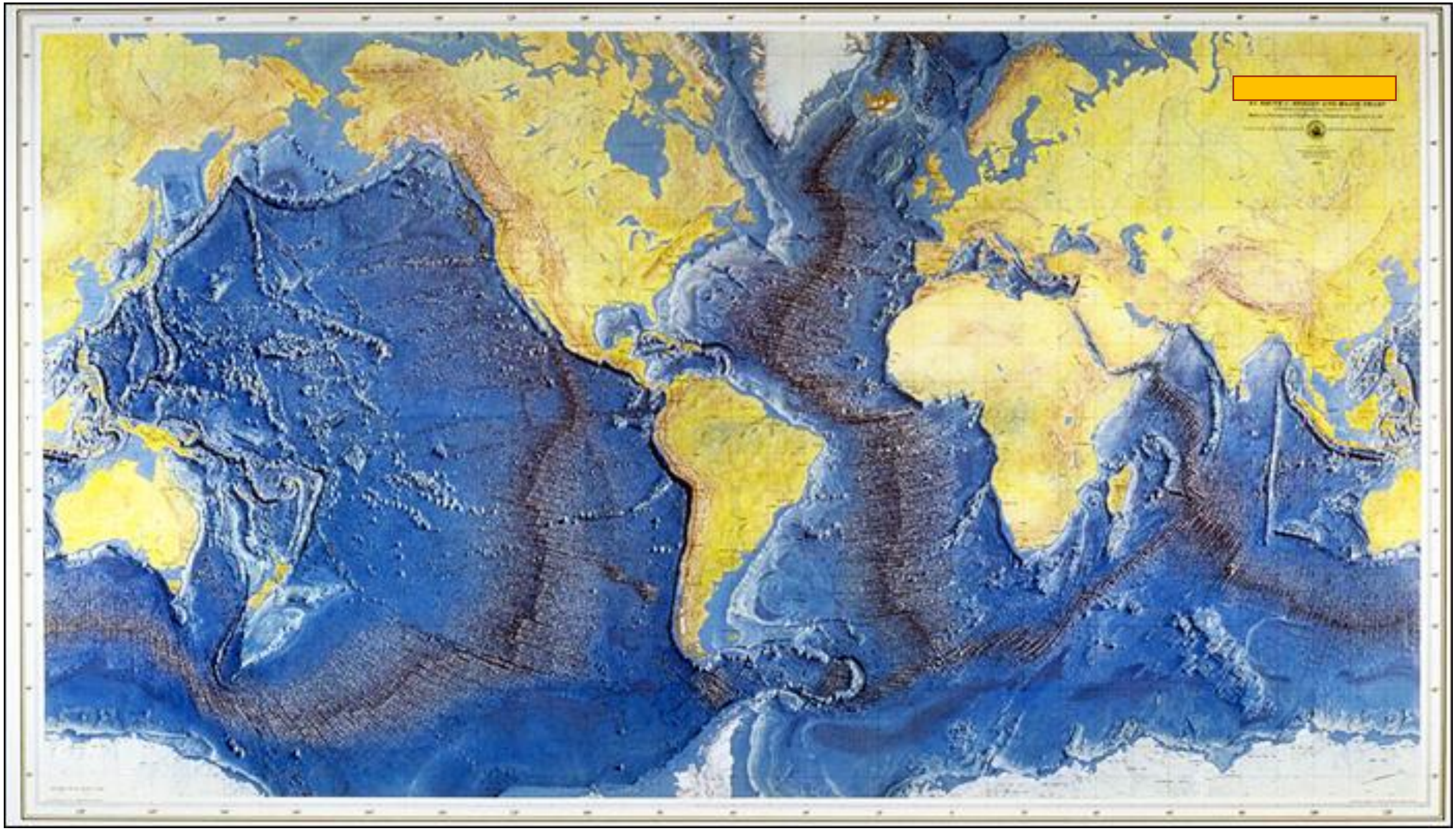
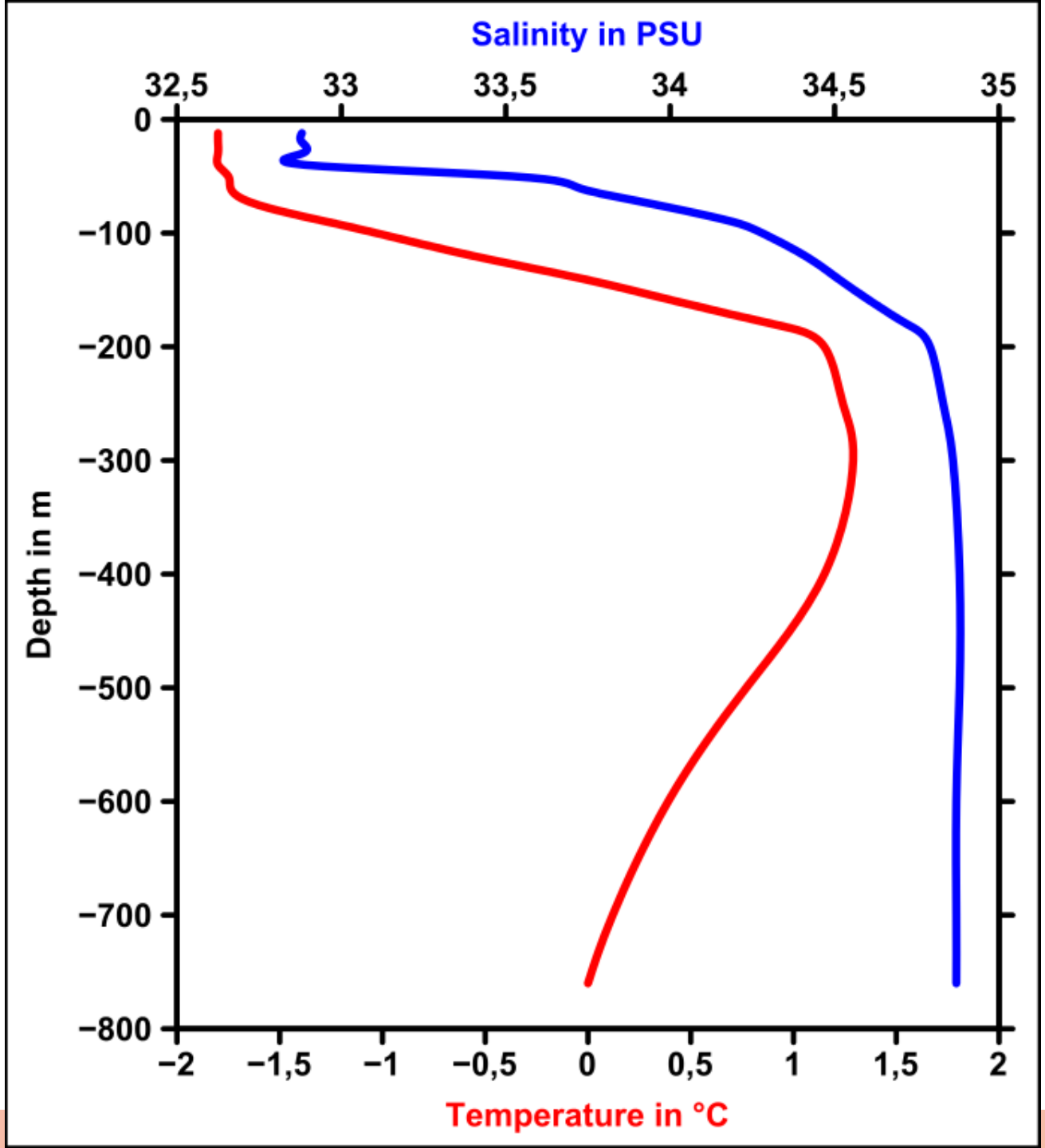



