Waves and Currents

Essential Question: How are waves and currents created?

Standards:

S6E3d. Explain the causes of waves, currents, and tides.

Activating Strategy: Watch the video below then answer the questions.

http://video.disney.com/watch/catching-the-eac-4bb39d25a179ea8833003b15

Where is this event happening?

What causes the condition shown in the video?

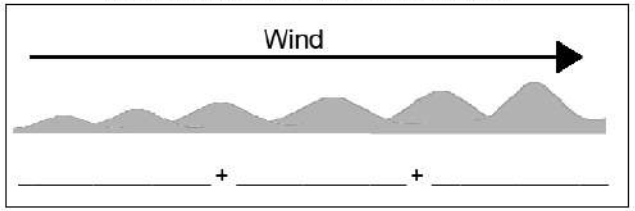
What do you think is the importance of the condition shown?

Use your notes to record important information during the lesson.

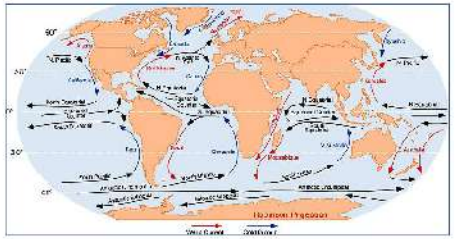
Waves & Currents Name _____ Date _____ Period ___

1. Definition of a wave _____
2. What causes waves? _____
3. Once set in motion, waves _____

Factors that Influence Wind Height



4. Surface currents move water _____
5. Surface currents are powered by _____.
6. Surface currents move in _____ patterns.
7. There are _____ surface currents and _____ surface currents.
8. Surface winds and surface currents are affected by _____.
9. Currents north of the equator _____ and currents south of the equator _____.
10. The ocean _____ the sun's heat (energy). _____ transport this energy.
11. Surface currents move _____.
12. Surface currents can have a _____ or a _____ effect on an area's climate. Why? _____



Waves

A wave is a rhythmic movement that carries energy through matter and space. In the ocean, waves move through seawater.

Causes of Waves

- When wind blows across a body of water, wind energy is transferred to the water
- If the wind speed is great enough, the water begins to pile up, forming a wave
- The height of a wave depends on:
  - The speed of the wind
  - The distance over which the wind blows
  - The length of time the wind blows

Causes of Waves

- Once set in motion, waves continue moving for long distances, even if the wind stops blowing
- The waves you see lapping at a beach could have formed halfway around the world

Currents

Ocean Currents

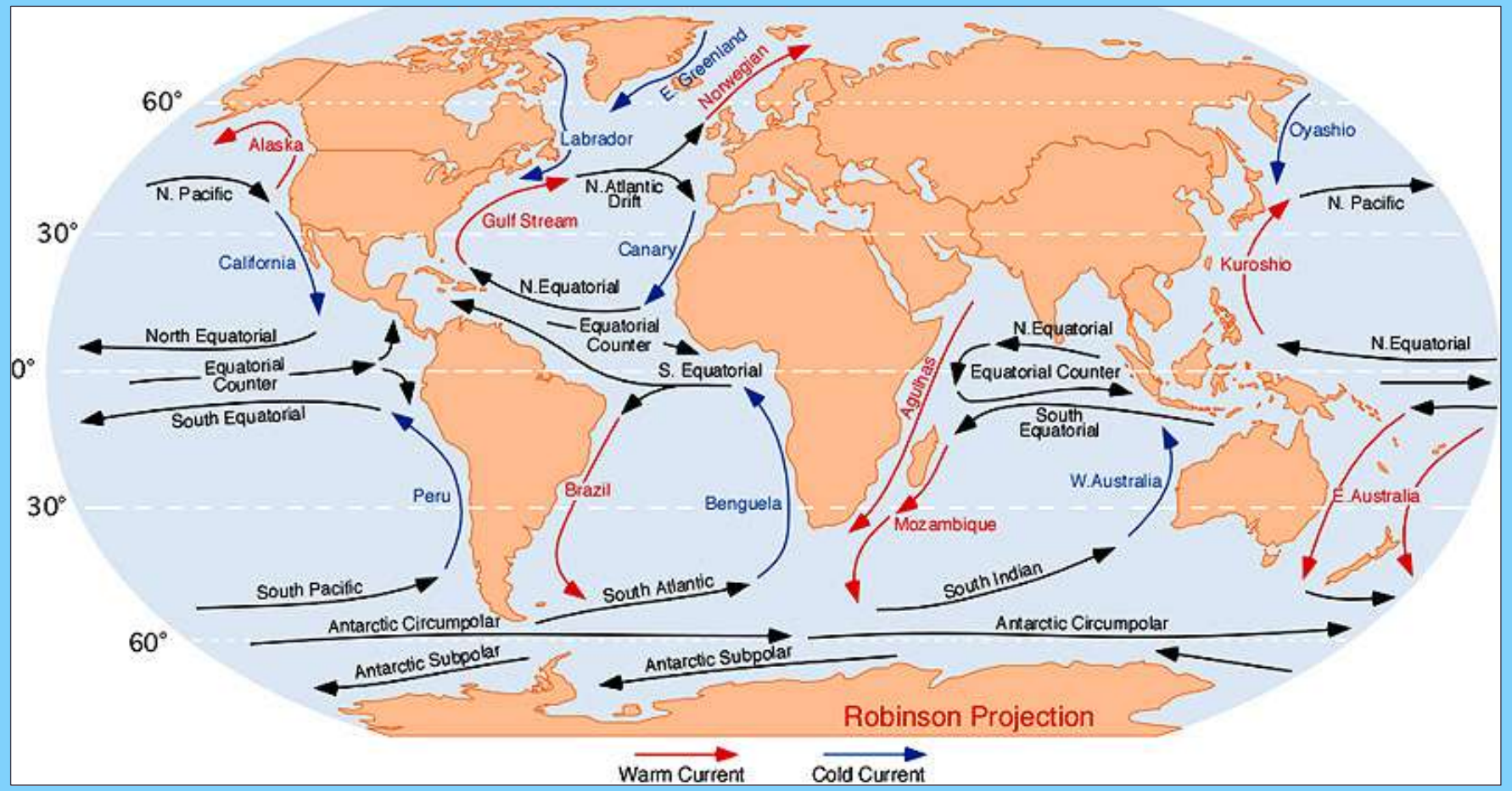
Ocean currents are a mass flow of ocean water. Remember the “Finding Nemo” clip

