

Currents

Garbage Patch and Bioaccumulation

- http://www.youtube.com/watch?v=XxNqzAHGXvs&feature=related&safety_mode=true&persist_safety_mode=1&safe=active



Did You Know?



- The **Kuroshio Current**, off the shores of Japan, is the largest current. It can travel between 40-121 km/day at 1.6-4.8 kph, and extends some 1,006 m deep. The **Gulf Stream** is close to this current's speed. The Gulf Stream is a well known current of warm water in the Atlantic Ocean. At a speed of 97 km/day, the Gulf Stream moves a 100 times as much water as all the rivers on earth and flows at a rate 300 times faster than the Amazon, which is the world's largest river

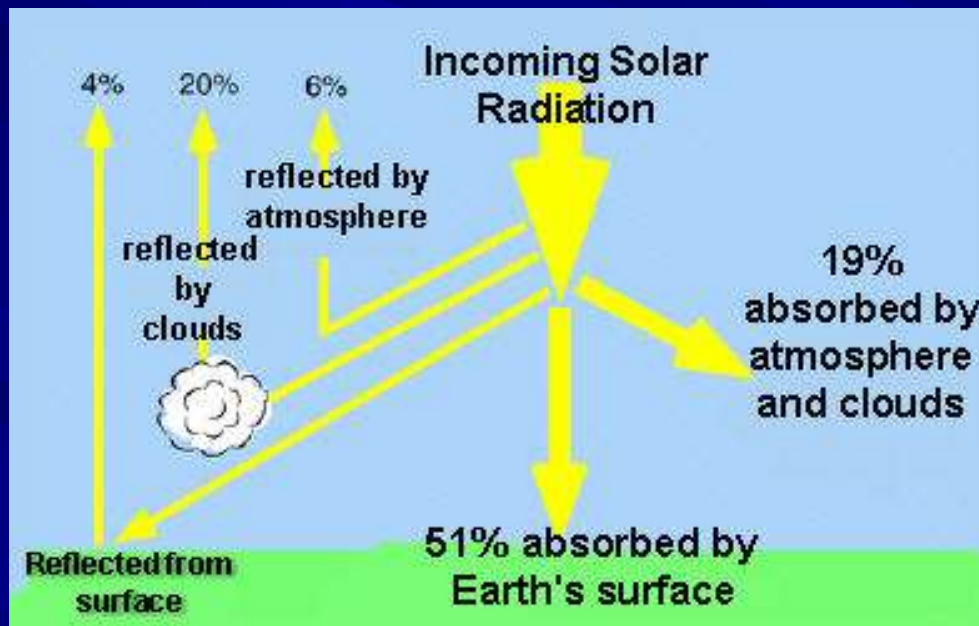
The Air and Sun

What components make up the air?

- 78% nitrogen
- 21% oxygen
- 0.9% argon
- 0.1% other gases (carbon dioxide is 0.03% of our atmosphere)