Salinity in PSU
32,5
33
33,5
34
34,5
35
0
−100
−200
−300
−400
−500
−600
−700
−800
Depth in m
−2
−1,5
−1
−0,5
0
0,5
1
1,5
2
Temperature in °C

Oceans

Essential Questions:

1. How are salinity, temperature, and density related?
2. How does the sun drive ocean currents?

Essential Questions:

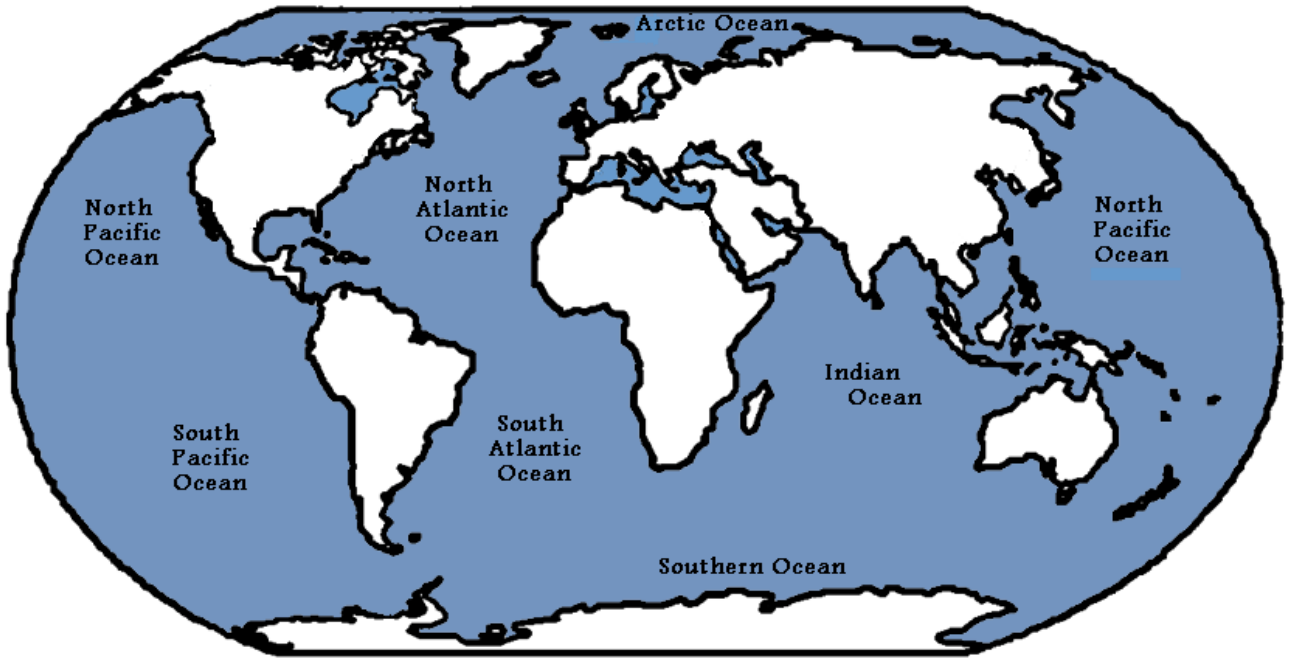
3. How are seafloor structures mapped?
4. How are humans dependent on ocean?
5. How have human activities modified the oceans?

Technology Lens - The Ocean Cleanup

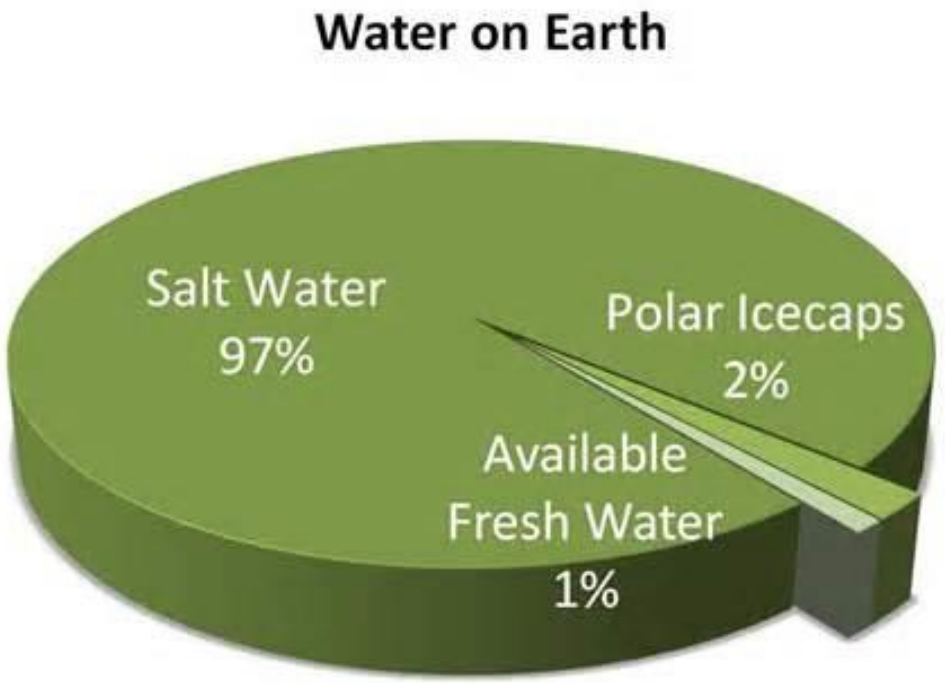
Oceans

Earth's oceans

- Five oceans from largest to smallest
  1. Pacific
  2. Atlantic
  3. Indian
  4. Southern
  5. Arctic



Oceans



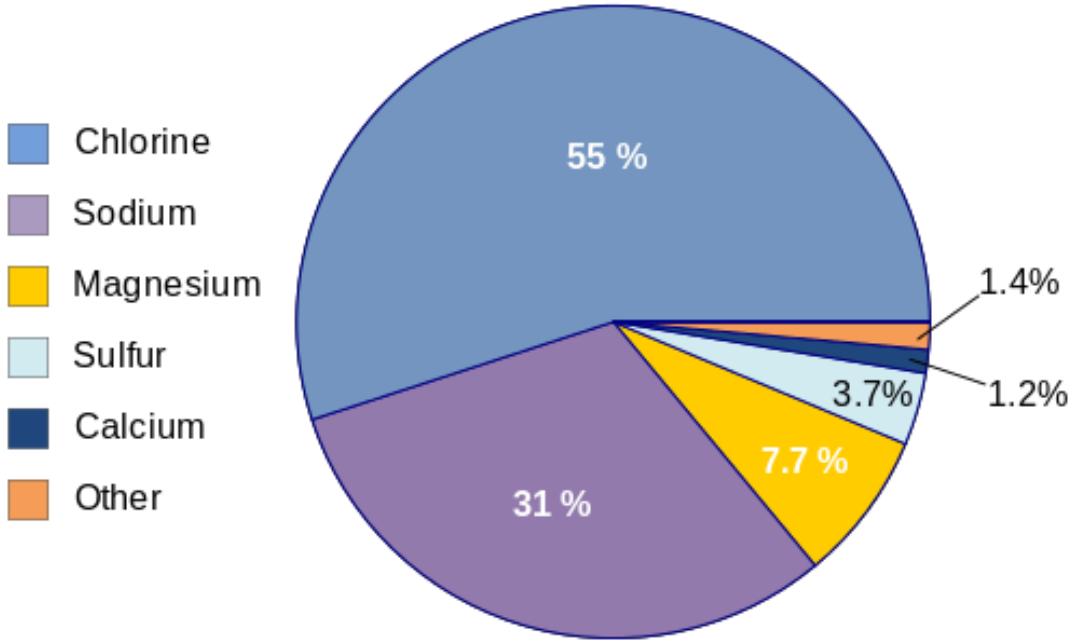
Water on Earth

- 70%+ of the planet is covered by oceans
- 97% of the water on Earth is in the oceans
- 2% is locked in glaciers and ice caps
- 1% is fresh water in lakes, rivers, and aquifers

