

# Oceans and Coastal Processes

- 70 % of the Earth's surface is covered by oceans, but that wasn't always the case.
- The early Earth's surface was too hot to hold surface water. The water that came up from the Earth's interior was held in the atmosphere.
- A small portion of the Earth's water came from comets and meteorites.

# Ocean water properties

- The Earth's oceans are, on average, 3.5% saline.
- These salts are mostly Sodium, Magnesium, Sulfate, Calcium and Potassium compounded to Chlorine.
- The salts in the oceans came from fresh water running over rocks that contained these soluble salts, dissolved them and deposited them in the oceans.

# Ocean Salinity

- Daily the oceans collect more water containing salts.
- Water evaporates from the ocean as fresh water, leaving the salt behind.
- Over time the oceans become more saline and it becomes more dense too.
- When oceans become too salty the salt precipitates out as salt deposits.

# Salinity and Latitude

- At the equator, precipitation is high and rivers dilute the ocean's salinity so salinity is low in this region.
- Around 25 degrees N and S the climate is dry and evaporation is high, so ocean salinity is high.
- In higher latitudes, cooler water and dry conditions keep salinity low.

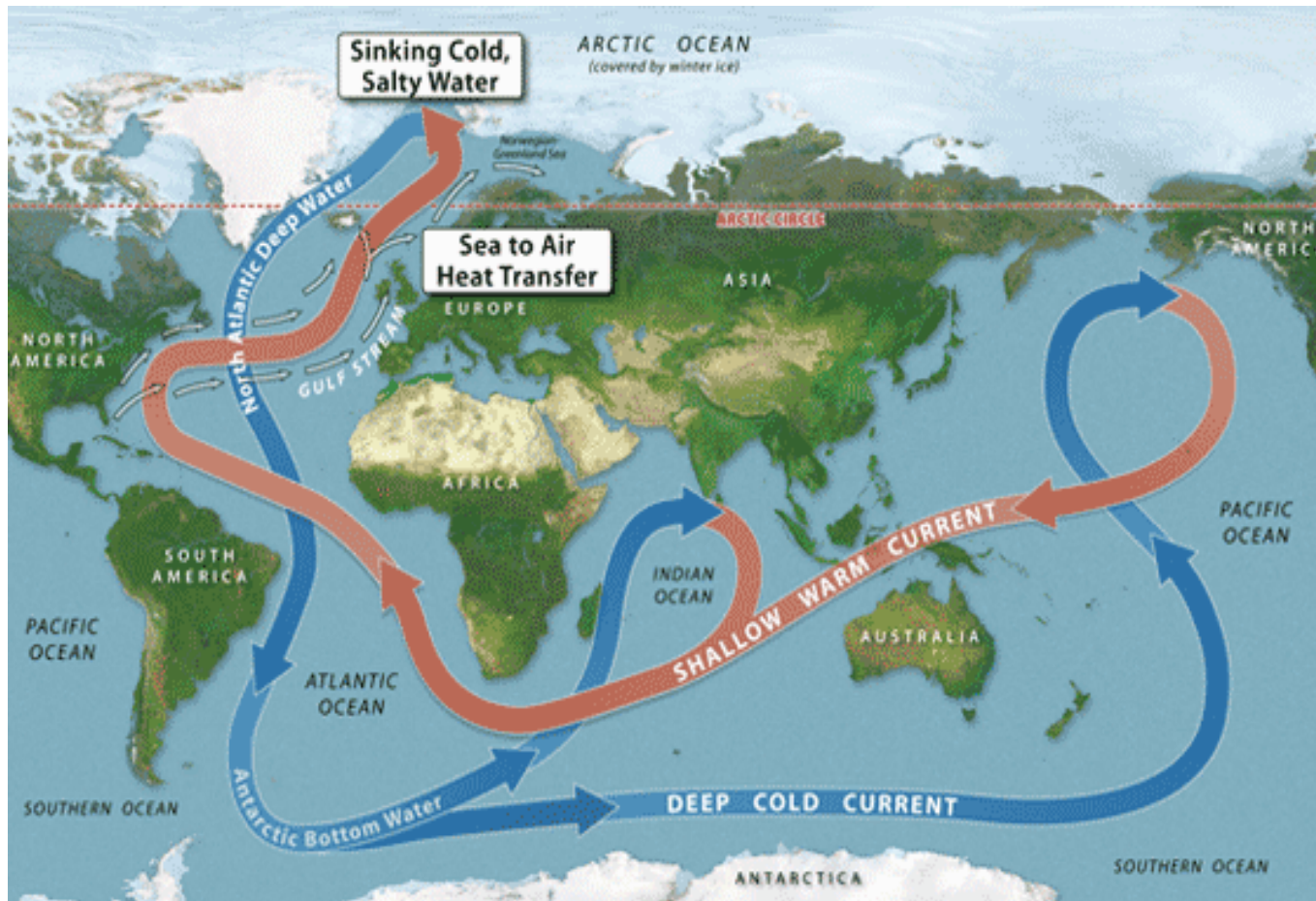
# Investigation the oceans

- Since WWII scientists have eagerly explored the oceans both directly and remotely using everything from submarines to sonar.
- In the 1960's-'70's oceanographers released the map of the Earth's ocean floors.

# The Earth's Ocean Floor



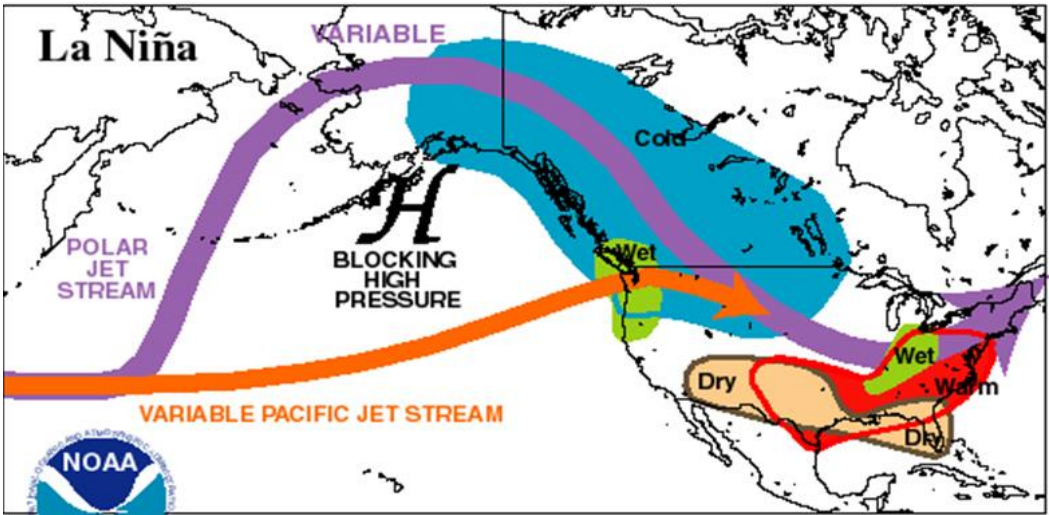
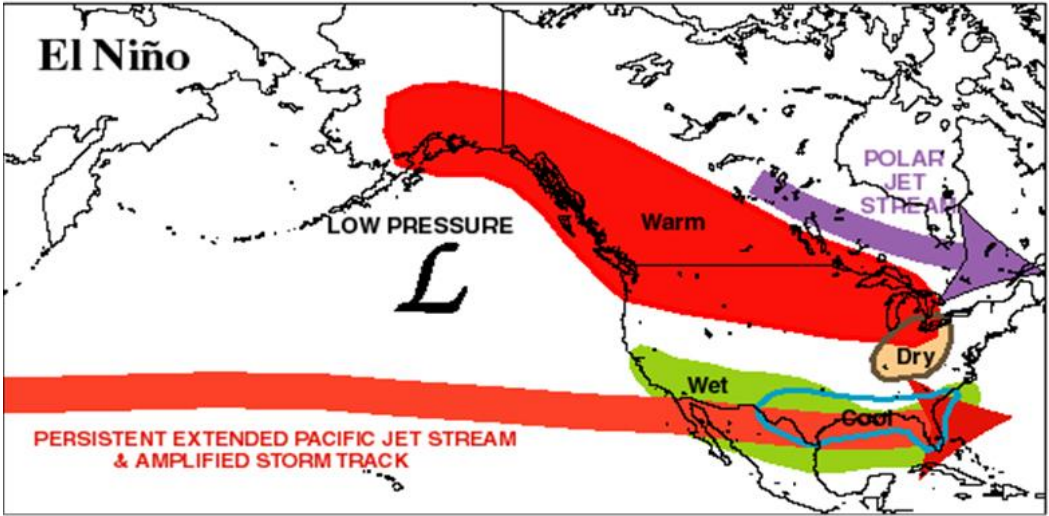
# Ocean Circulation



