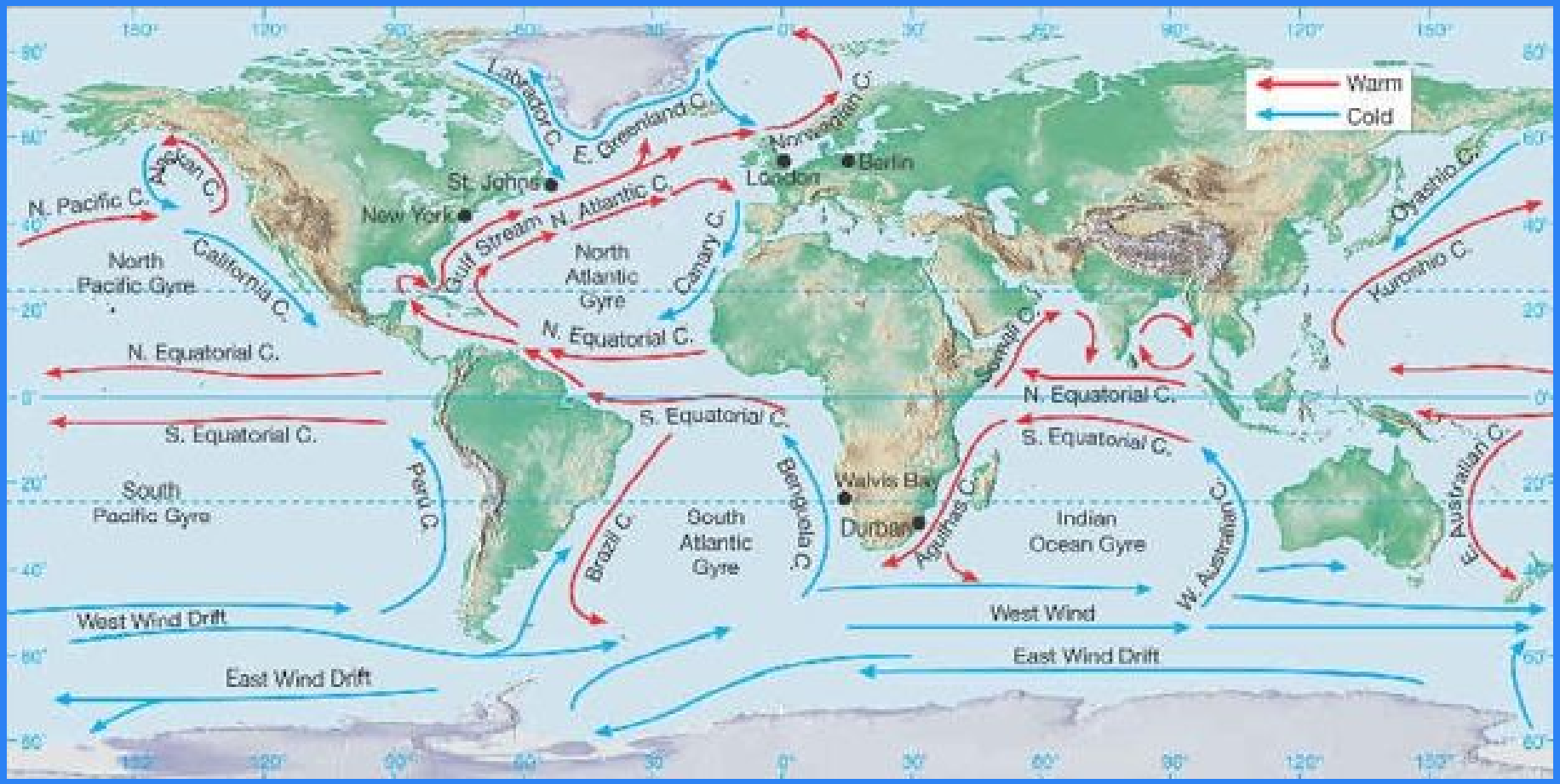
Ocean Currents and How They Impact Weather and Climate



The Oceans

Oceans hold **more** heat energy than the atmosphere

Because of this they **influence** the climate on land in many ways

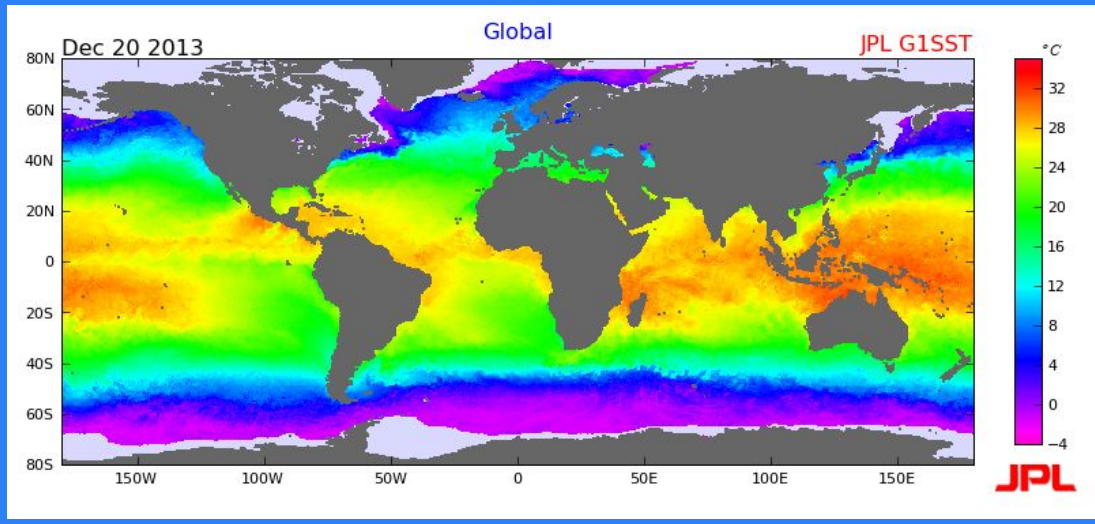
Ocean Current

a large volume of water flowing in a certain direction

Why Do We Have Ocean Currents?

1. **Winds** - they blow along the surface of the water creating currents

2. **Variation in water temperatures** – this creates convection currents which causes oceans to move