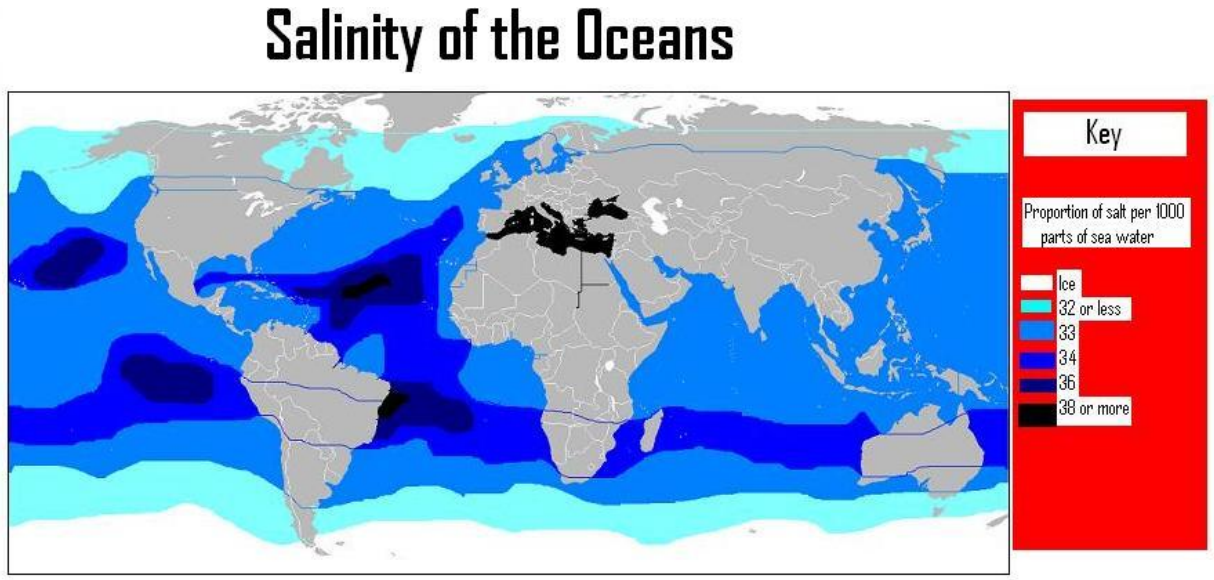
Oceans

Ocean's Elements

- The ocean water is made up of hydrogen and oxygen (water or H_2O).
- The other two main elements in ocean water are chlorine and sodium (salt or NaCl).
- Magnesium, sulfur and calcium are the next most abundant elements.



Oceans - Properties



Salinity

- Measure of the amount of dissolved salt in the water. (salinity = saltiness)
- Measured in parts per thousand (ppt)
- Average ocean salinity is 35ppt. For every 1000 grams (1kg) of seawater, 35 grams are salt.
- Average river salinity is 0.5ppt.

Oceans - Properties

Salinity and Density

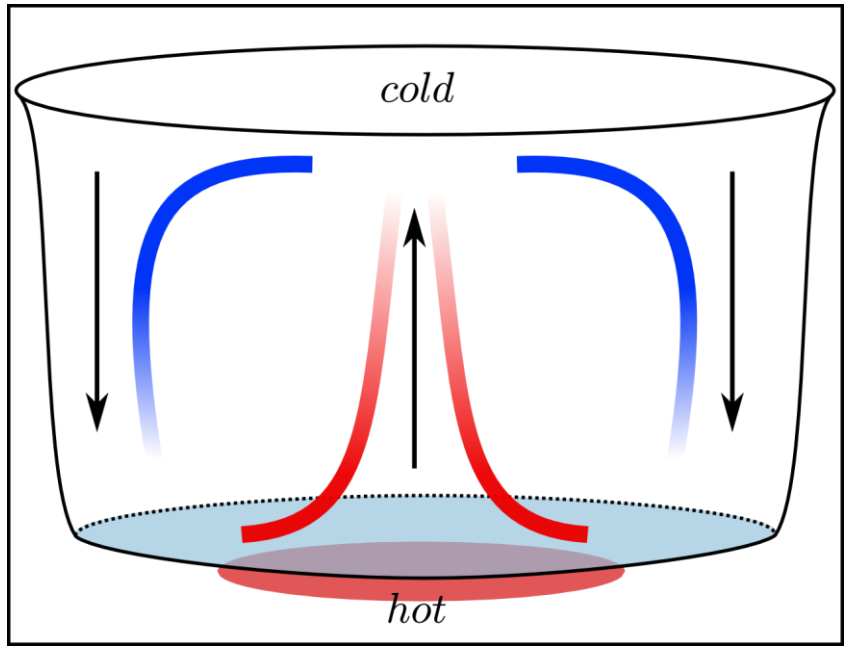
- Density is affected by **salinity.**
- Water with dissolved salts (higher salinity) is more dense.
- Water without dissolved salts (lower or no salinity) is less dense.

Oceans – Properties

Temperature and Density

- Density is affected by **temperature.**
- Water with <u>colder</u> temperatures is <u>more dense</u>.
- Water with <u>higher</u> temperatures is <u>less dense</u>.
- Convection currents in the ocean move warm water towards the surface and cold water deep into the ocean.

Convection



Quick Action – Oceans

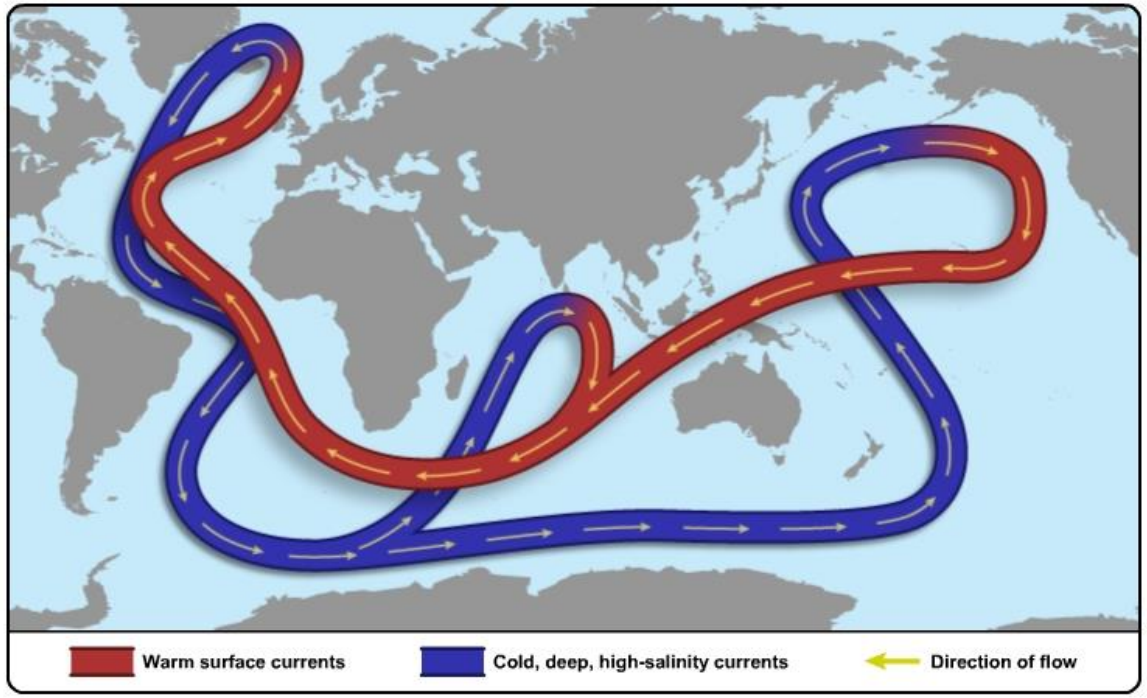
In groups of four – consider what we've learned about ocean properties.