There are two main types of currents we will be discussing: Surface Currents and Density Currents

Ocean Currents: Surface Currents

- Surface currents move water horizontally – parallel to Earth's surface
- Surface currents are powered by wind
- The wind forces the ocean to move in huge, circular patterns http://www.livescience.com/19662-animation-reveals-ocean-currents.html
- There are warm surface currents and cold surface currents

Ocean Currents: Surface Currents



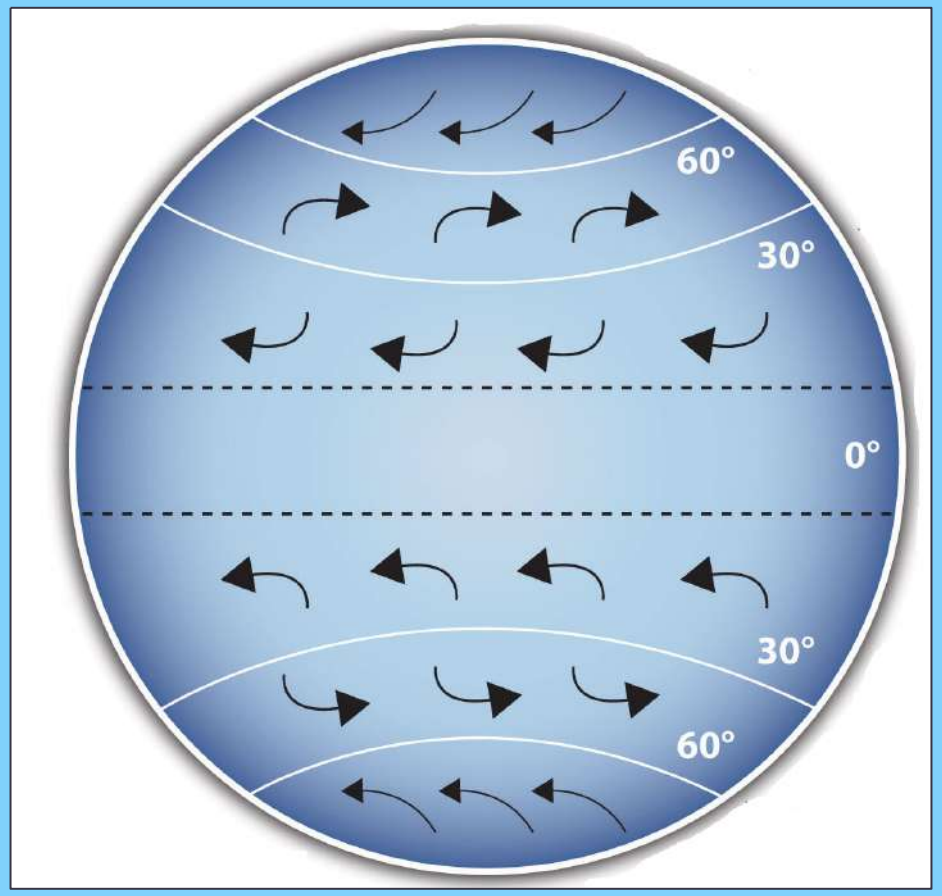
Ocean Currents: Surface Currents

- Surface winds and surface currents are affected by the rotation of the Earth (the Coriolis Effect)