Types of Currents

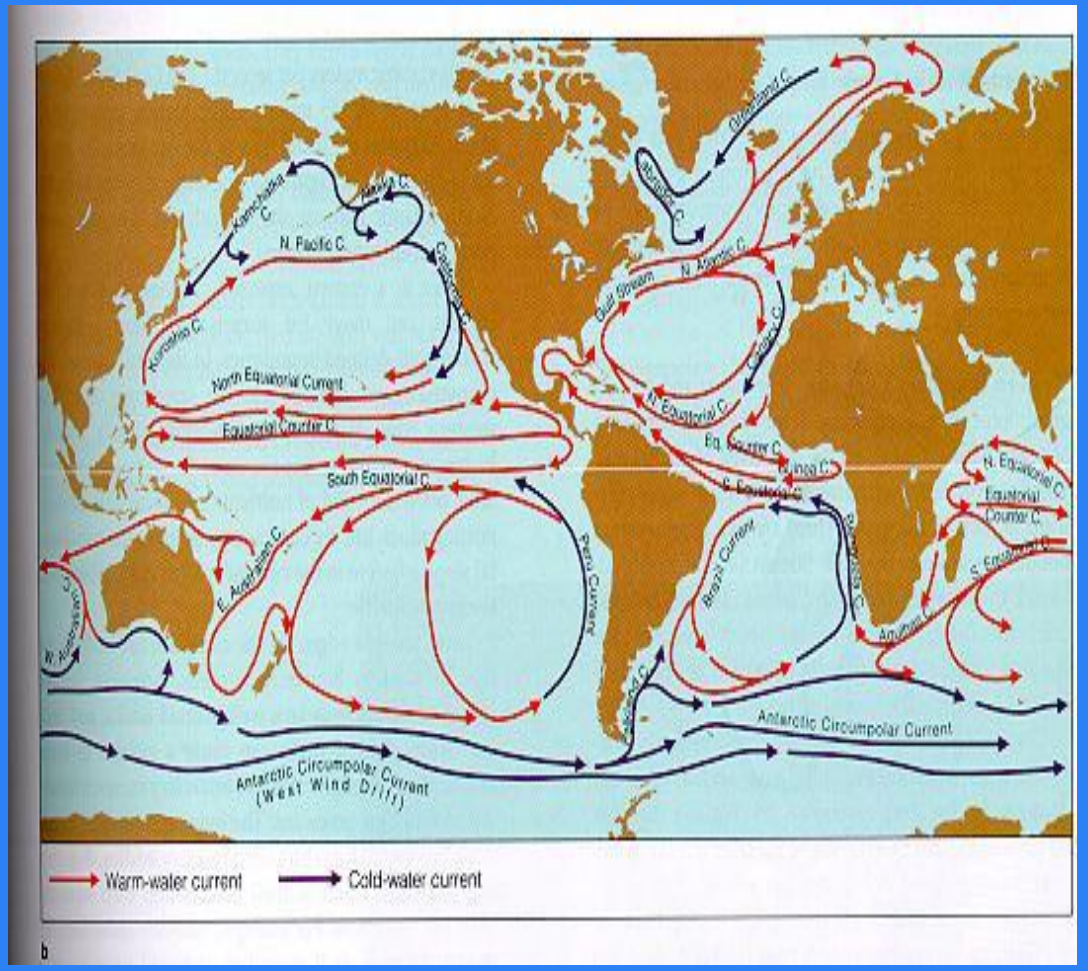
Two kinds of ocean currents that distribute this heat

1) **surface currents -** driven by prevailing winds/convection in the atmosphere

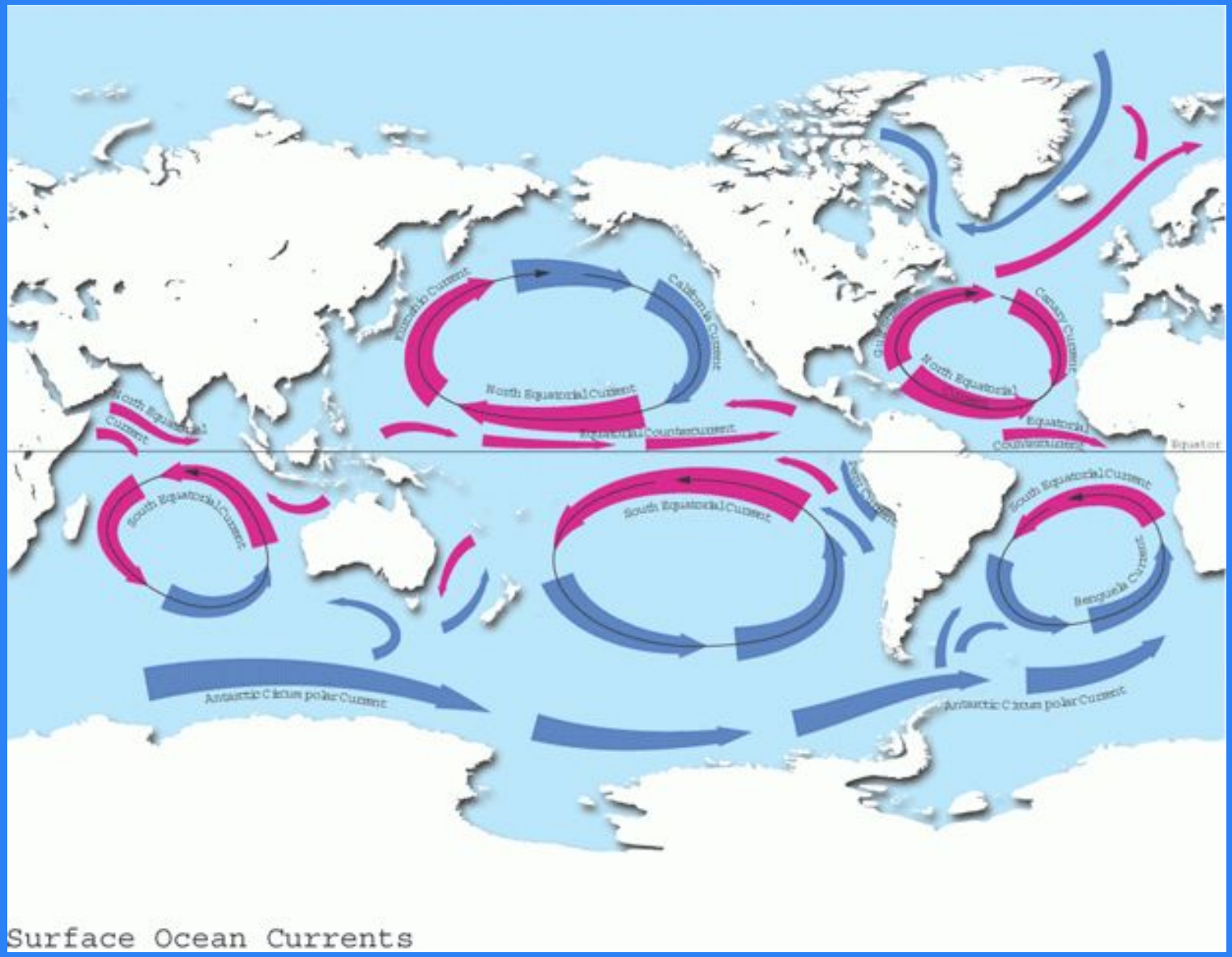
2) **deep ocean currents -** driven by convection in the ocean