Look at the map provided and answer the following questions on a whiteboard.
Be prepared to share with the class

1. What do you think this map represents?
2. What do you think causes this?

Oceans - Currents

Referred to as the ocean's conveyer belt



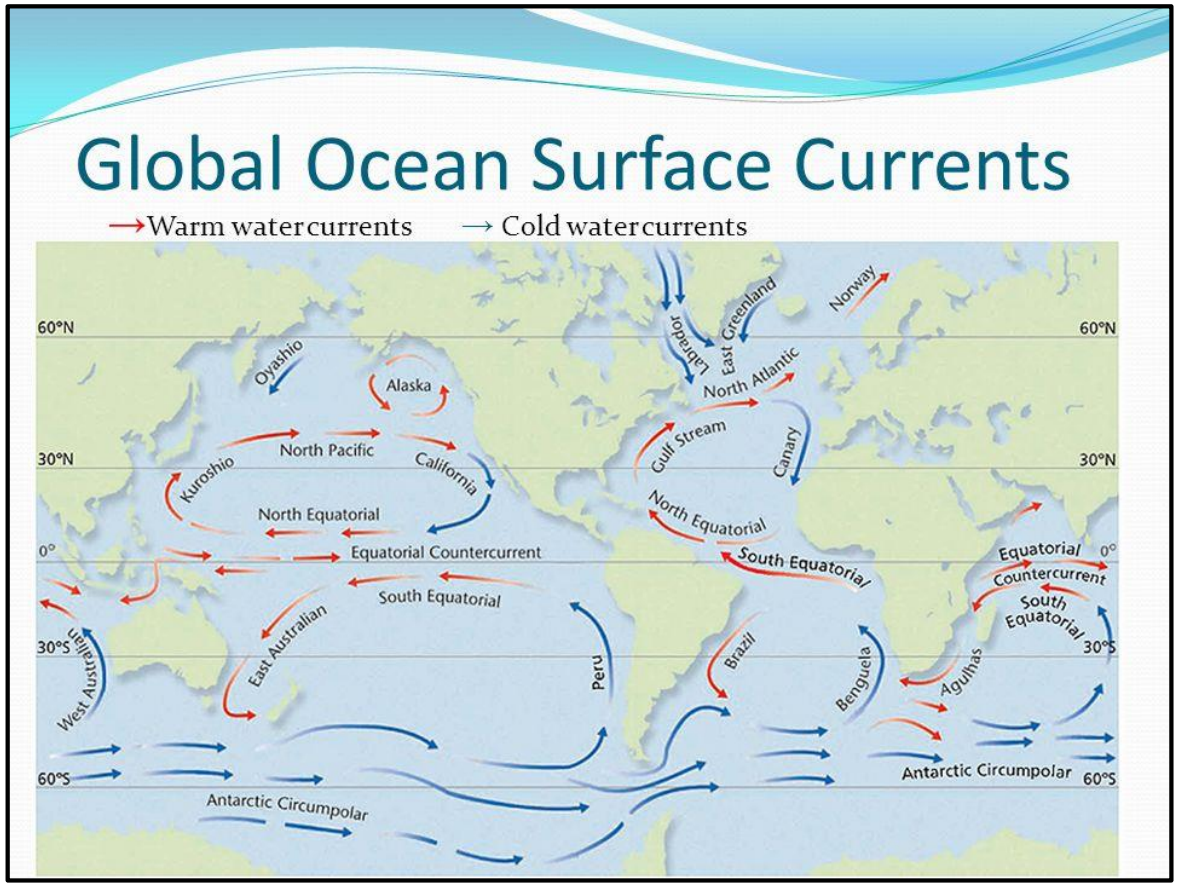
Deep Ocean Currents

- Driven by density differences in salinity and temperature
- Lowest temperature and highest salinity is the most dense ocean water.
- Flows under the surface of the ocean
- Moves nutrients, oxygen, and heat with them.

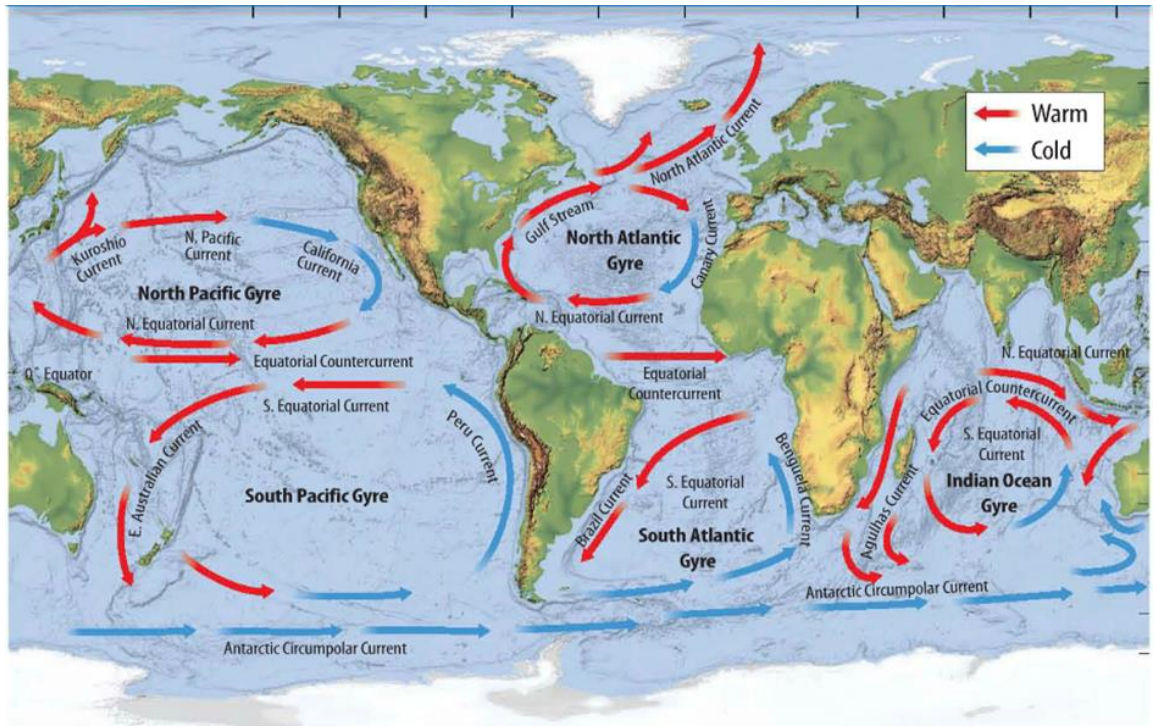
Oceans – Currents

Surface Ocean Currents

- A continuous flow of water in a particular direction, created mainly by surface winds.
- Surface ocean currents drive weather patterns.
- Warm water is transported from the equator towards the poles.
- Cold water is transported from the poles towards the equator.