http://www.youtube.com/watch?v=dt_XJp77-mk

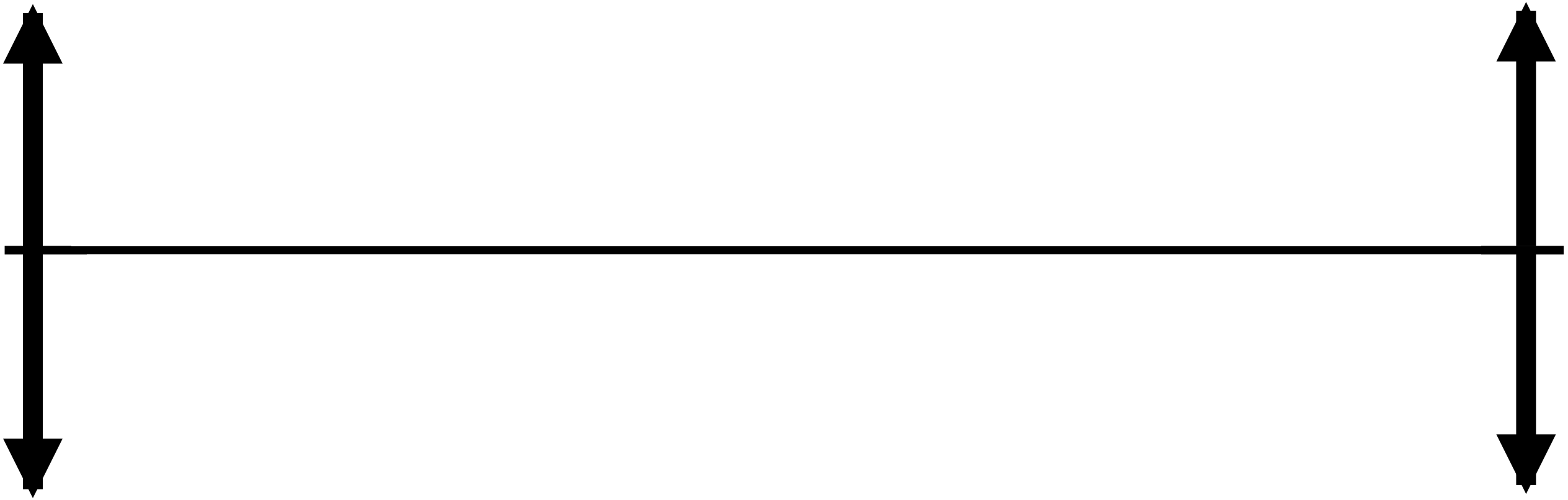
- Because Earth rotates toward the east, winds appear to curve to the right in the northern hemisphere and to the left in the southern hemisphere
- So, currents north of the equator turn to the right and currents south of the equator turn to the left

Ocean Currents: Surface Currents



Curving of surface winds due to the Earth's rotation

Currents



Warm Current Cold Current

Animation of Ocean Surface Currents

http://www.classzone.com/books/earth_science/terc/content/visualizations/es2401/es2401page01.cfm?chapter_no=visualization

Animation of Coriolis Effect

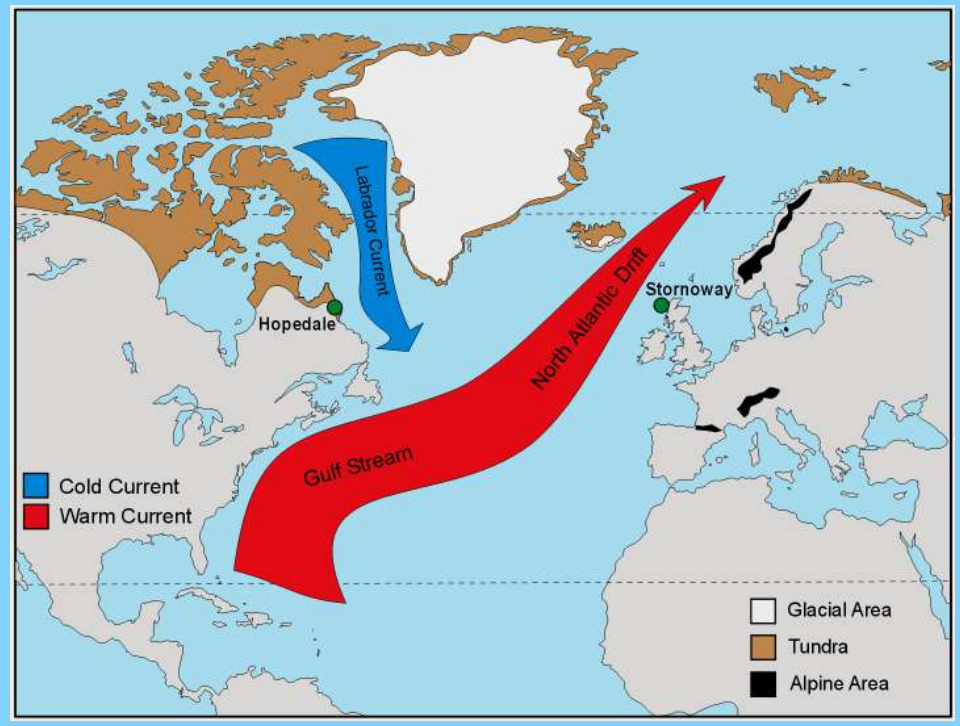
http://www.classzone.com/books/earth_science/terc/content/visualizations/es1904/es1904page01.cfm

Surface Currents Affect Climate

- The ocean absorbs, stores, and moves the sun's heat (energy)
- Surface currents transport this energy all over the world
- Surface currents move warmer water into cooler regions and return cooler water to the warmer regions (tropics)
- Currents can have a cooling effect on an area's climate or a warming effect on an area's climate
- As warm water flows from the equator, heat is released into the atmosphere and the air is warmed.

