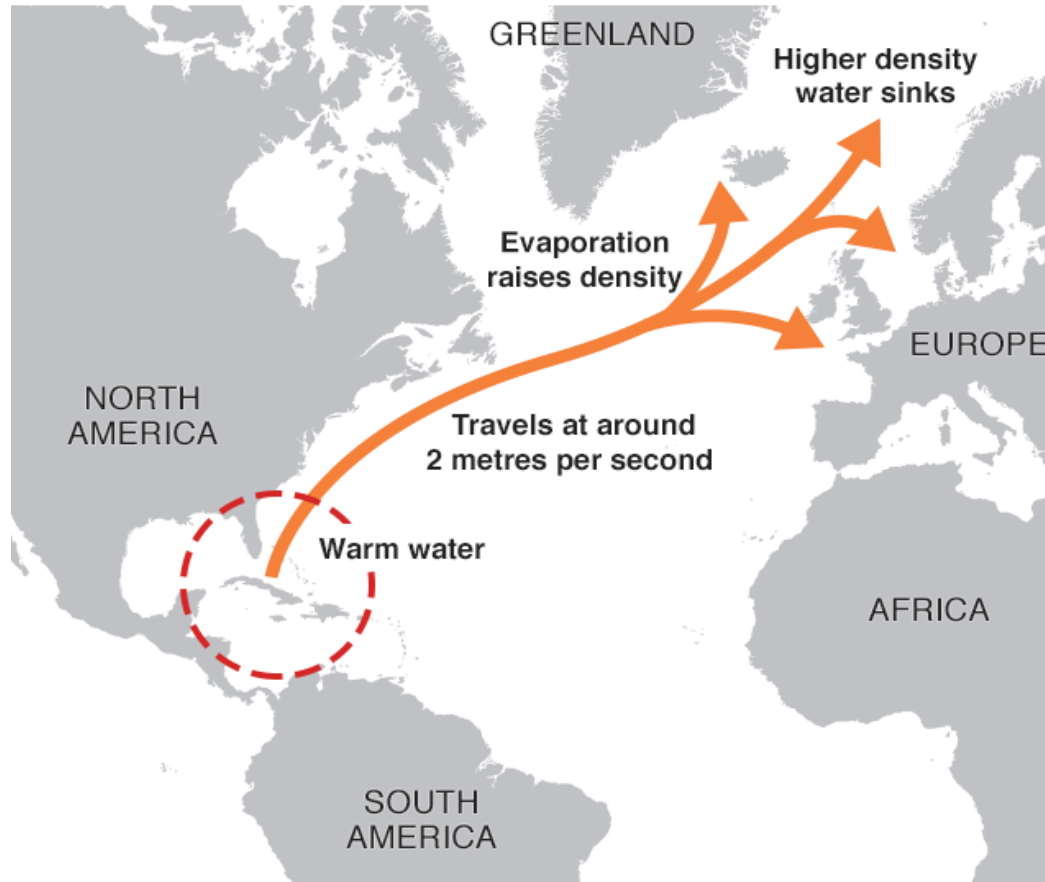
(Like a giant multilevel conveyer belt)



# Ocean Circulation

**Gulf Stream:** A warm current that carries thermal energy from the Gulf of Mexico up into the North Atlantic Ocean.

This influences the climate along the east coast of North America, as well as parts of northwestern Europe.