Oceans - Currents

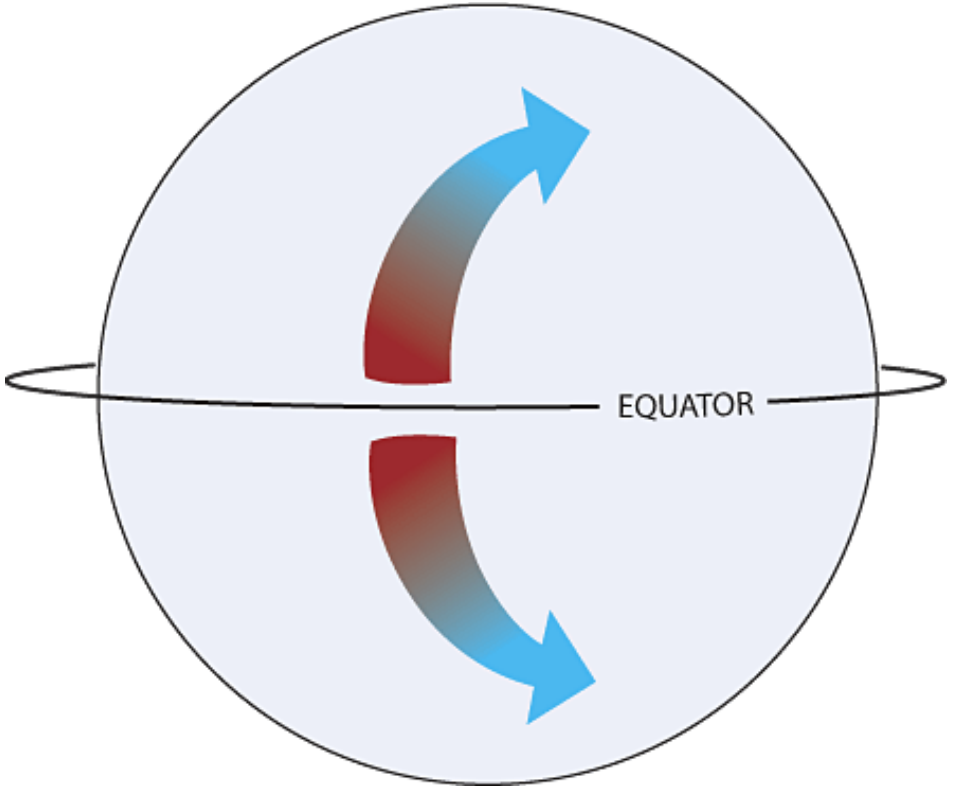


Surface Ocean Currents

- Ocean currents help regulate global climate even if an area is hundreds of miles from the coast.
- Without currents, regional temperatures would be more extreme – super hot at the equator and frigid at the poles.
- Much more of the land would be unusable.

Oceans – Currents

Coriolis Effect
Due to Earth's rotation



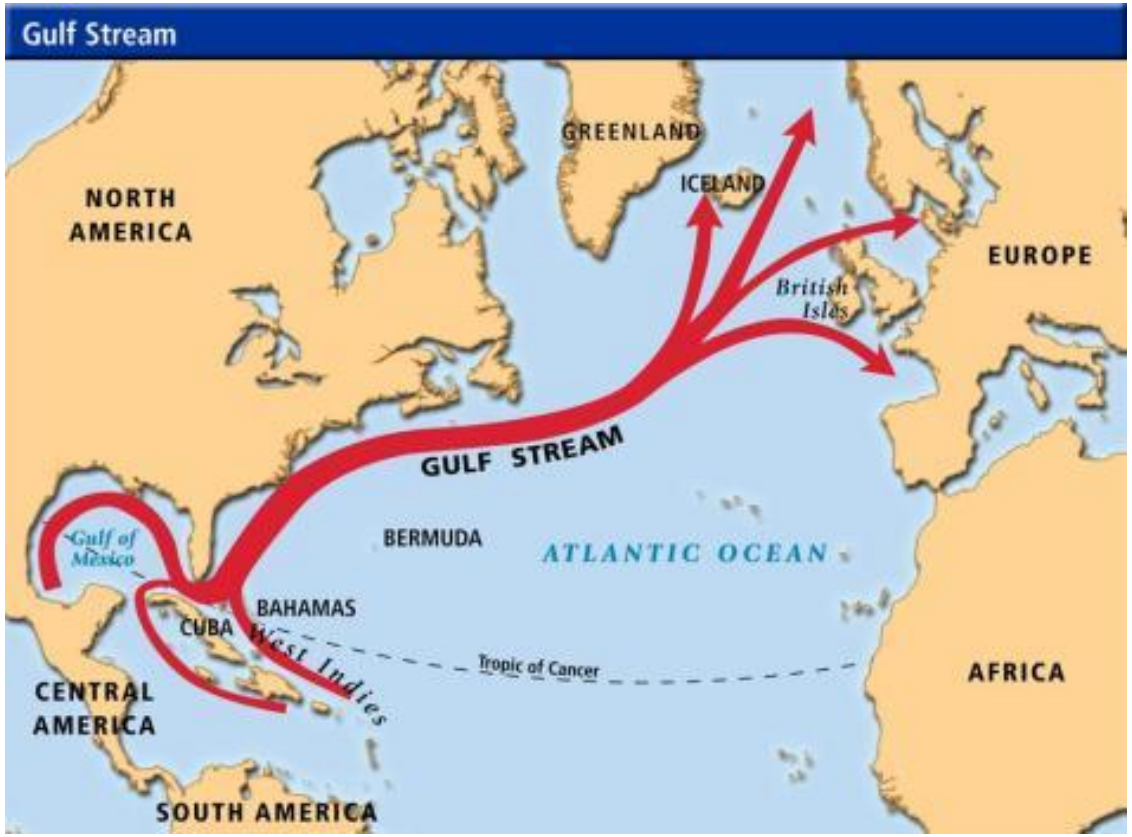
Coriolis Effect

- Because the Earth rotates on its axis, circulating air is deflected toward the right in the Northern Hemisphere and left in the Southern Hemisphere.
- This is the Coriolis Effect.
- The water at the ocean surface (Surface Ocean Currents) is moved primarily by winds due to this certain pattern.