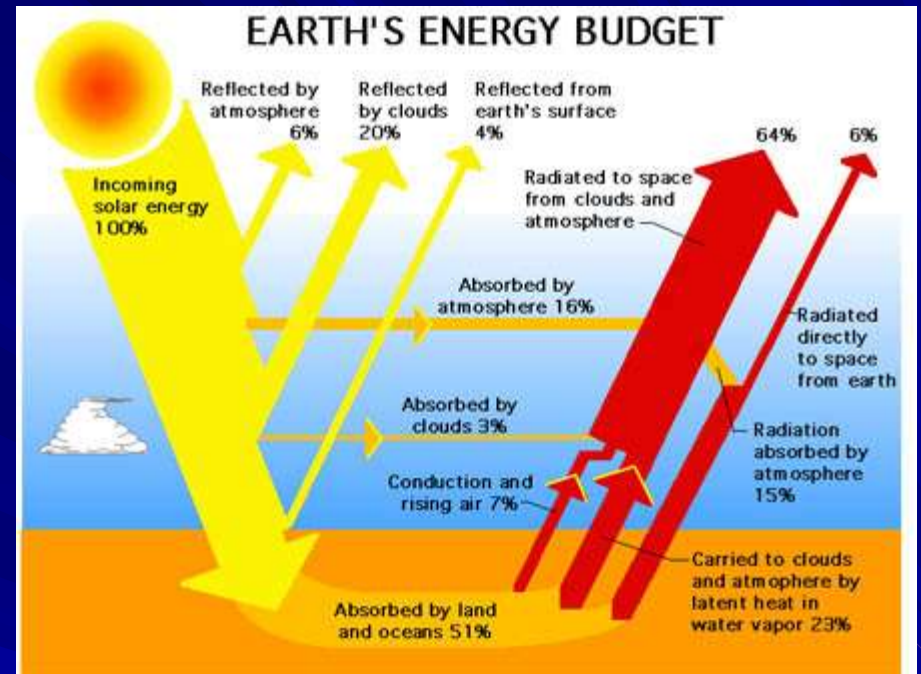
Solar Energy

- Sun is the major source of energy for Earth's surface.
- Only 50% of incoming solar energy is absorbed by the Earth. The rest is either absorbed in the atmosphere, reflected by the atmosphere, or reflected by land.

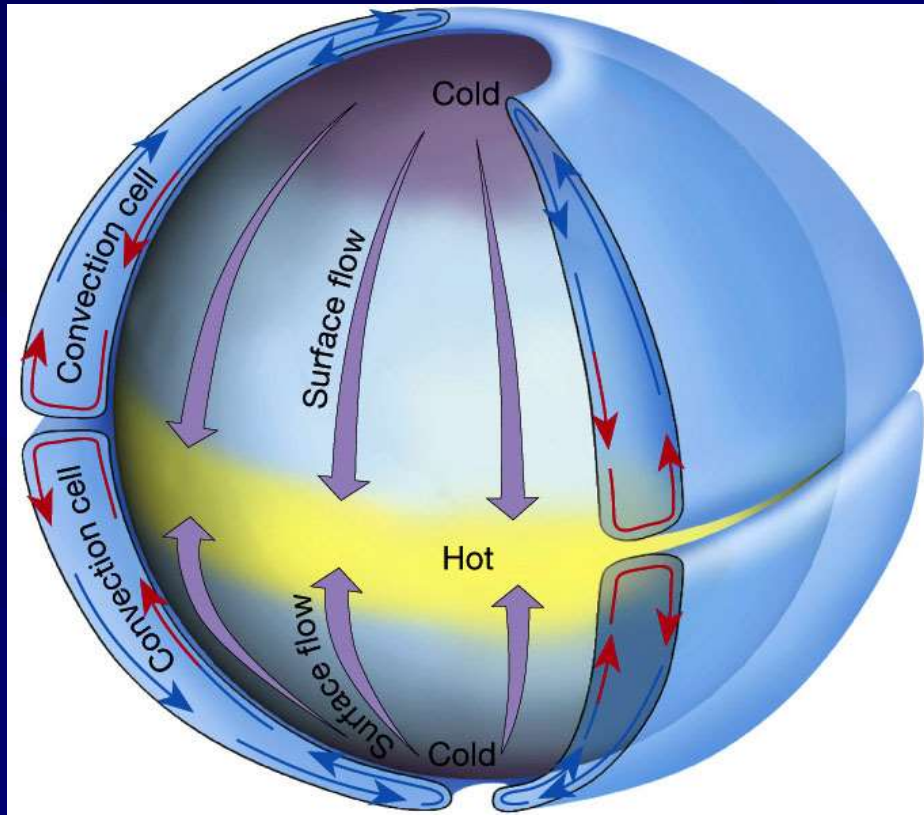


Earth's Heat Balance

- Earth reradiates as much heat back into space as it receives from the sun.
- Earth has an Energy equilibrium.
- Carbon dioxide holds heat - It is a greenhouse gas. What will happen this balance if we increase the amount of carbon dioxide in Earth's atmosphere?



What causes convection?