Surface Currents

Surface ocean currents are caused by the **surface wind patterns**

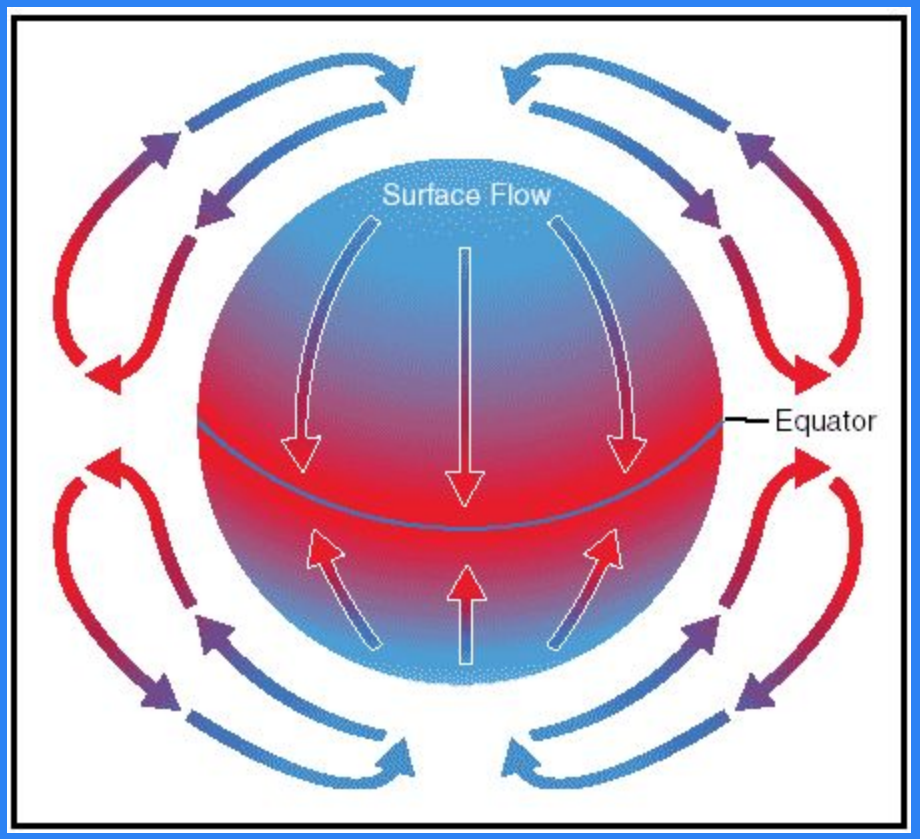


Winds Cause Surface Ocean Currents



Variation of Water Temperatures

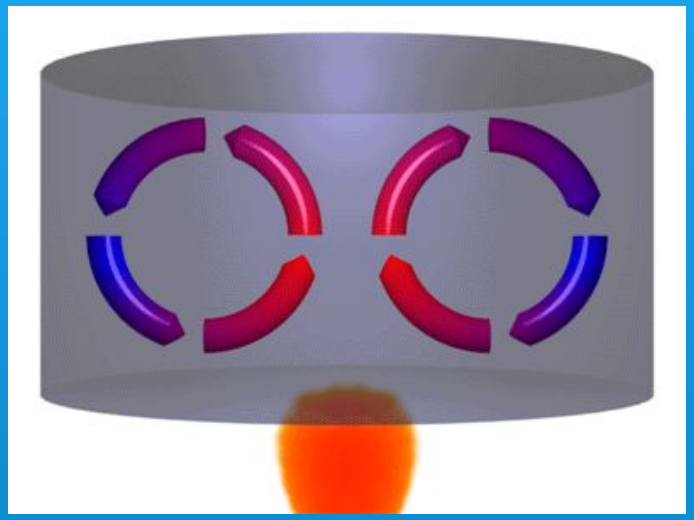
- Warm currents flow away from the equator
- Cold currents flow toward the equator from the poles

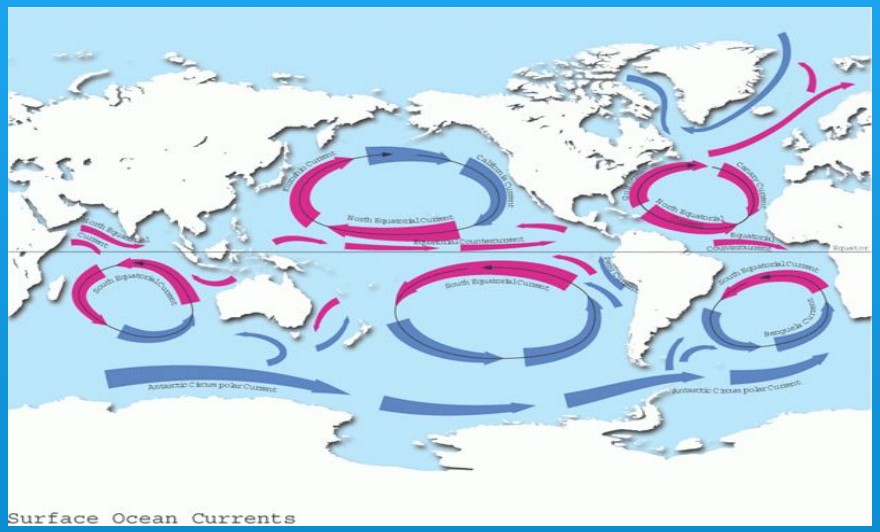


Variation of Water Temperatures

- Convection Currents - lighter (less dense), warm water rises while heavier (more dense) cool water sinks

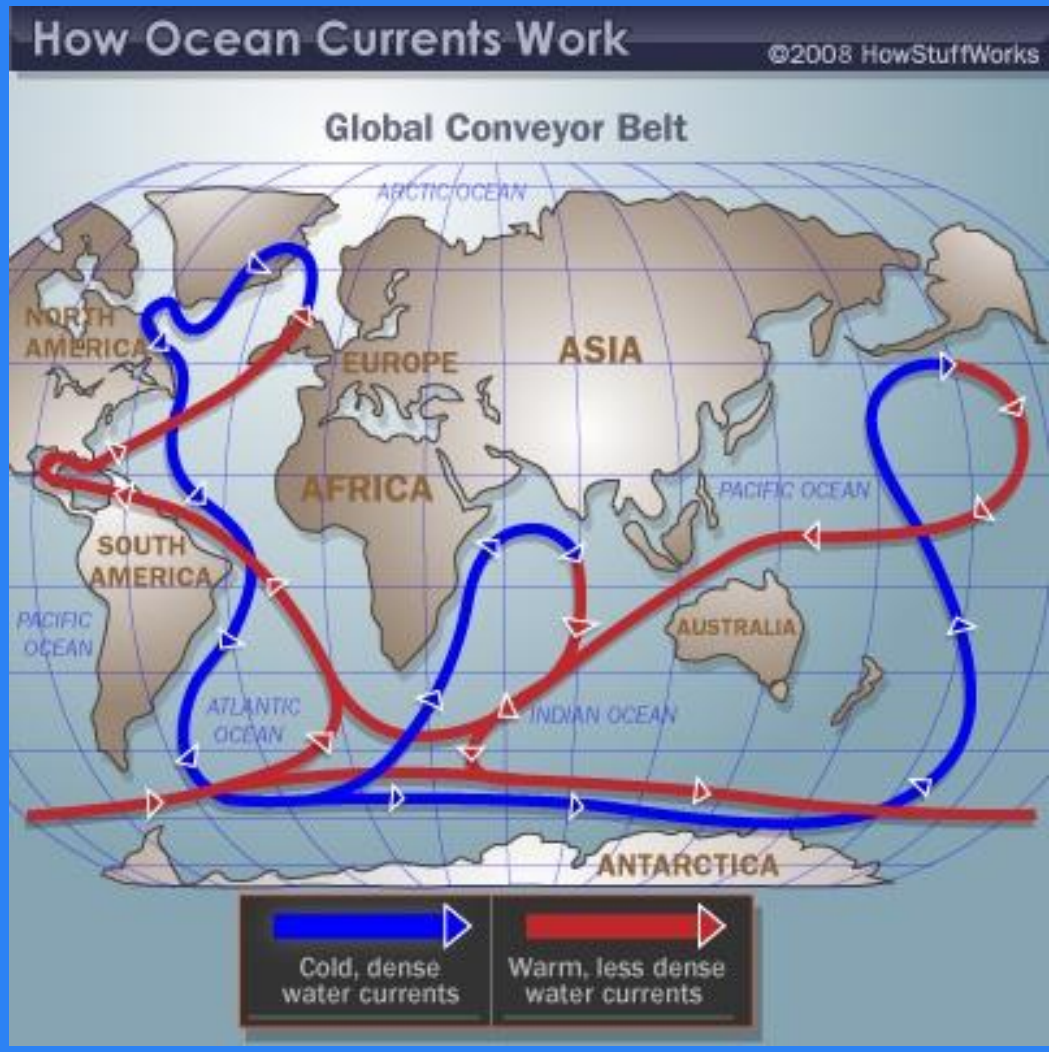
- This movement creates circulation patterns