Oceans

Example - Gulf Stream

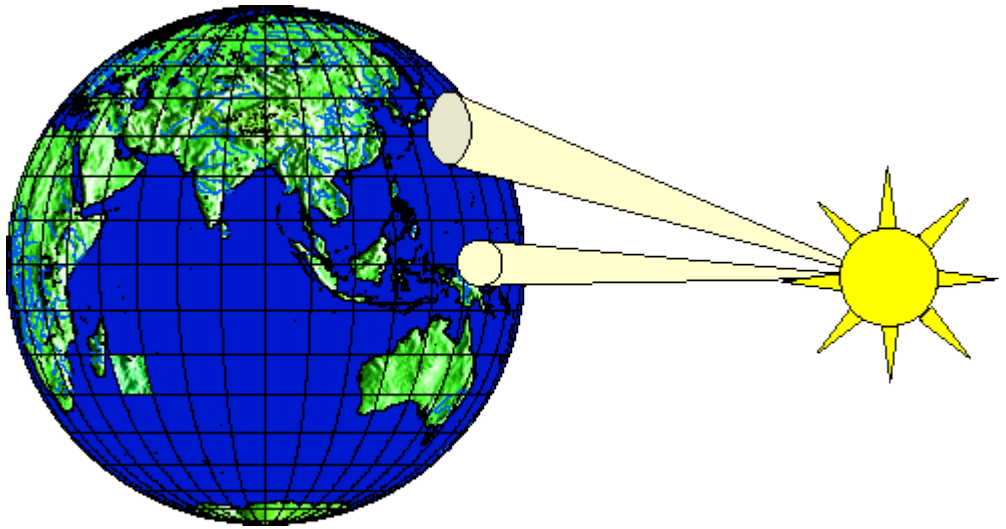
- A powerful, warm, swift ocean current flowing in the Atlantic.
- Originates in the Gulf of Mexico and travels up the east coast of the U.S. before combining with the North Atlantic Drift.
- Brings much milder temperatures to Western and Northern Europe than would otherwise occur.



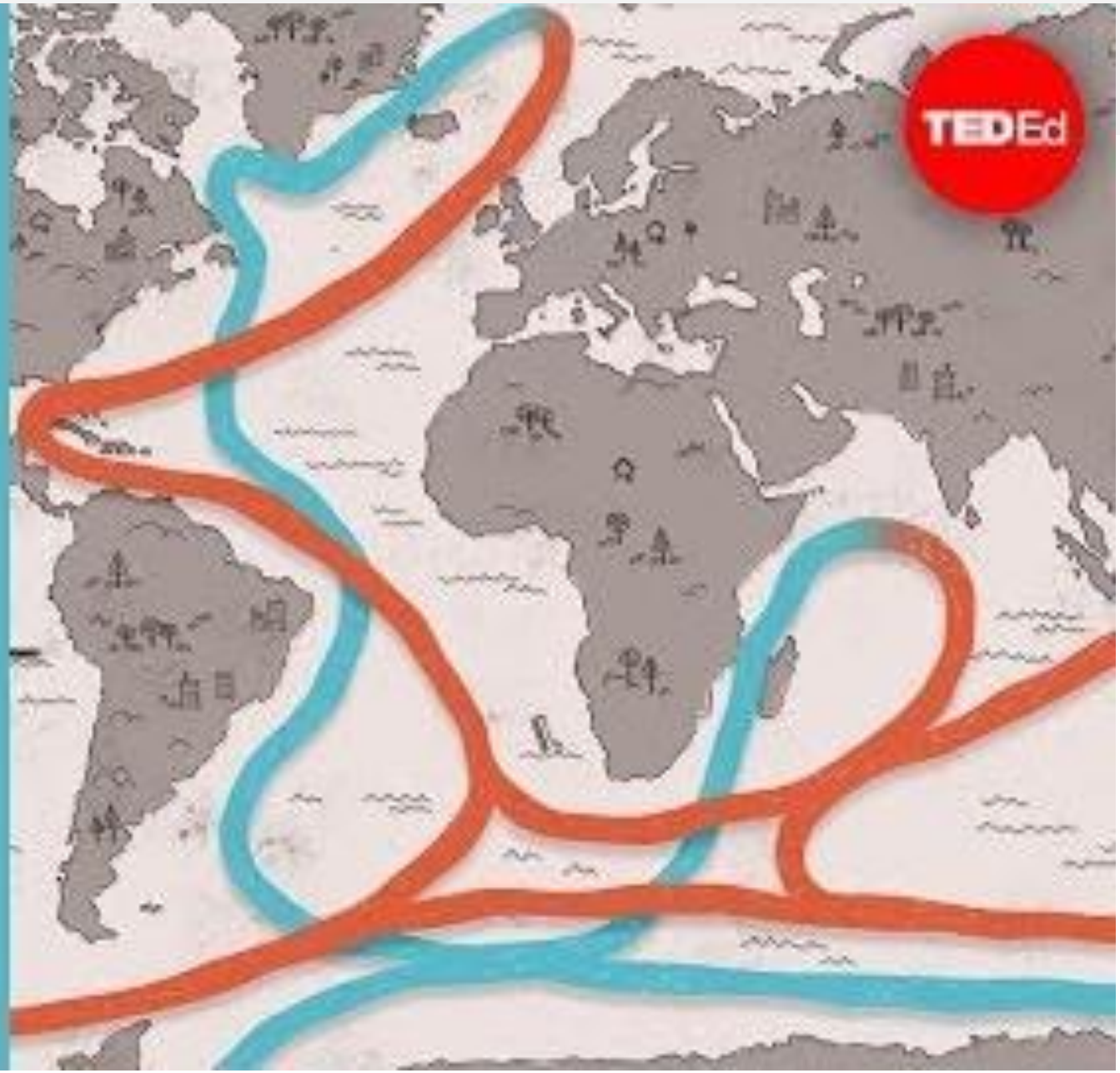
Quick Action – Oceans

Surface Ocean Currents

Using the diagram at the right, explain why the ocean waters are warmer at the equator than at higher latitudes.



HOW DO OCEAN CURRENTS WORK?



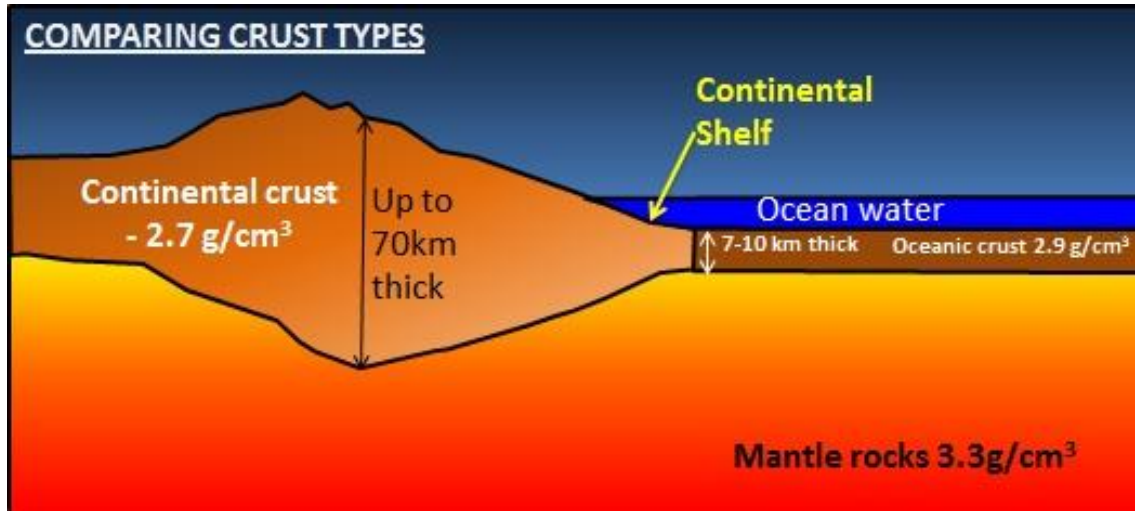
Quick Action – Oceans

Plastic- a- drift

- Go to **adrift.org.au** on your personal device

- Explore the map of plastic-a-drift
- Write Ms. Abbott a paragraph explaining how a message in the bottle might travel through the ocean
  - You can choose it's starting location
  - Explain it's route and where it ends up.