# El Nino/ La Nina and Southern Oscillation

- Off the Western coast of South America the ocean water is usually cold and nutrient rich, making for good fishing.
- Some years, around Christmas time, the water is about 4-5 degrees warmer. This affects the climate on each side of the Pacific.
- More rain and flooding in the Western USA and drought & wildfires in Australia.
- La Nina has just the opposite affect on the climate.





Climate Prediction Center/NCEP/NWS

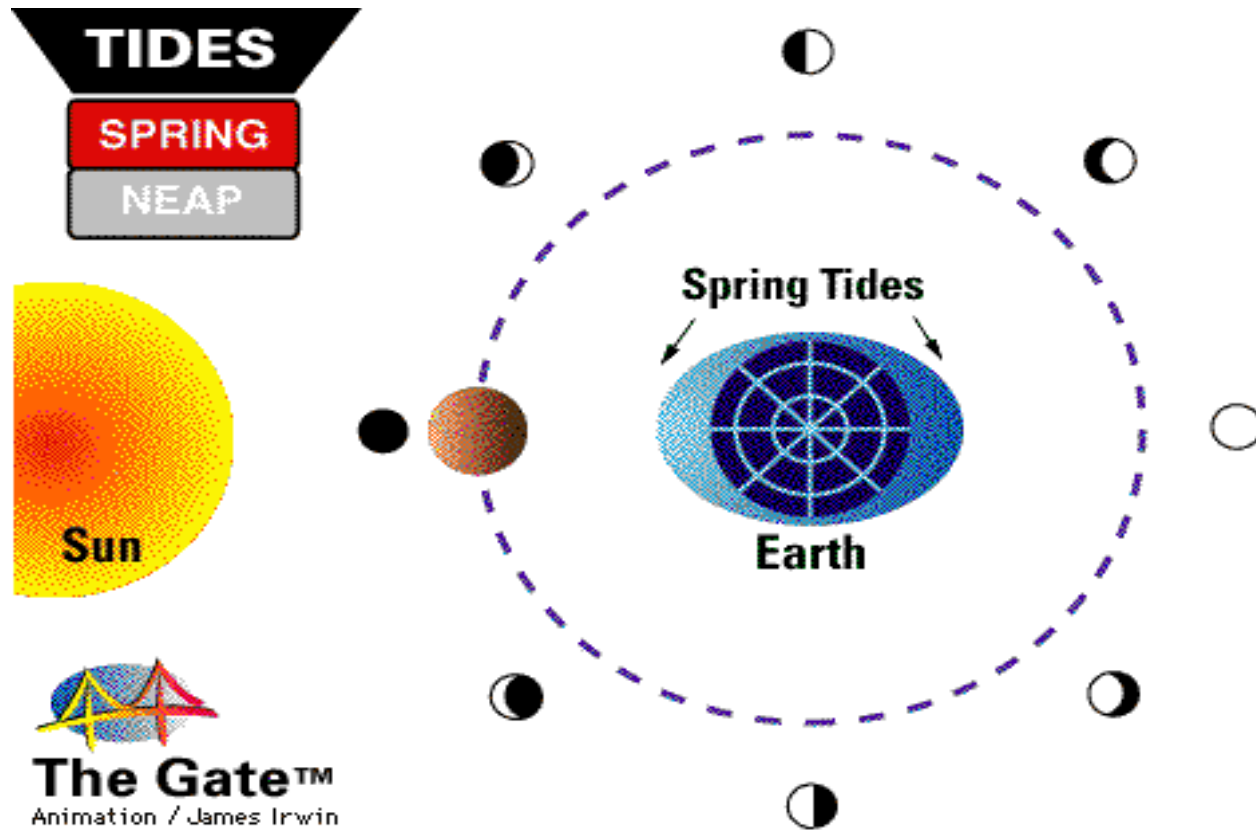
# The Earth's Tides

- Tides are the twice daily cycle of change in sea-level.
- Tidal range is the difference between lowest and highest tides. Some are small and others are extreme. EX: Bay of Fundy
- The tides are caused by the moon's gravitational pull on the Earth. The oceans show the greatest change because they are fluid.