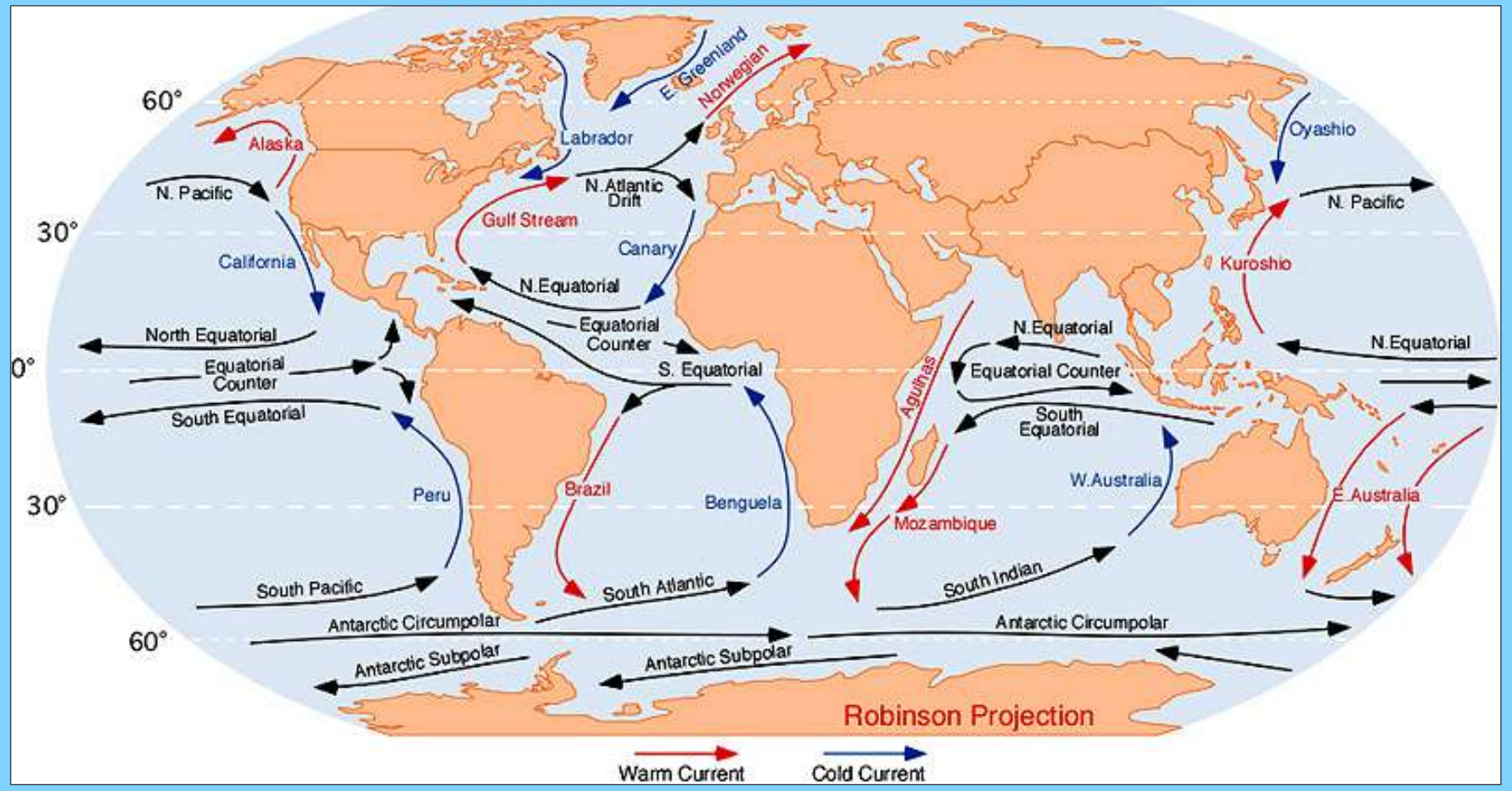
Surface Currents Affect Climate

- Think about what you learned in social studies about Europe's climate. What surface current makes Europe's climate temperate (mild)?
- The Gulf Stream is a surface current that moves warm water from the tropics to the cooler regions around Europe.



Surface Currents

Notice again the Red arrows and the Blue arrows showing the movement of warm water and the movement of cold water