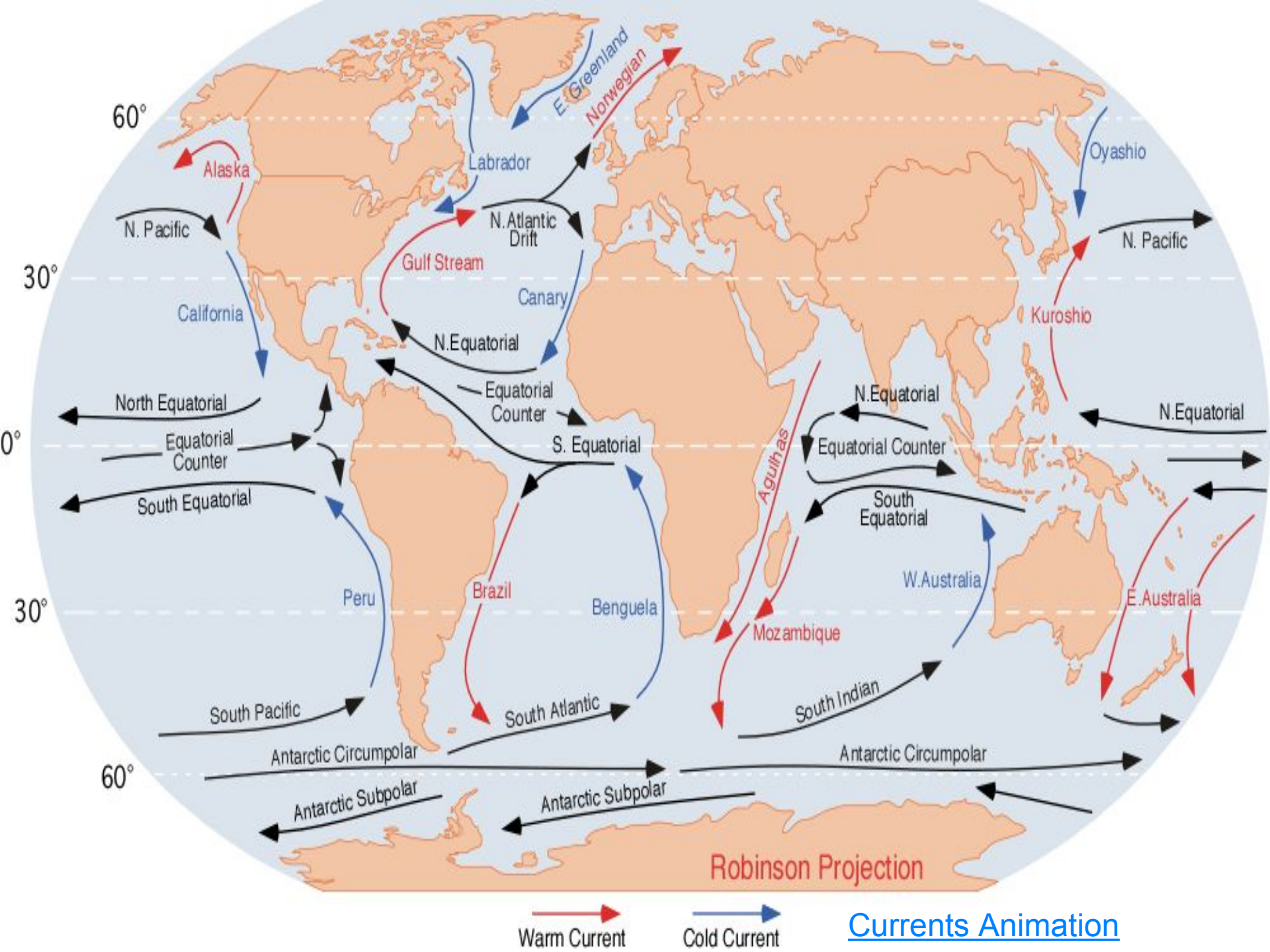




Variation of Water Temperatures

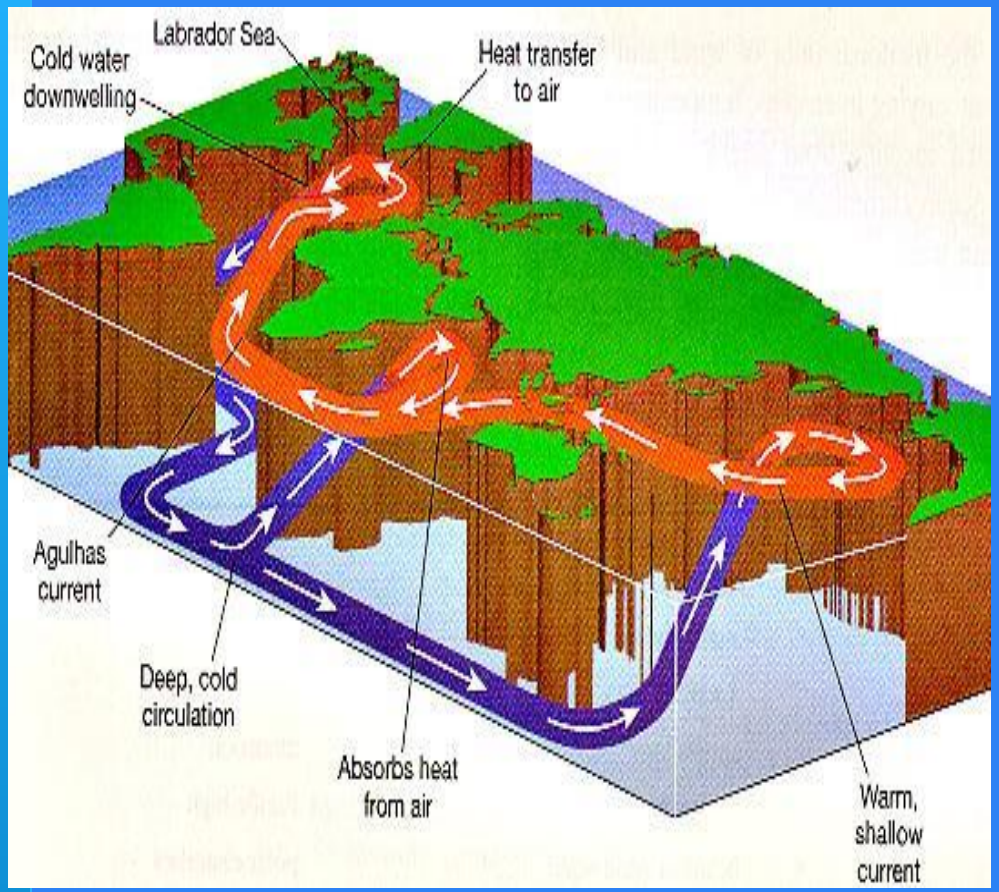
Convection results in the continual circulation of ocean water on a global scale