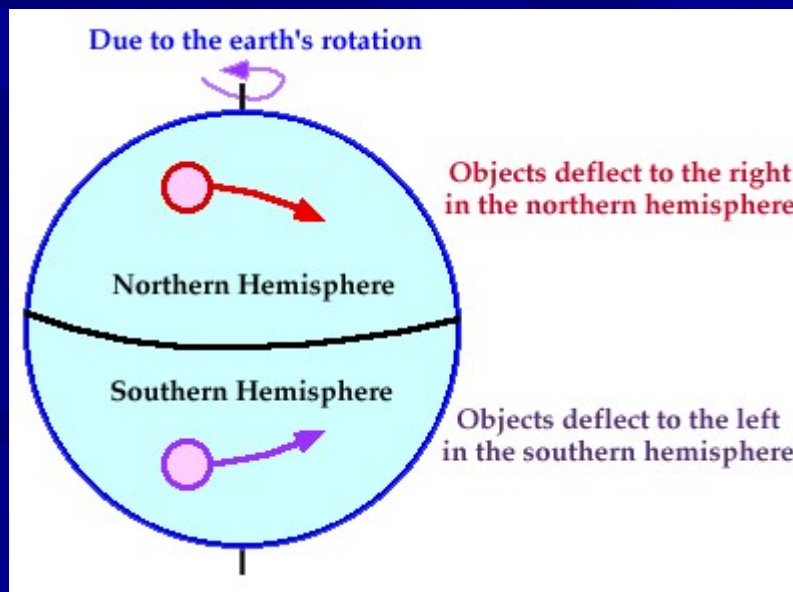


- The sun heats the Earth unevenly because of Earth's tilt. The poles get less direct light from the sun than the equator's sunlight.
- When the sun warms the Earth's surface, the warm air becomes less dense and rises. Cooler, more dense air replaces it.
- Warm air from the tropics rise and cooler air, more dense air from the poles replace it.

So why don't we have winds only from the north and south?

What is the Coriolis effect?

- It is the tendency for the path of the winds and currents to deflect to the right in the Northern Hemisphere and to the left in the Southern Hemisphere.



The Coriolis Effect

Caused by the earth's rotation

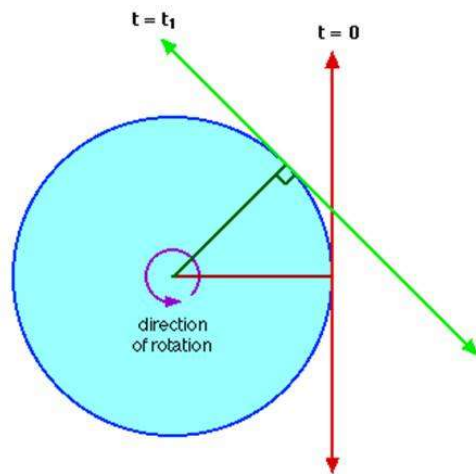


Figure 2: Change in the direction of "East" in a rotating system.