Gulf Stream and Climate

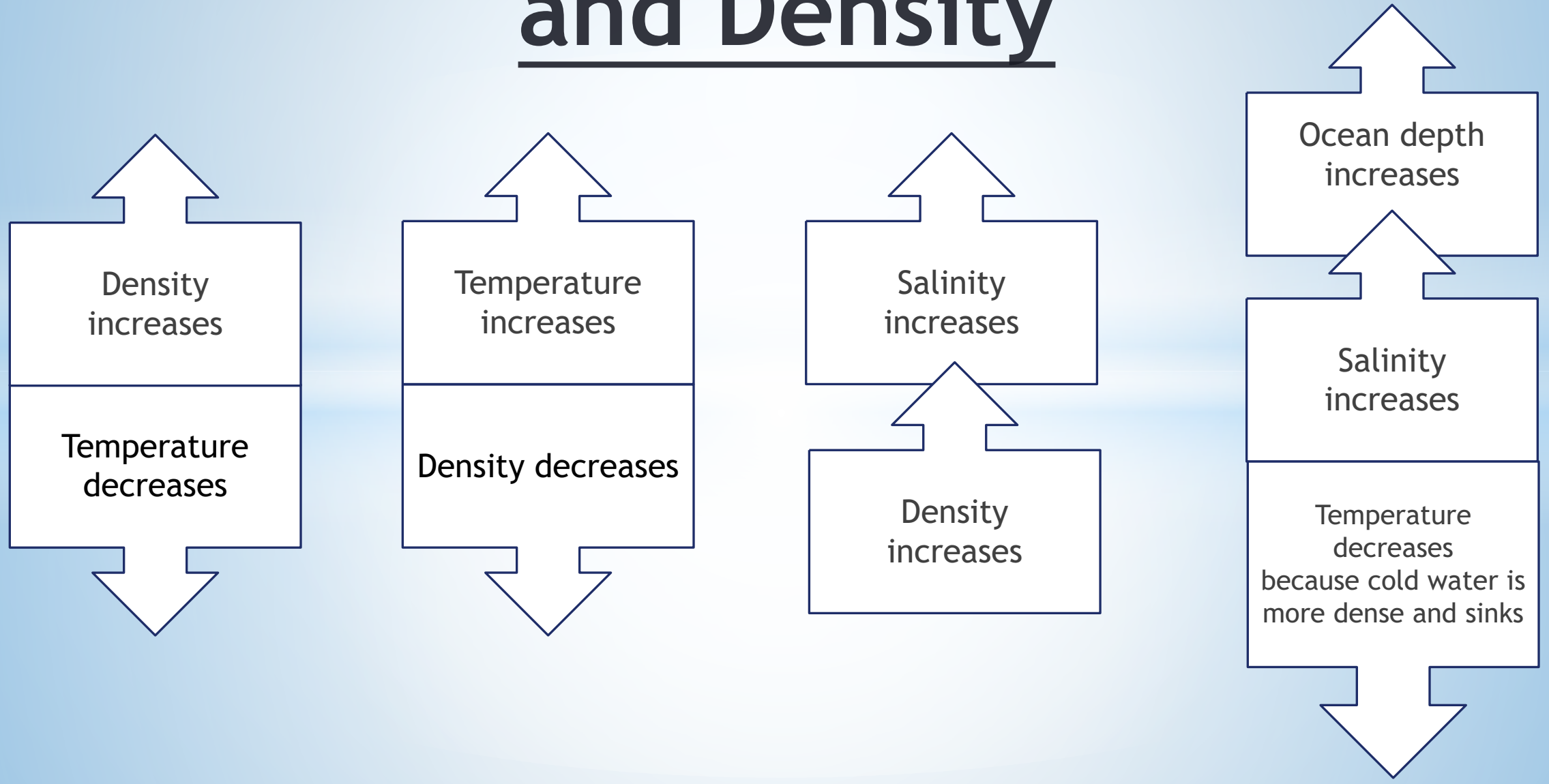
http://www.youtube.com/watch?v=UuGrBhK2c7U

The video reminded us that the masses of water are moved by wind, but what did they say was the primary cause of ocean currents?

Different densities are responsible for ocean currents. What factors did we learn influence ocean water's density?

Temperature and Salinity Affect the Density
of Ocean Water.