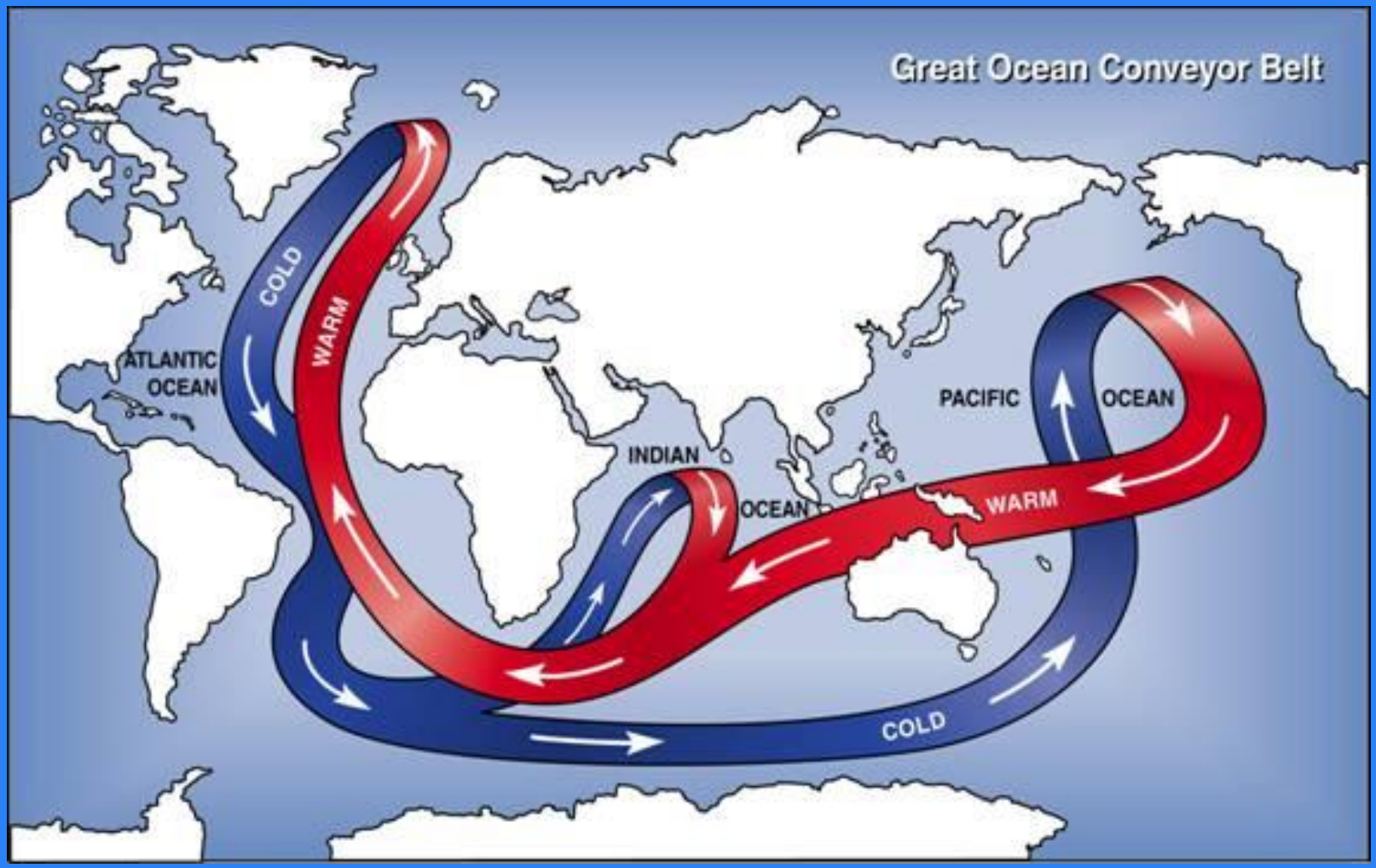

60°
30°
0°
30°
60°
Alaska
N. Pacific
California
Labrador
E. Greenland
Norwegian
N.Atlantic Drift
Gulf Stream
Canary
N.Equatorial
North Equatorial
Equatorial Counter
South Equatorial
Equatorial Counter
S. Equatorial
Peru
Brazil
Benguela
South Pacific
South Atlantic
Antarctic Circumpolar
Antarctic Subpolar
Oyashio
N. Pacific
Kuroshio
N.Equatorial
N.Equatorial
Equatorial Counter
South Equatorial
Agulhas
W.Australia
E.Australia
Mozambique
South Indian
Antarctic Circumpolar
Antarctic Subpolar
Robinson Projection
Warm Current
Cold Current
Currents Animation

Deep Ocean Currents

- caused by differences in temperature and salinity (saltiness)
- help regulate temperature and maintains Earth's balance
- transports water around the globe
- Example: The Great Ocean Conveyor Belt



Deep Ocean Currents



Great Conveyor Belt

The Great Ocean Conveyor Belt

- how ocean currents circulate thermal energy around Earth

Big Idea!

Temperature and Salinity Affect Density

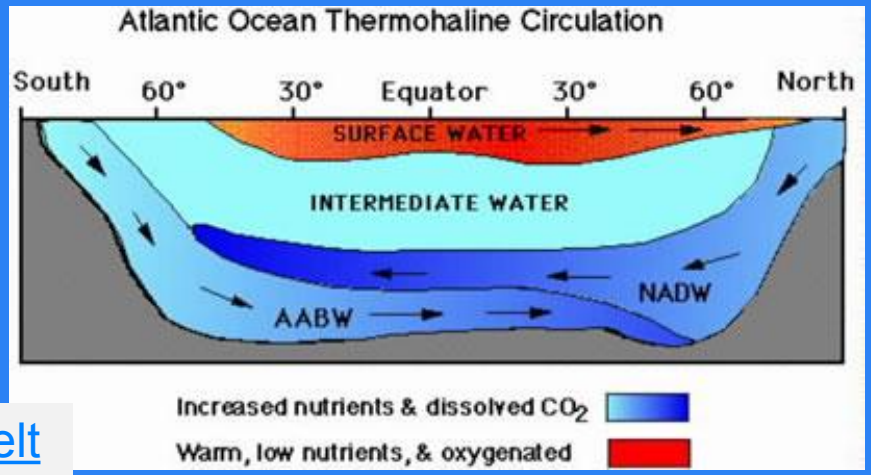
Colder + Saltier = Denser

Interesting Fact:

- The Great Conveyor Belt moves much more slowly than surface currents
- it takes one section of the belt about 1,000 years to complete one full circuit of the globe

Importance of the Conveyor Belt

- helps regulate temperature
- transports water around the globe
- allows for nutrient recycling (nutrients and carbon dioxide from the bottom layers of the ocean are distributed through the upper layers enabling the growth of algae and seaweed that ultimately support all forms of life)



Ocean Currents (start at 1:15)

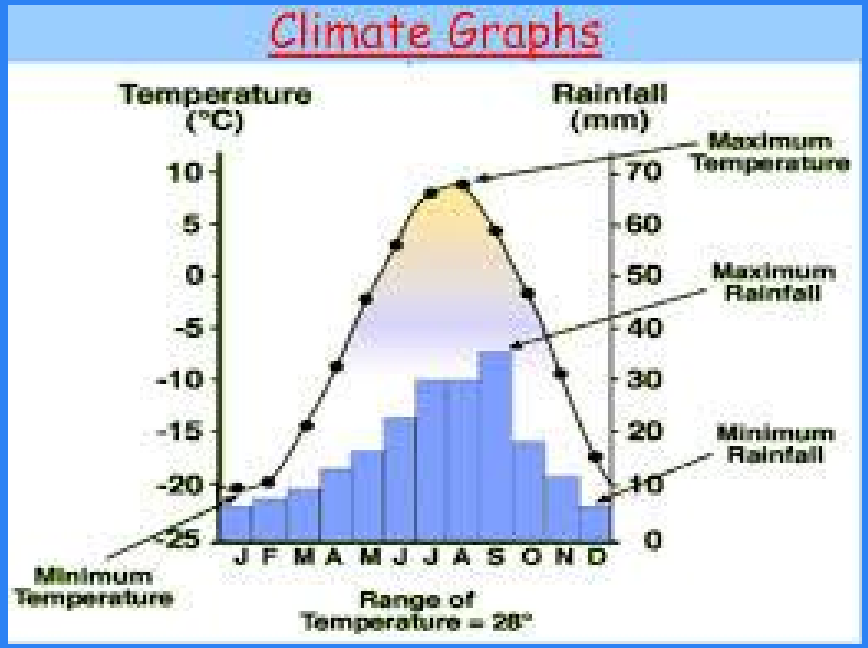
Conveyor Belt


OCEANS, CLIMATE,
AND WEATHER

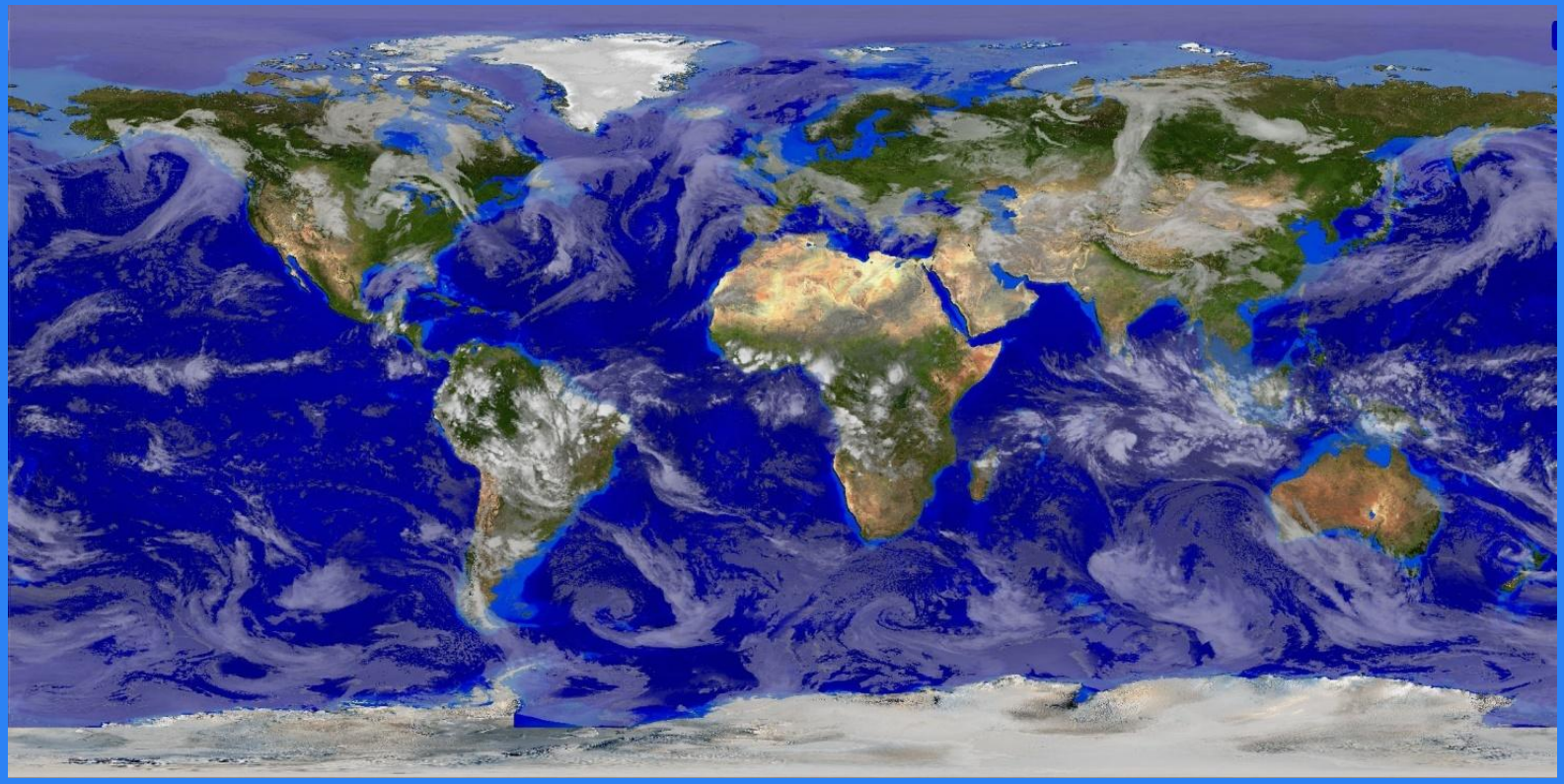
Difference Between Weather and Climate

Weather - conditions of the atmosphere are over a short period of time

Climate - how the atmosphere "behaves" over relatively long periods of time (usually measured in periods of 30 years or more)