<http://www.eyrie.org/~dvandom/Edu/newcor.html>



Objects deflect to the right in the Northern hemisphere

Objects deflect to the left in the Southern Hemisphere

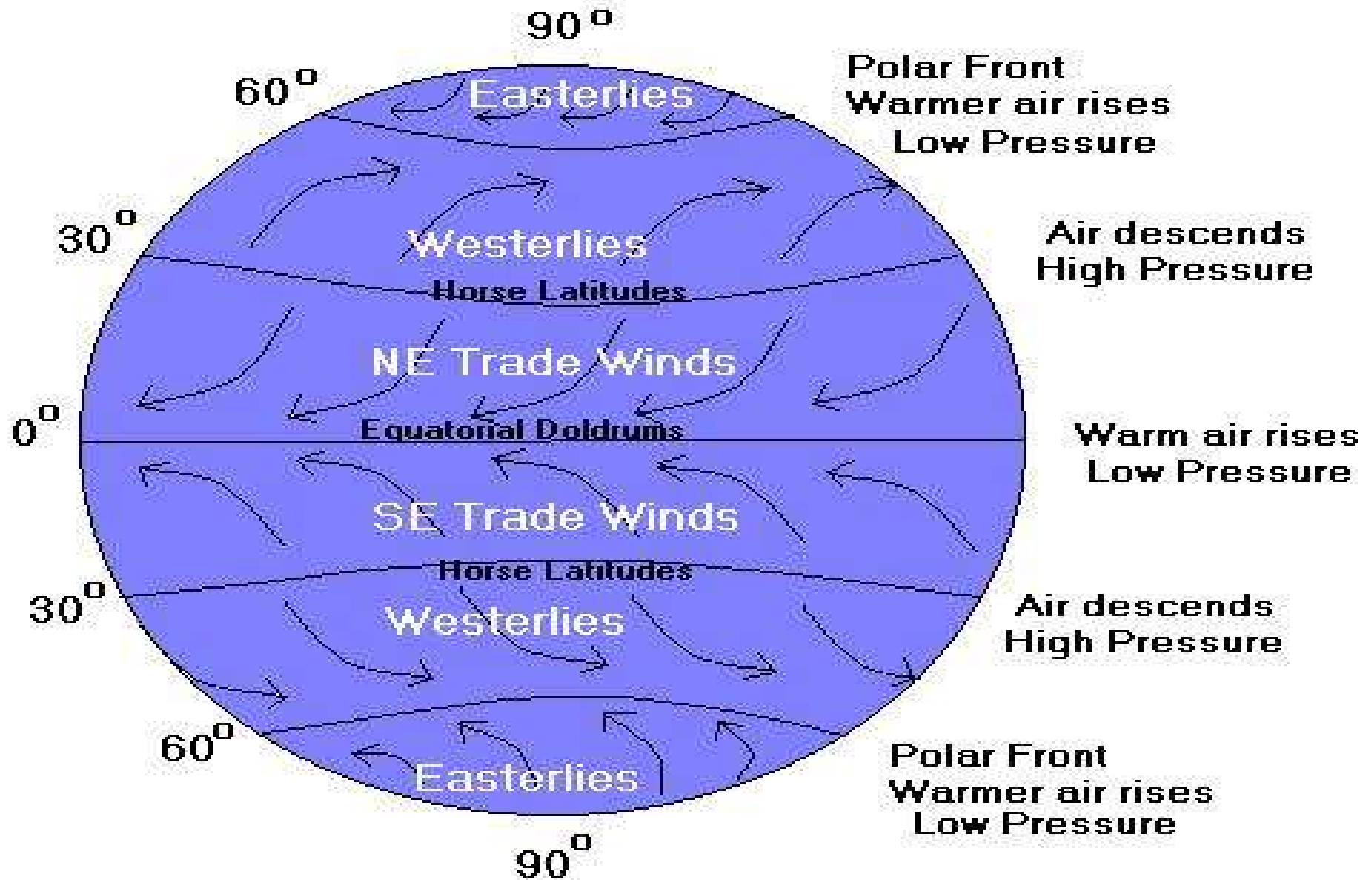
<http://www.thezonehole.com/coriolis.htm>



http://en.wikipedia.org/wiki/Coriolis_effect

Wind Belts

(copy but leave off info to the right)

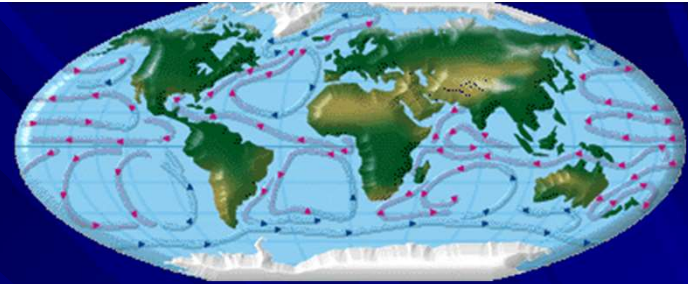


Did You Know?