# The Cryosphere

The cryosphere consists of all the frozen water on the Earth's surface





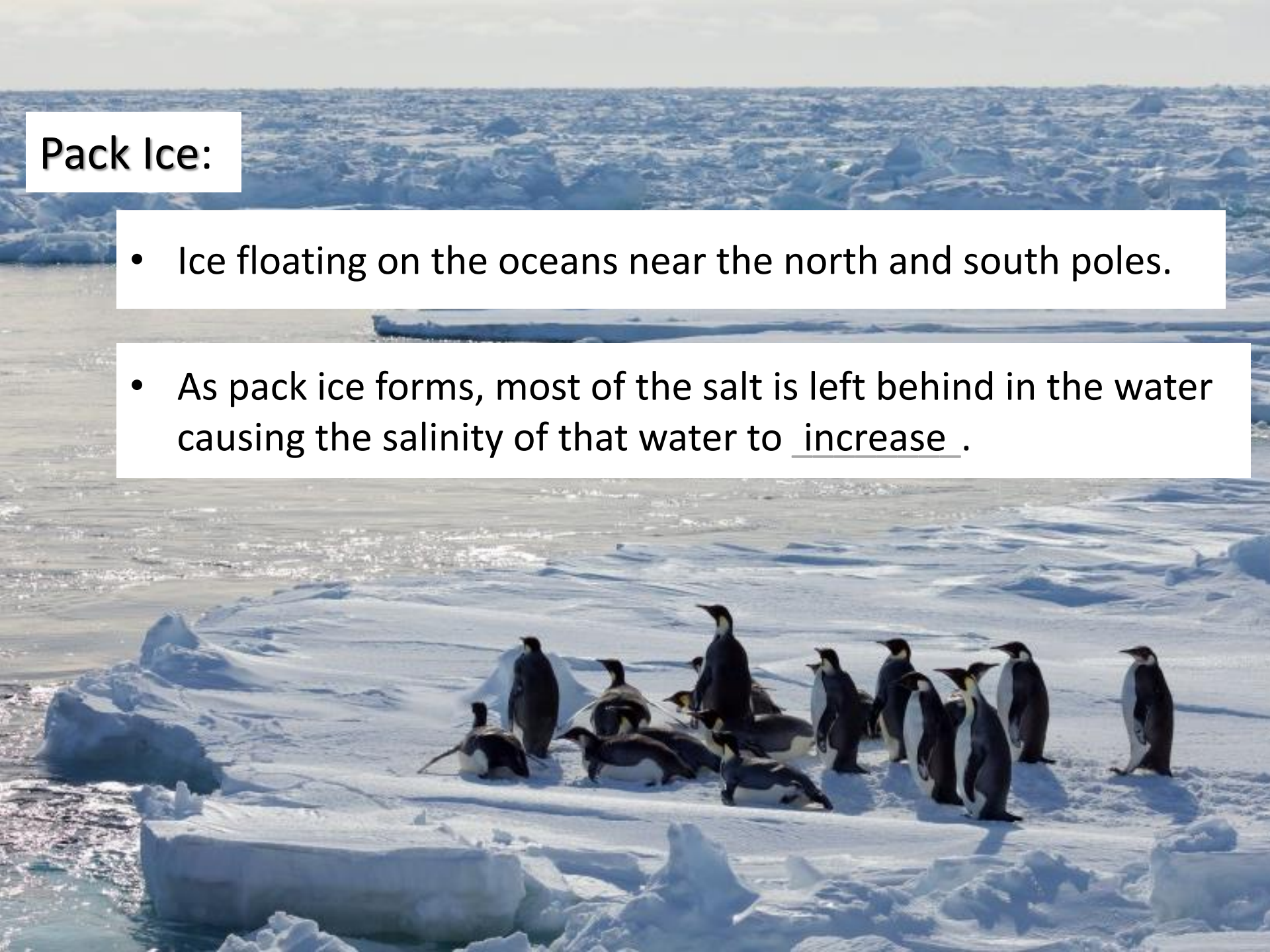
## Pack Ice:

- Ice floating on the oceans near the north and south poles.

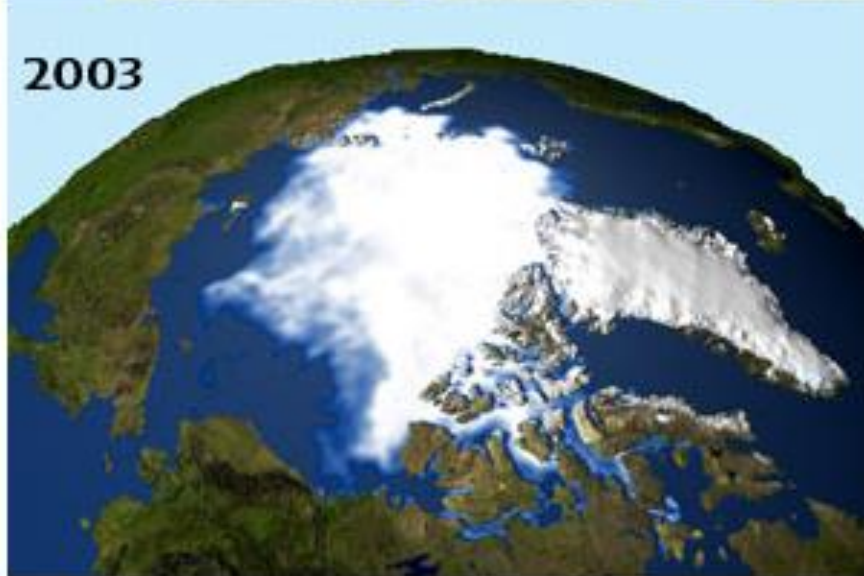


## Pack Ice:

- Ice floating on the oceans near the north and south poles.
- As pack ice forms, most of the salt is left behind in the water causing the salinity of that water to increase .