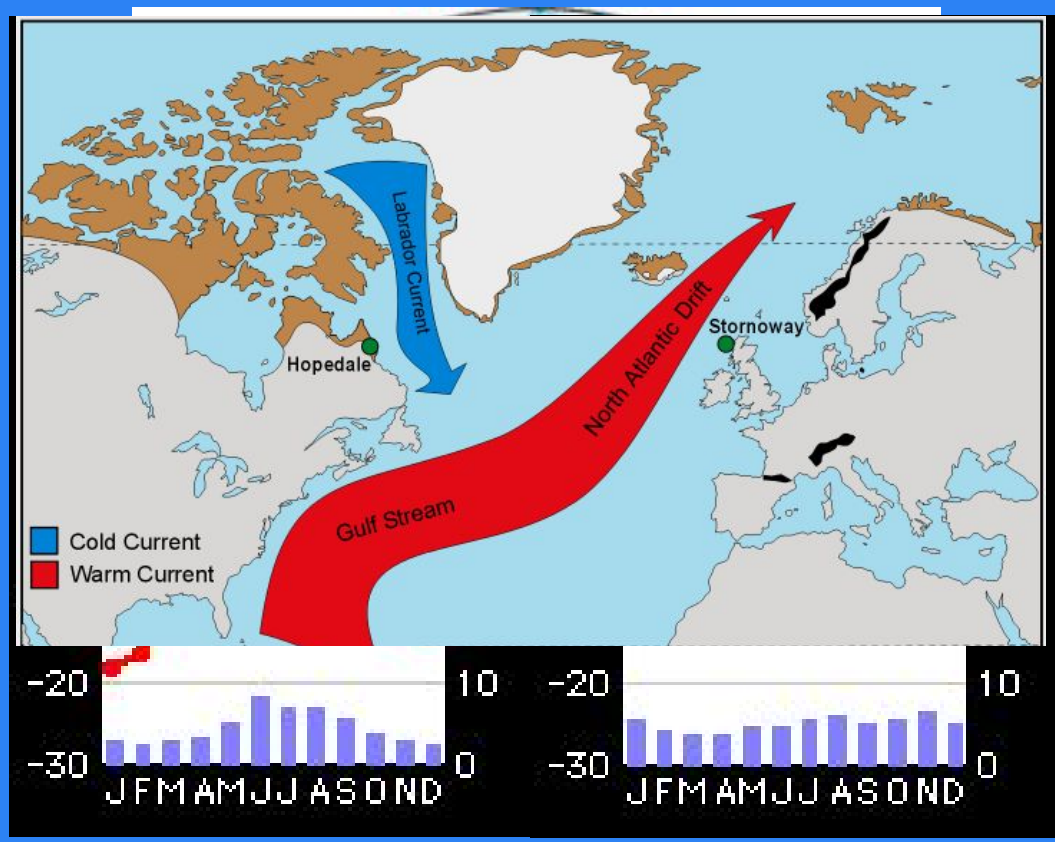


Since ocean currents transport energy (temperature) and moisture around the globe, they play an important role in global weather patterns

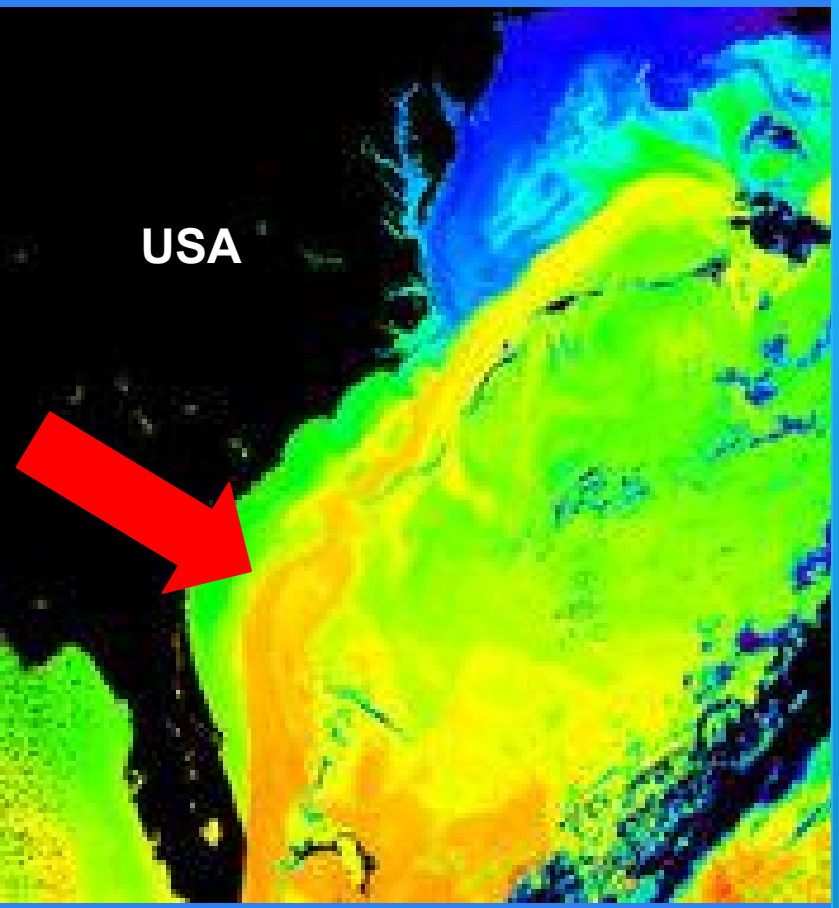


Ocean Currents and Climate

- It takes **more** energy to change the temperature of water than land or air
  - Water warms up and cools off much more slowly than land or the atmosphere
- England's climate is warmer due to the ocean and a warm current (Gulf Stream)



Gulf Stream



The Gulf Stream, is a powerful, warm, and swift Atlantic ocean current that originates in the Gulf of Mexico

The Gulf Stream influences the climate of the east coast of North America from Florida to Newfoundland, and the west coast of Europe

Its extension toward Europe makes winters warmer than they otherwise would be at those latitude

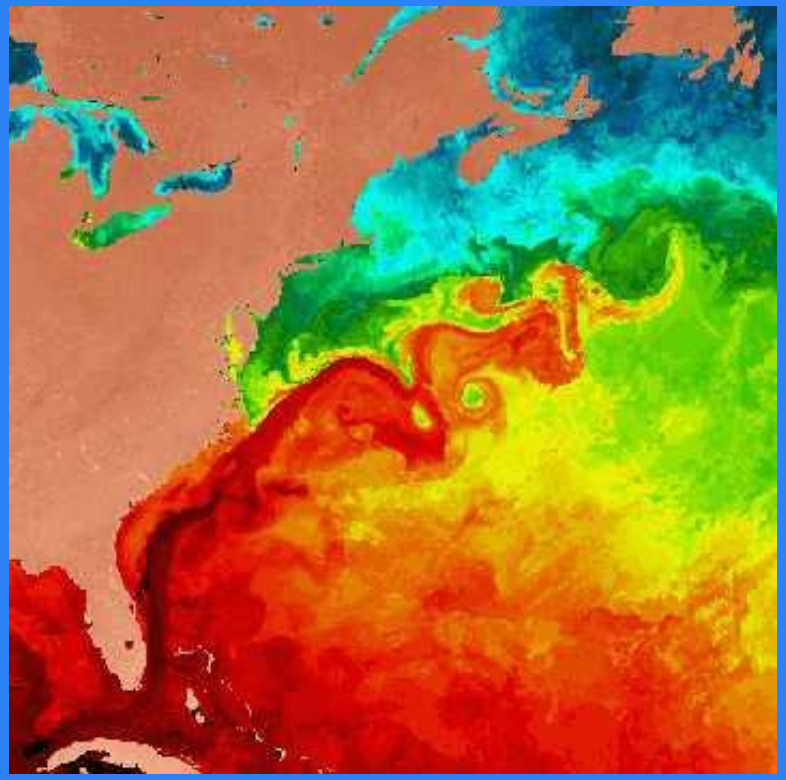
The Gulf Stream is largely driven by the wind.