- **The Atlantic Giant Squid's eye can be as large as 15.75 inches (40 centimeters) wide.**



Currents



- A large mass of continuously moving water.
- **Surface Ocean Currents** – the largest currents that move across the ocean. Mostly created by wind.
 - Significant b/c they move plankton across the ocean.
- **Deep Ocean Currents** – warm water rises at the equator, flows until it cools, and sinks at the poles. This cold water flows along the bottom toward the equator where it warms and rises.

http://www.cpalms.org/CPALMS/perspectives_teacher_SC912E76_MG_Video1.aspx

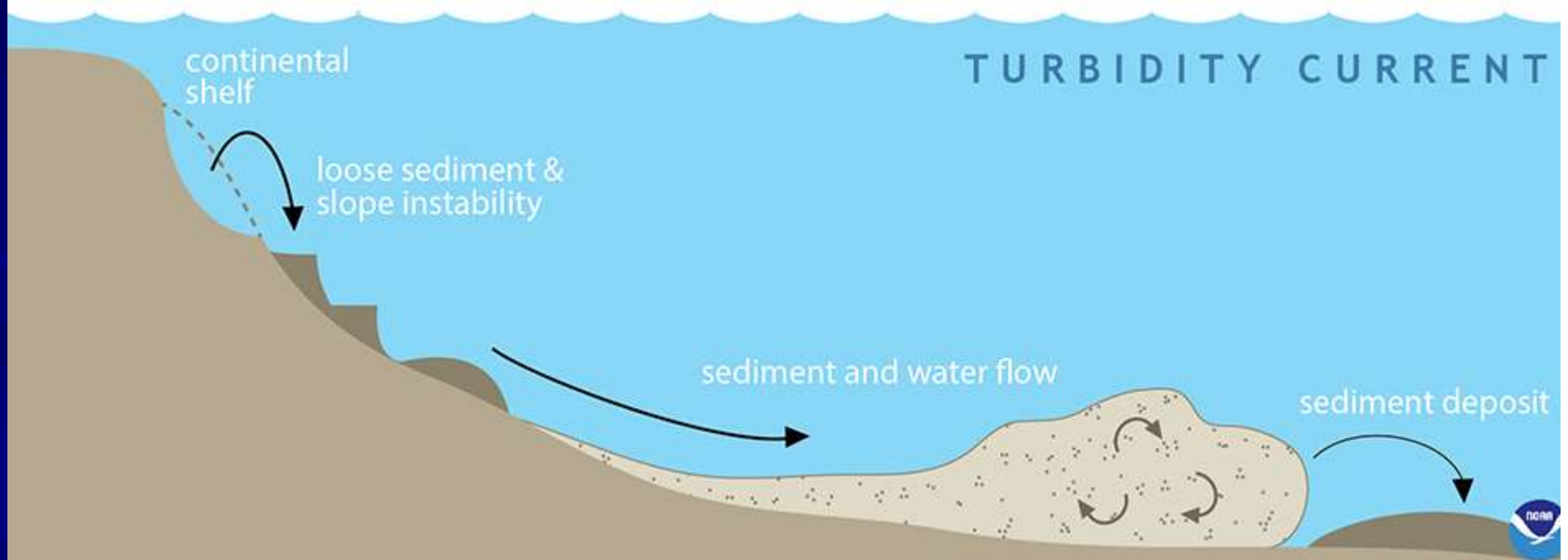
More types

- **Vertical Ocean Currents** – subsurface currents which move in a vertical direction.
 - Occur when 2 bodies of water with different densities are coming together.

Remember: Cold water has a higher density than warm water. High salinity water has a higher density than fresh water.