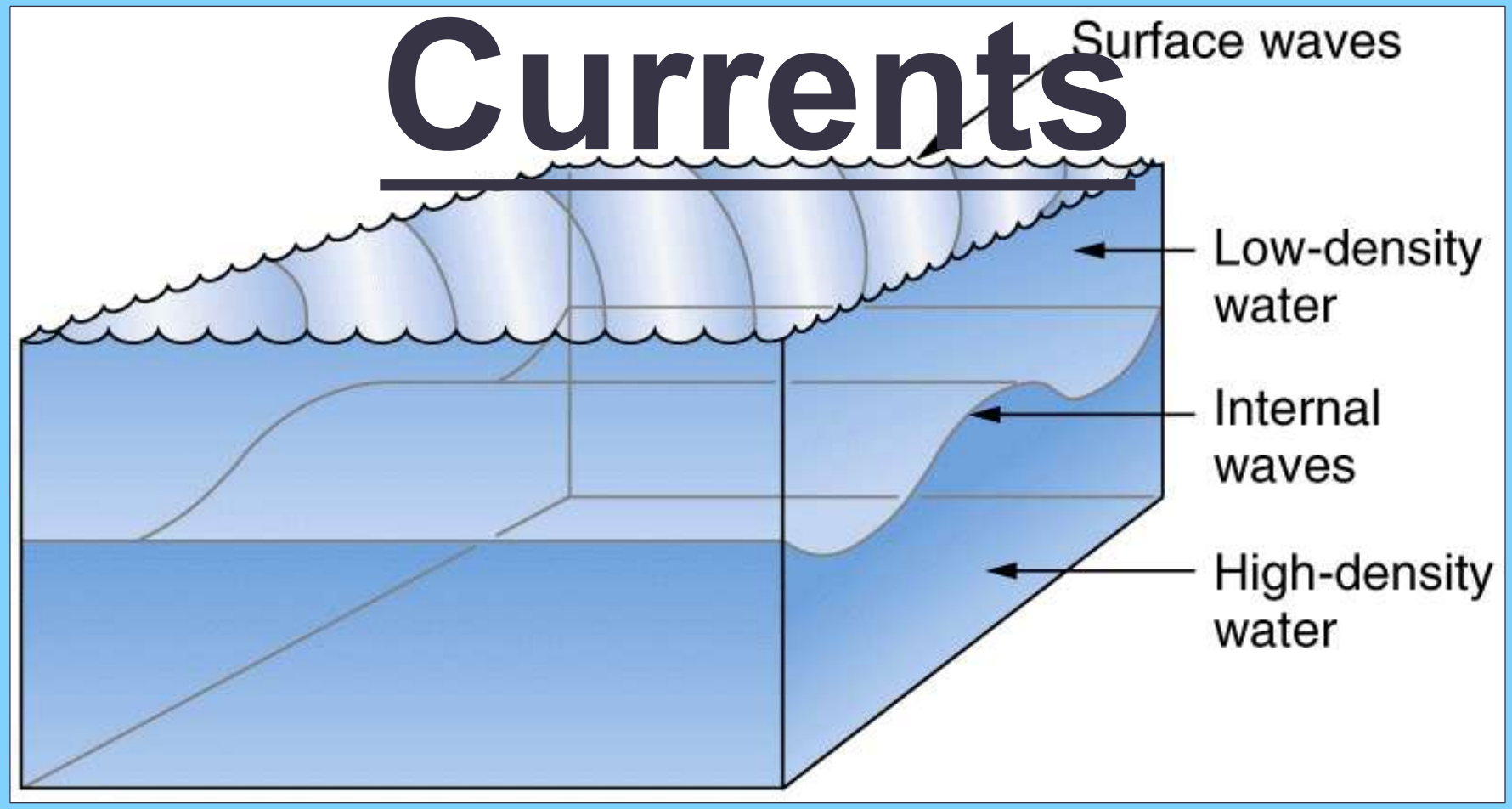
Temperature, Salinity and Density



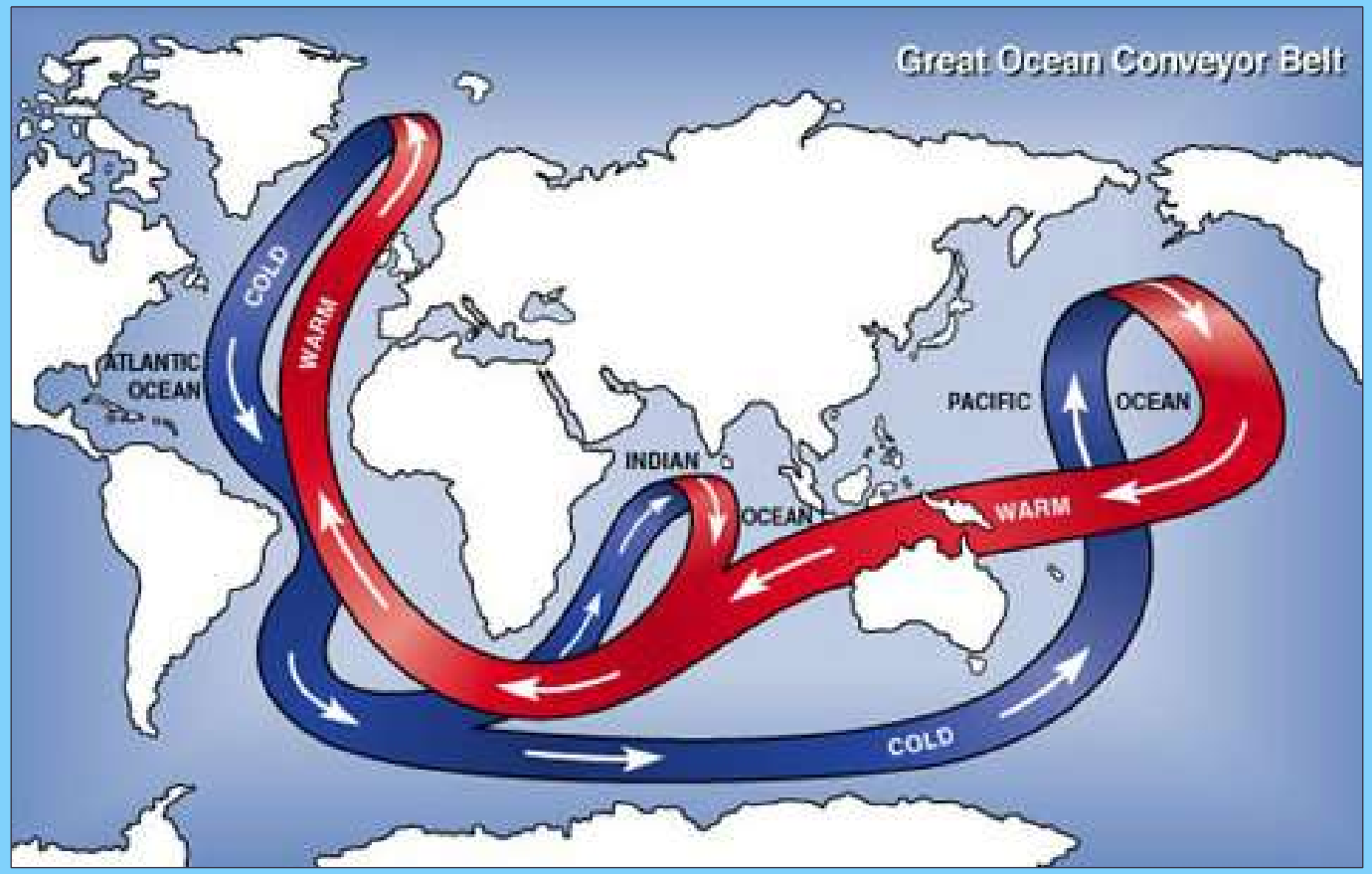
Density Currents

- Deep in the ocean, waters circulate not because of wind but because of density differences.
- A density current forms when a mass of seawater becomes more dense than the surrounding water.
- More dense seawater sinks beneath less dense seawater.
- Density currents circulate ocean water slowly.