Ocean Currents and Climate

- the climate near the coast line is moderated by the ocean
  - cooler summers
  - warmer winters

Warm Ocean Currents

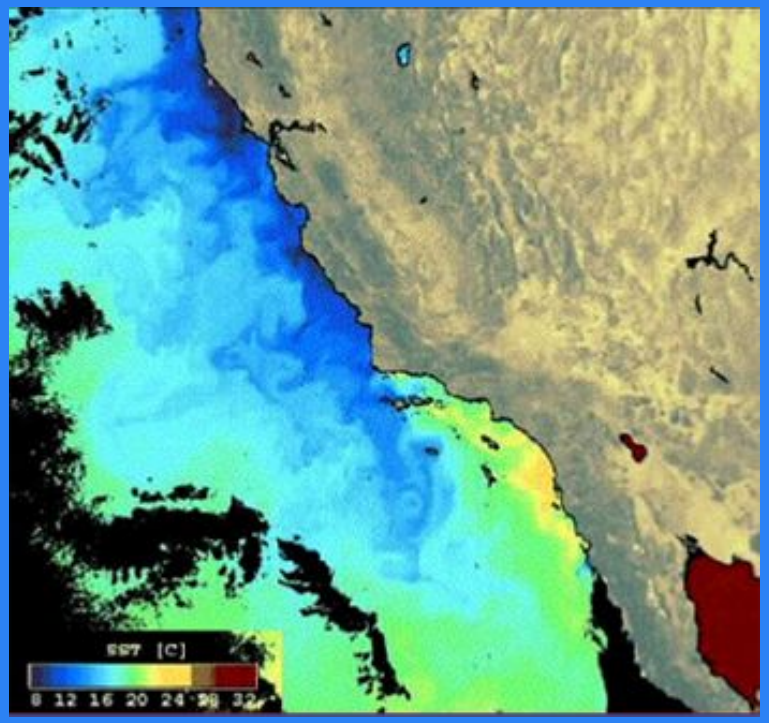
- Warm ocean currents move into an area -
  - evaporation increases, moving moisture and energy to the atmosphere
  - Increases temperature and humidity in the area



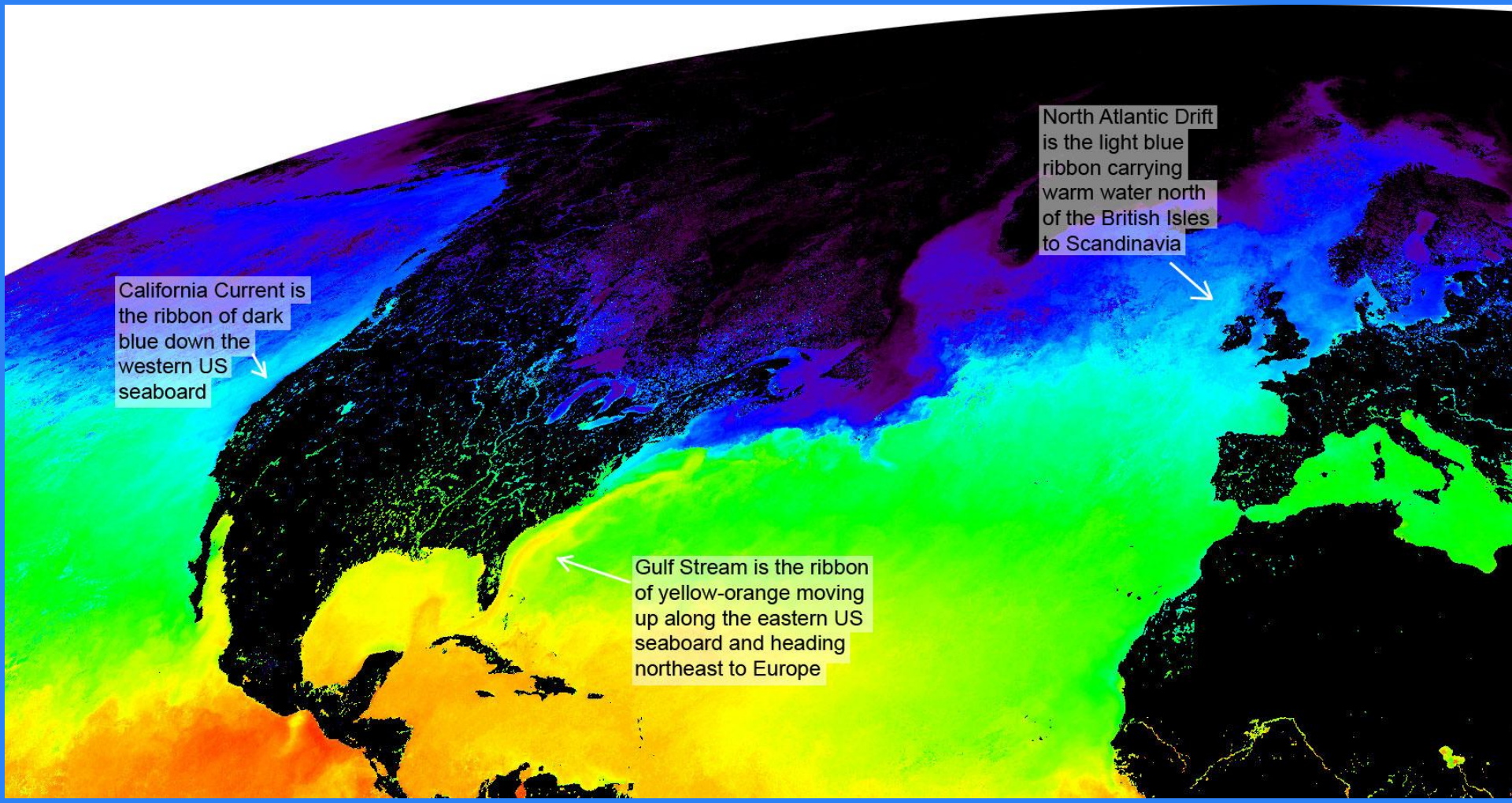
Ocean Currents

Cold Ocean Currents

- Cold ocean currents move into an area -
  - lowers surface air temperatures
  - reduces evaporation rates
  - leads to colder, drier conditions in the area



Atacama Desert


North Atlantic Drift is the light blue ribbon carrying warm water north of the British Isles to Scandinavia
California Current is the ribbon of dark blue down the western US seaboard
Gulf Stream is the ribbon of yellow-orange moving up along the eastern US seaboard and heading northeast to Europe

Ocean's Role

- Oceans influence weather systems (local and short-term) and climate (regional and long-term)
  - The temperature of the water affects the temperature of the air above it - air moves around heating up or cooling off the land nearby
  - Water is harder to heat up and cool off than land
    - land near the sea tends to be milder, not getting as hot or cold as inland climates
  - Ocean currents distribute heat and cold around the Earth, thus making climates less extreme at the poles and equator