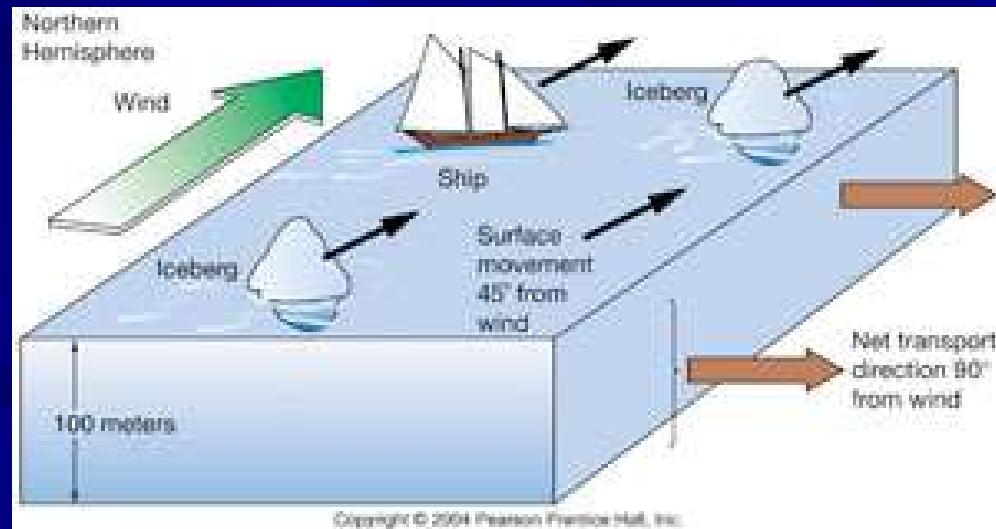
More types

- **Turbidity Current** – the fastest type of current, found along the continental slope.
 - **Turbid** means cloudy – this is from the silt, mud and clay in the current as it rushes along the slope.



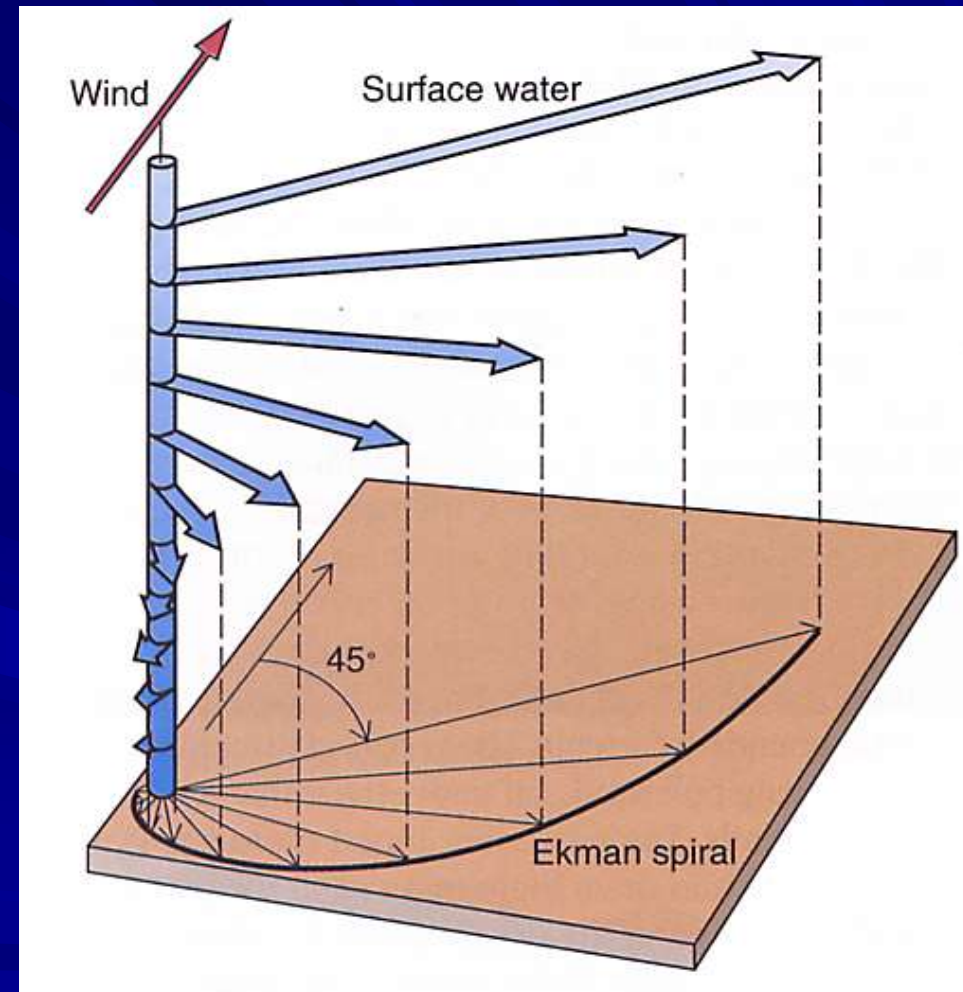
What is Ekman Transport?