# Pack Ice – The North Pole



# Melting Pack Ice

Melting pack ice threatens the survival of species that depend on the ice.



Melting pack ice does not actually raise sea levels; this is because pack ice is already in the ocean.

A photograph of a massive glacier wall, likely the Perito Moreno Glacier, meeting a body of water. The glacier is a deep blue color, showing vertical crevasses and a rough, textured surface. The water in the foreground is dark blue, with some white foam and icebergs near the base of the glacier. A small boat is visible in the distance on the right side of the water.

## Glaciers:

- Masses of ice on land, formed by compressed snow.

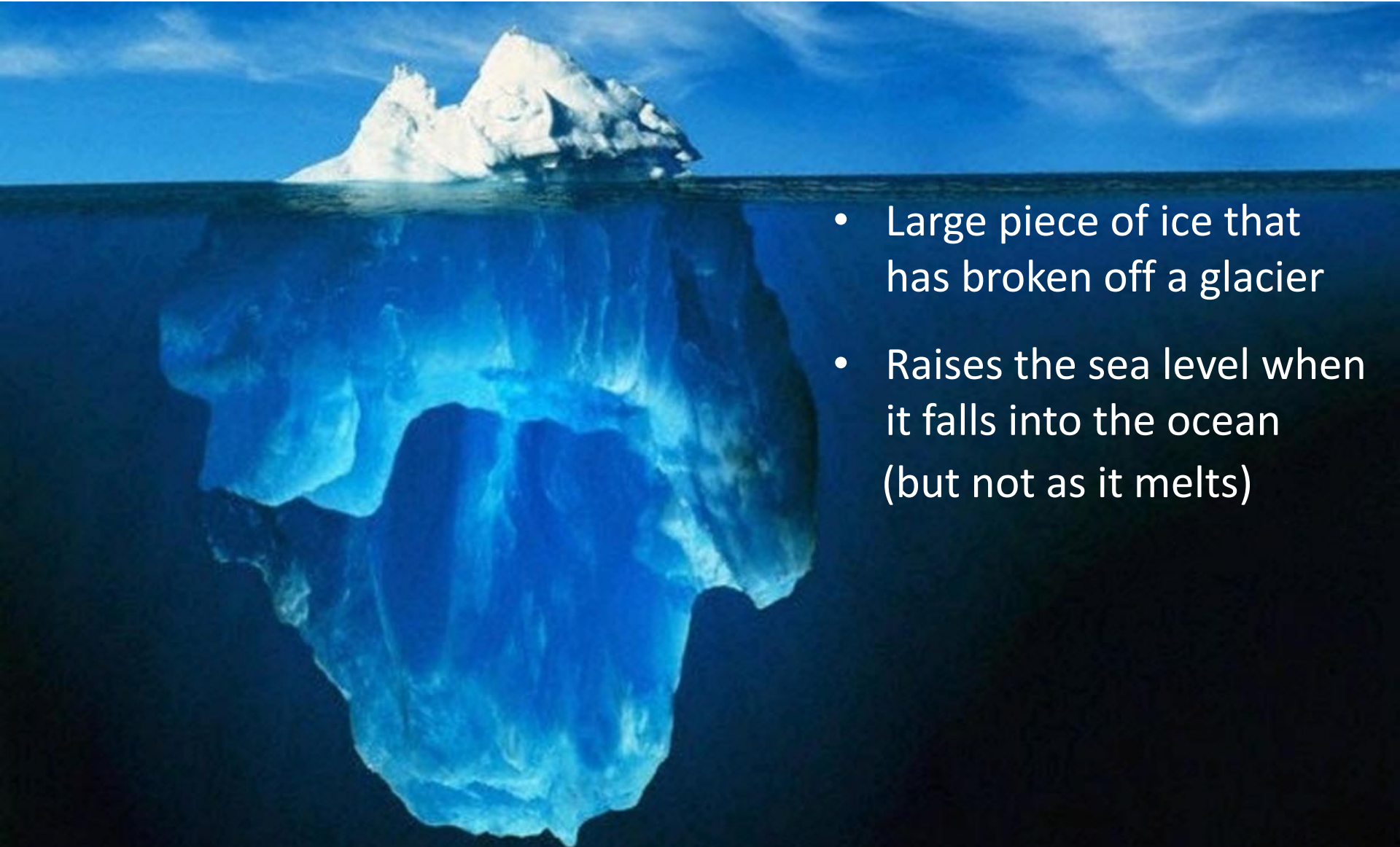
# Melting Glaciers



# Melting Glaciers



# Iceberg

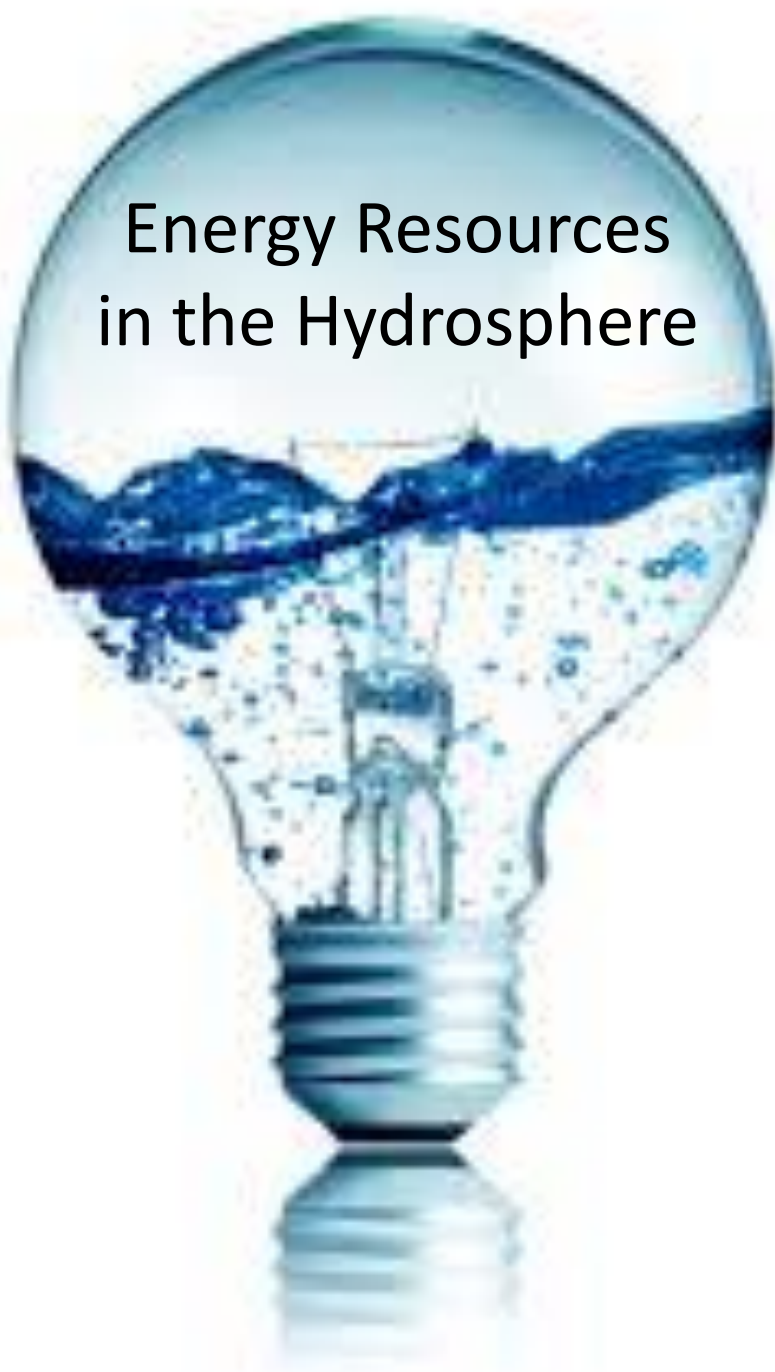


- Large piece of ice that has broken off a glacier
- Raises the sea level when it falls into the ocean (but not as it melts)