Oceans – Seafloor Features



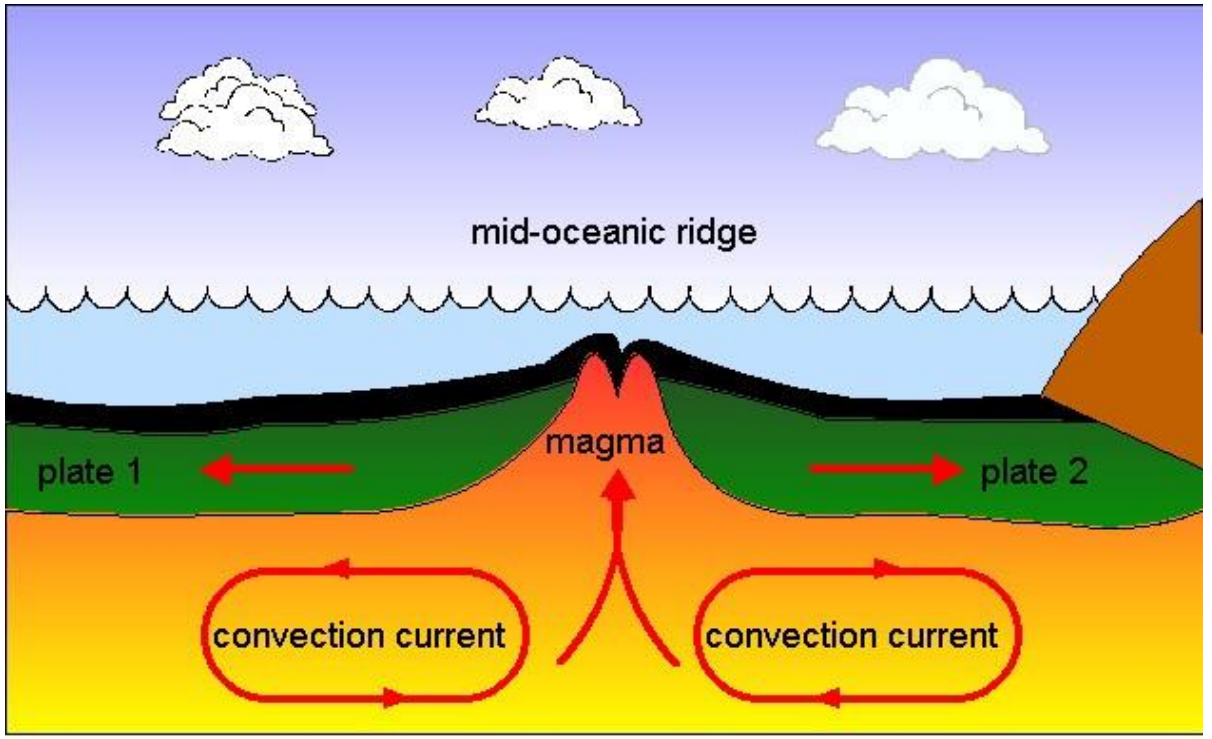
Oceanic Crust

- A thick layer of rock that separates the Earth's oceans from the hot mantle beneath it.
- Different from continental crust in several ways.
  - Thinner
  - More dense
  - Younger
  - Different chemical composition

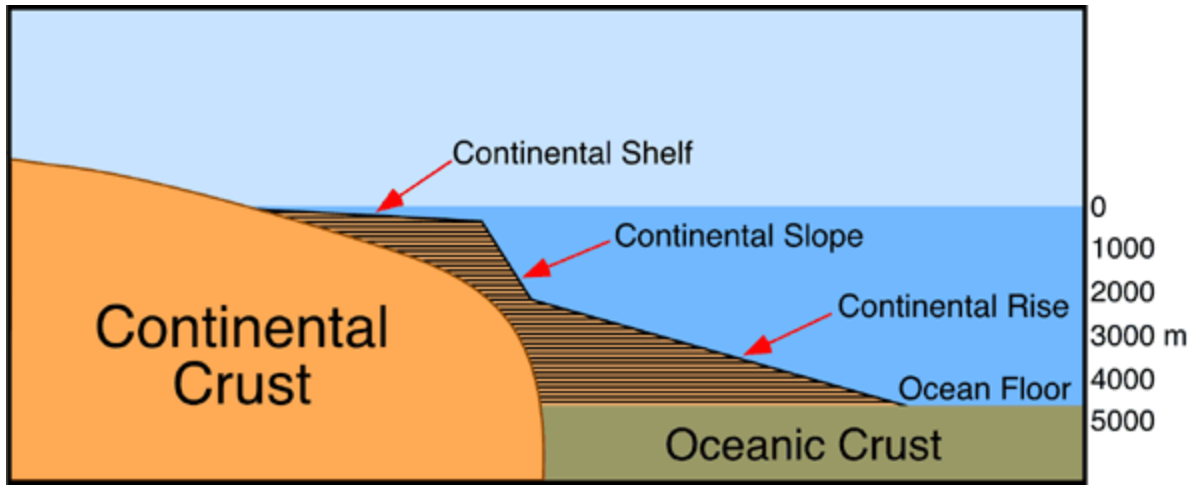
Oceans – Seafloor Features

Sea Floor Spreading

- Plates 1 and 2 move apart.
- Magma rises, cools, and solidifies forming new igneous rock.
- This happens at mid-ocean ridges.
- The youngest rocks are found closest to the ridge.
- *We will learn more about this during our Plate Tectonics unit.*



Oceans – Seafloor Features

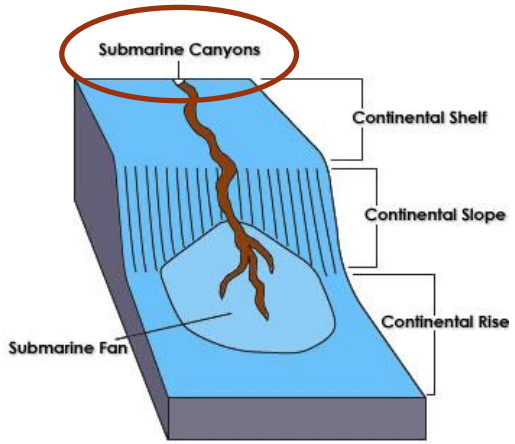


The boundary of the continent is not the coastline but rather the edge of the continental shelf.

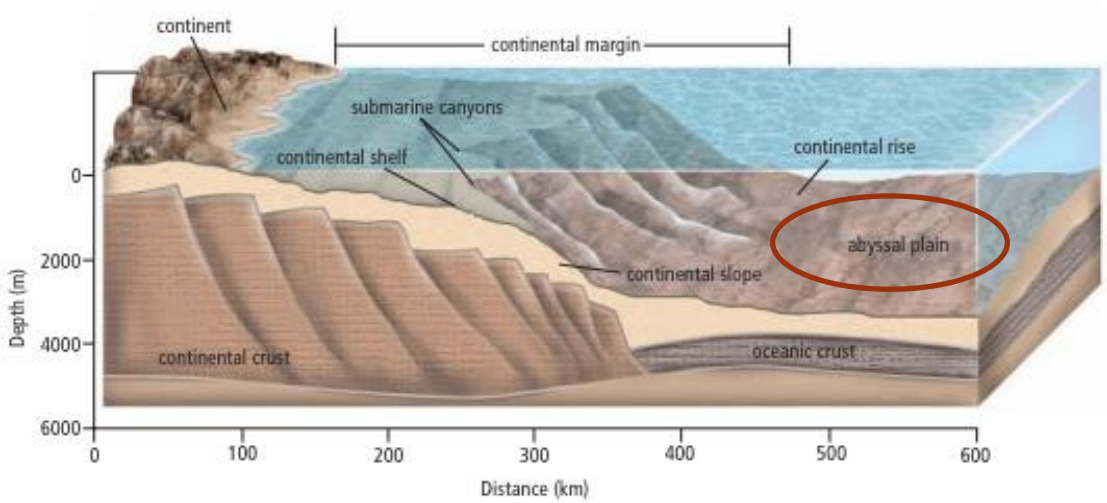
Seafloor Features

- Continental Shelf – edge of the continent that lies under the ocean
- Continental Slope – the break that descends toward the seafloor
- Continental Rise – final boundary between the continental crust and oceanic crust