# The Sun and Tides

- The sun also influences the Earth's tides along with the Moon they create an effect called the Spring and Neap Tides.
- Spring Tide- When the Moon and Sun are aligned with the Earth.
- Neap Tide- When the Moon and Sun are at right angles to the Earth.

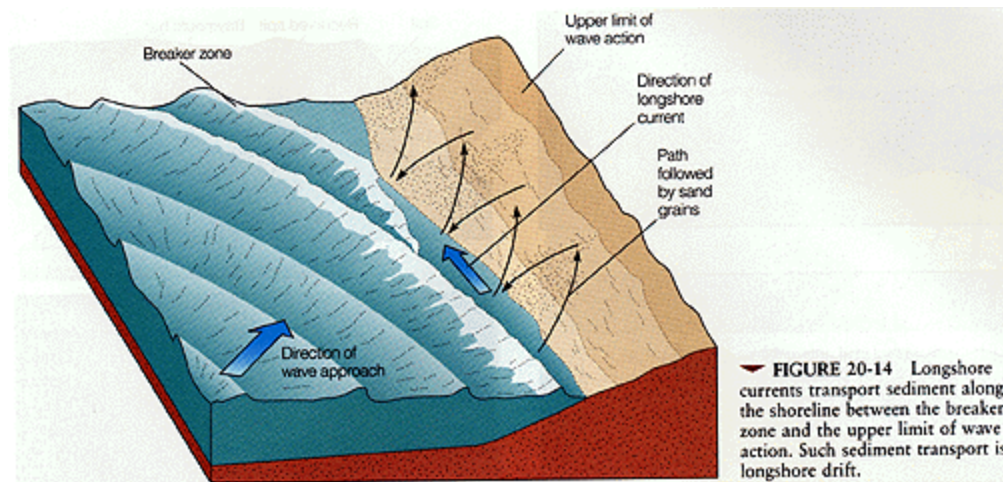
# Spring and Neap Tides



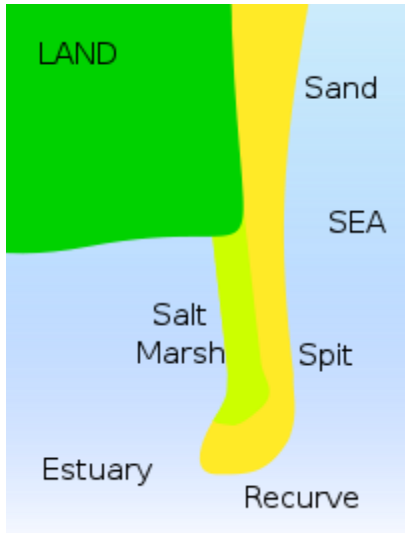
# Coastline Changes

- Due to ocean currents, the shoreline of all continents are constantly changing.
- Waves and Longshore Current break up rocks and transport beach sediments.
- This transport of sediments creates sandbars and barrier islands. EX: Long Island

# Long Island and barrier islands

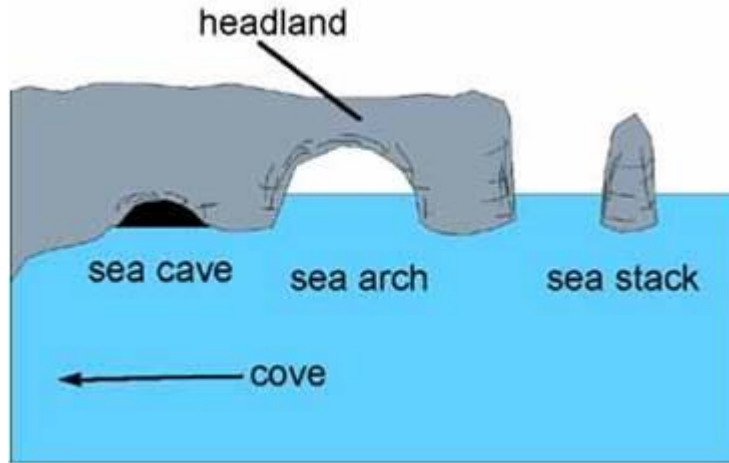


# Coastal Processes



# Coastal erosion and deposition

- Headlands arches and caves



- [Video: caves, arches and stacks](#)