# Energy Resources in the Hydrosphere

# Energy Resources in the Hydrosphere



# Energy Resources in the Hydrosphere

## Hydroelectricity

### Beauharnois Power Station



# Hydroelectricity

Beauharnois Power Station

Motion

Hydraulic\*  
Energy



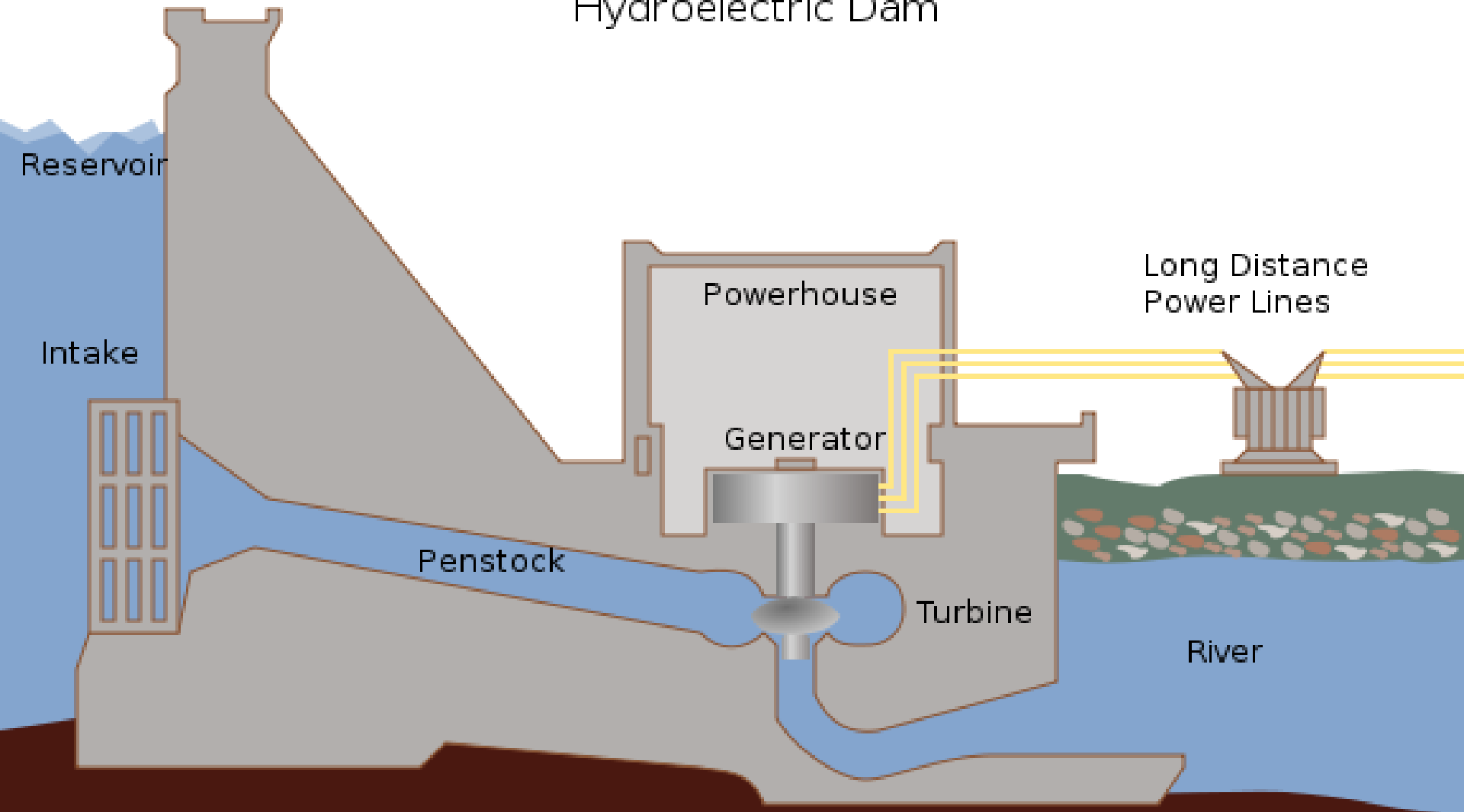
Electricity

Electrical  
Energy

- Hydraulic energy (*moving water*) is a form of kinetic energy

# Hydroelectricity

## Hydroelectric Dam



# Energy Resources in the Hydrosphere

Tidal Energy

Rance Tidal Power Station, France





HYDROSPHERE