Oceans – Seafloor Features



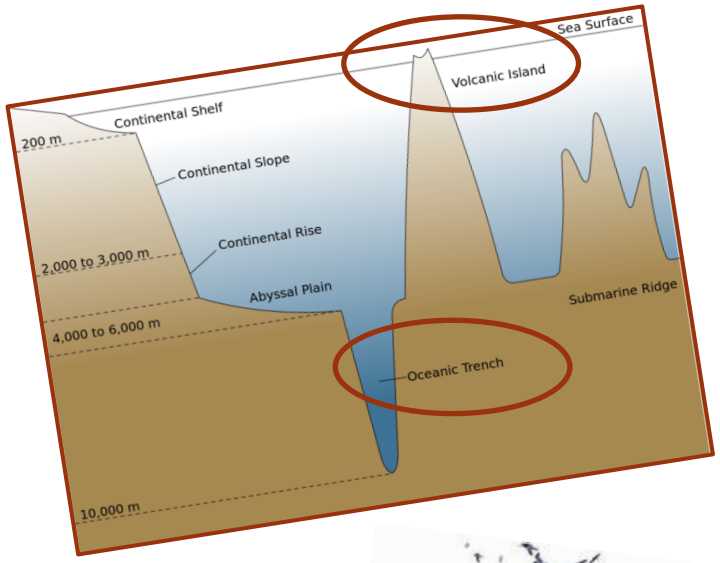
Submarine Canyons

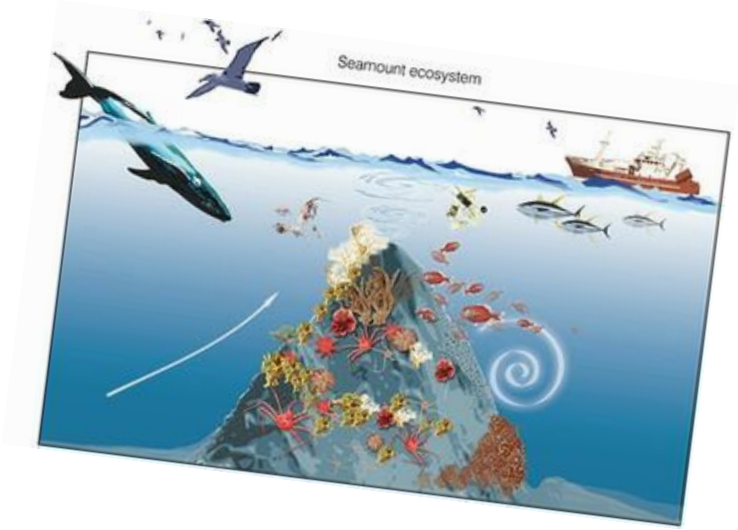


Seafloor Features

- Submarine Canyons – deep channels cut through the continental shelf
- Abyssal Plain – underwater plain usually lying between the continental rise and mid-ocean ridge – covers more that 50% of the Earth's surface

Oceans – Seafloor Features

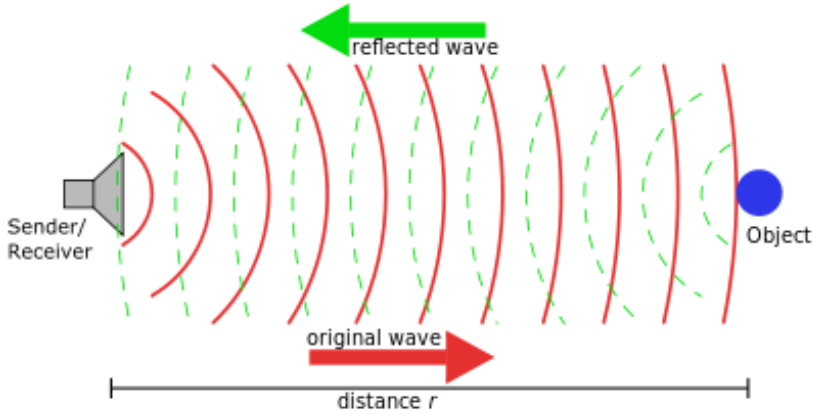


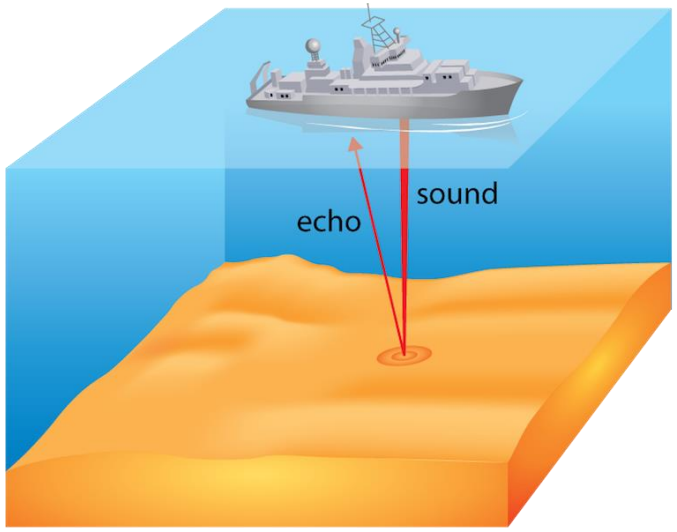


Seafloor Features

- Trench - Long, narrow depressions on the seafloor formed when plates collide (Mariana Trench – deepest part of the ocean almost 7 miles deep)
- Sea Mounts – undersea mountains formed by volcanic activity – biological hotspots
- Volcanic Island – Sea Mount that breaks the surface.

Oceans - Seafloors





Mapping the Seafloor

- Sonar is used to identify ocean features.
- Sound waves are bounced off of the ocean floor.
- The time it takes the sound wave to return back as an echo indicates the depth of the seafloor.
- The equipment is mounted on the bottom of the boat.

Mind Up!

Choose a partner across the room.

Name and define as many seafloor features as you can.

Come back to your seat and create a drawing of the seafloor and label its features. Use the textbook if needed to identify as many features as possible.

Ocean Technology-Art Project!

- In one of the following four categories, find and research one piece of technology that impacts what we know/understand about the ocean, or how we impact the ocean.
  - Exploration
  - Climate Change
  - Weather
  - Solutions
- Take one of the project handouts, and let's explore some inspiration!

Project inspiration:
https://www.youtube.com/watch?v=Uqly8ERIkHM

Oceans

Dependence on Oceans

- Evaporation supplies us with fresh water
- Provides oxygen and absorbs excess carbon dioxide through plants
- Fishing for food and fish oils
- Jobs
- Tourism and recreation
- Effects our weather patterns
- Mining and oil

Oceans

Human Impact

- Unsustainable Fishing – over fishing or threatening fish environments
- Pollution – 80% of marine pollution comes from land (runoff)
- Tourism/Development – disrupts fragile marine environments
- Climate Change – sea surface temperatures rise impacting climate; also, sea levels rise