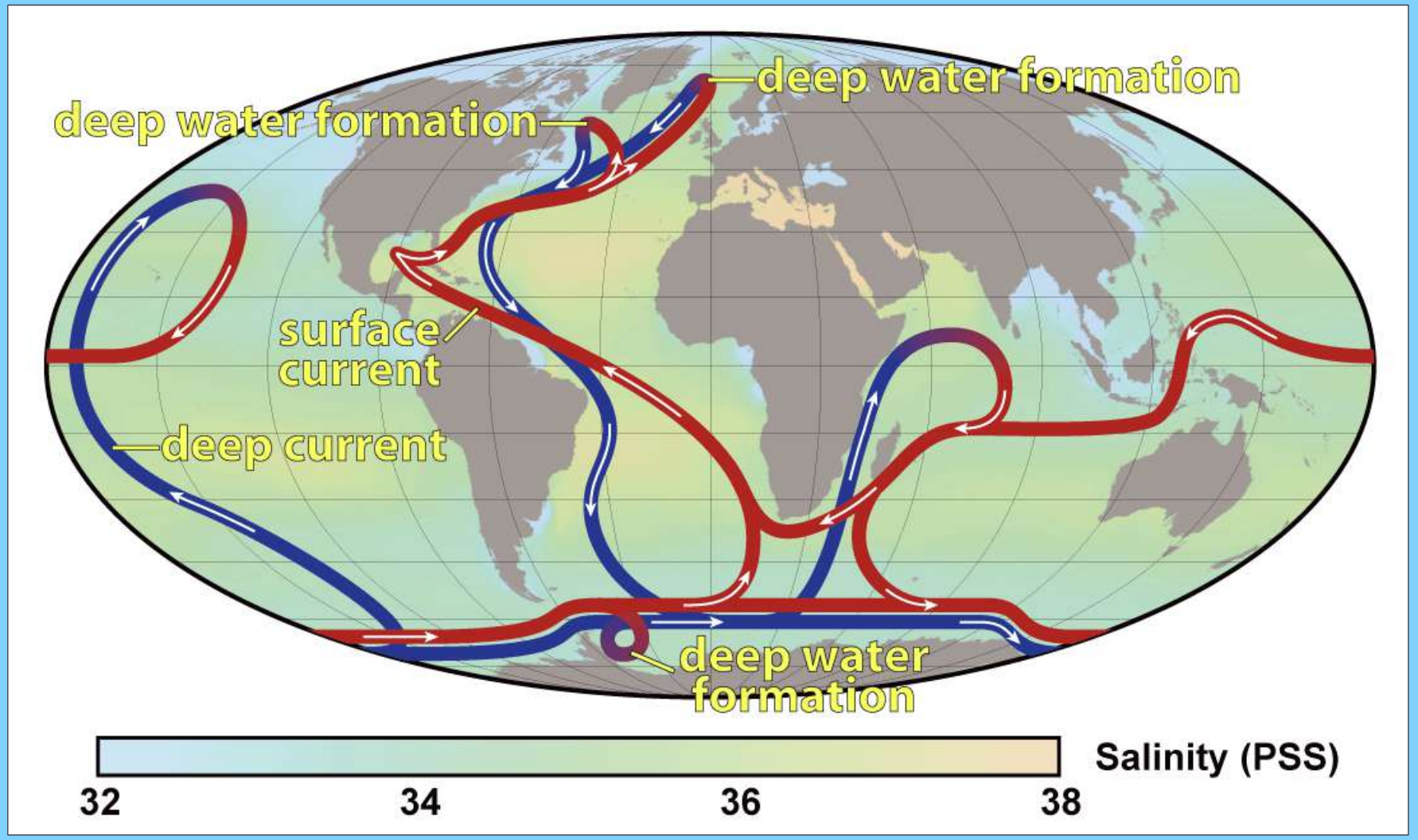
Density Currents



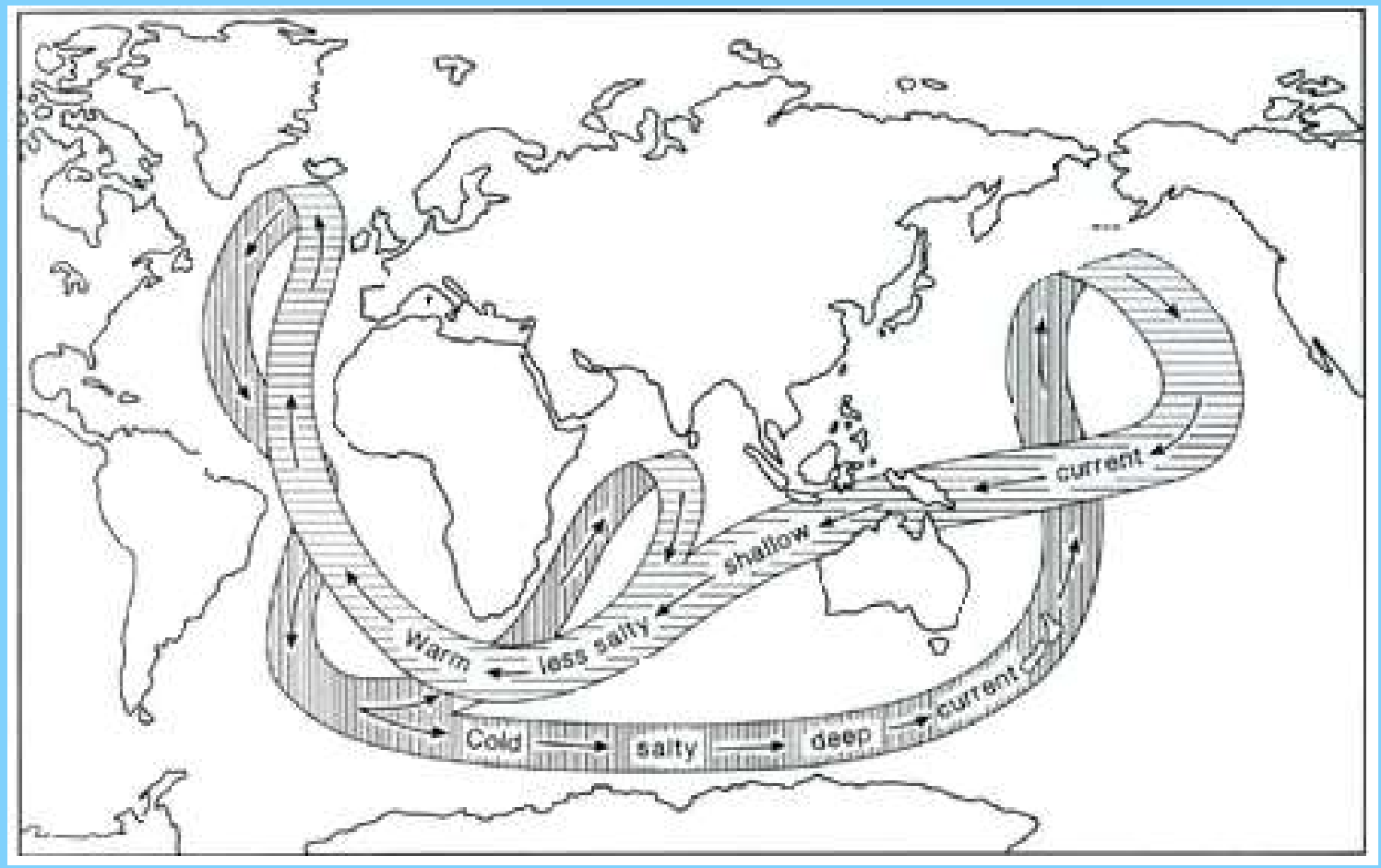
Density Currents



Currents


deep water formation
deep water formation
surface current
deep current
deep water formation
Salinity (PSS)
32
34
36
38

Label on your diagram



Ocean Currents Song

https://www.youtube.com/watch?v=NsdH_NRM-CU

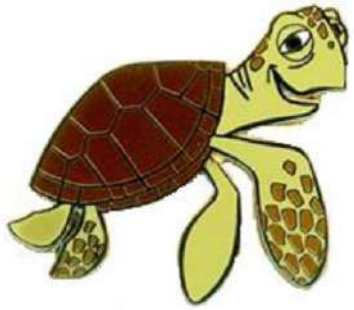
Waves & Currents Video

http://studyjams.scholastic.com/studyjams/jams/science/weather-and-climate/waves-and-currents.htm

Summarizing Strategy

Waves and Currents Summarizer Name _____ Date _____ Period ___

Imagine you are Crush [from "Finding Nemo"].
Answer the following questions using your knowledge from the lesson on waves and currents.



1. Since you love to surf the waves, describe the factors needed to produce the "perfect" wave.

_____

_____

2. Explain how surface currents and density currents help you to travel the world. Include in your explanation warm water currents, cold water currents, density, salinity and temperature.

_____

_____

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