- Currents shift 90 degrees to the right of the wind due to the coriolis effect. (northern hemisphere).



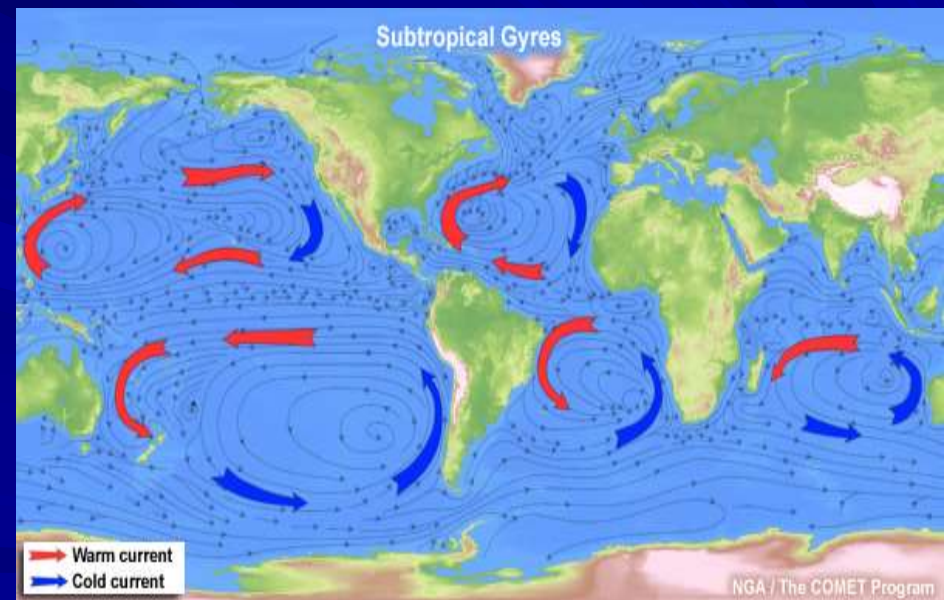
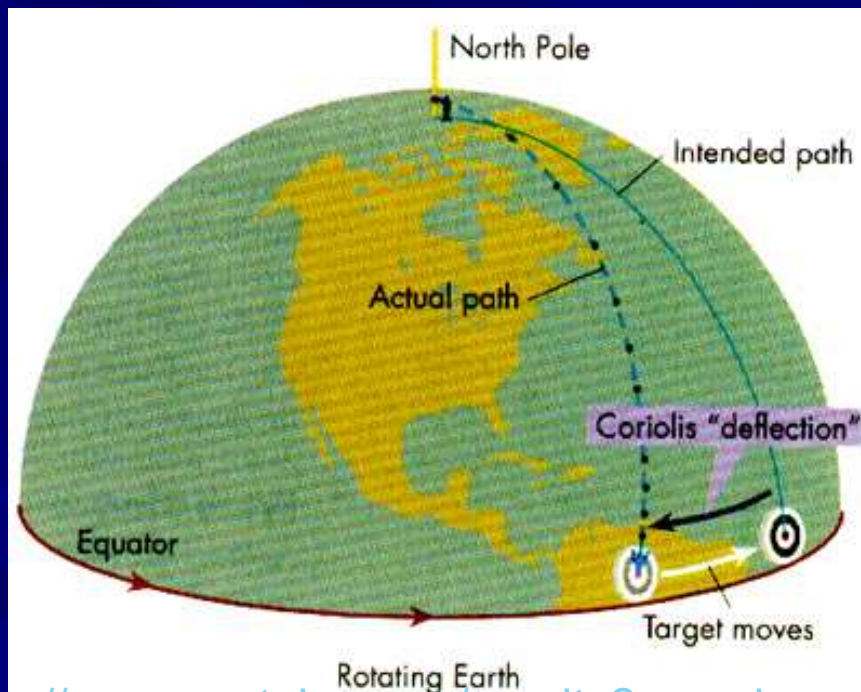
Ekman Spiral

- B/c of the Coriolis Effect, the wind affects water movement down to a depth of about 100 meters.
- The amount of water movement and the velocity at which it moves, decreases as you go down.

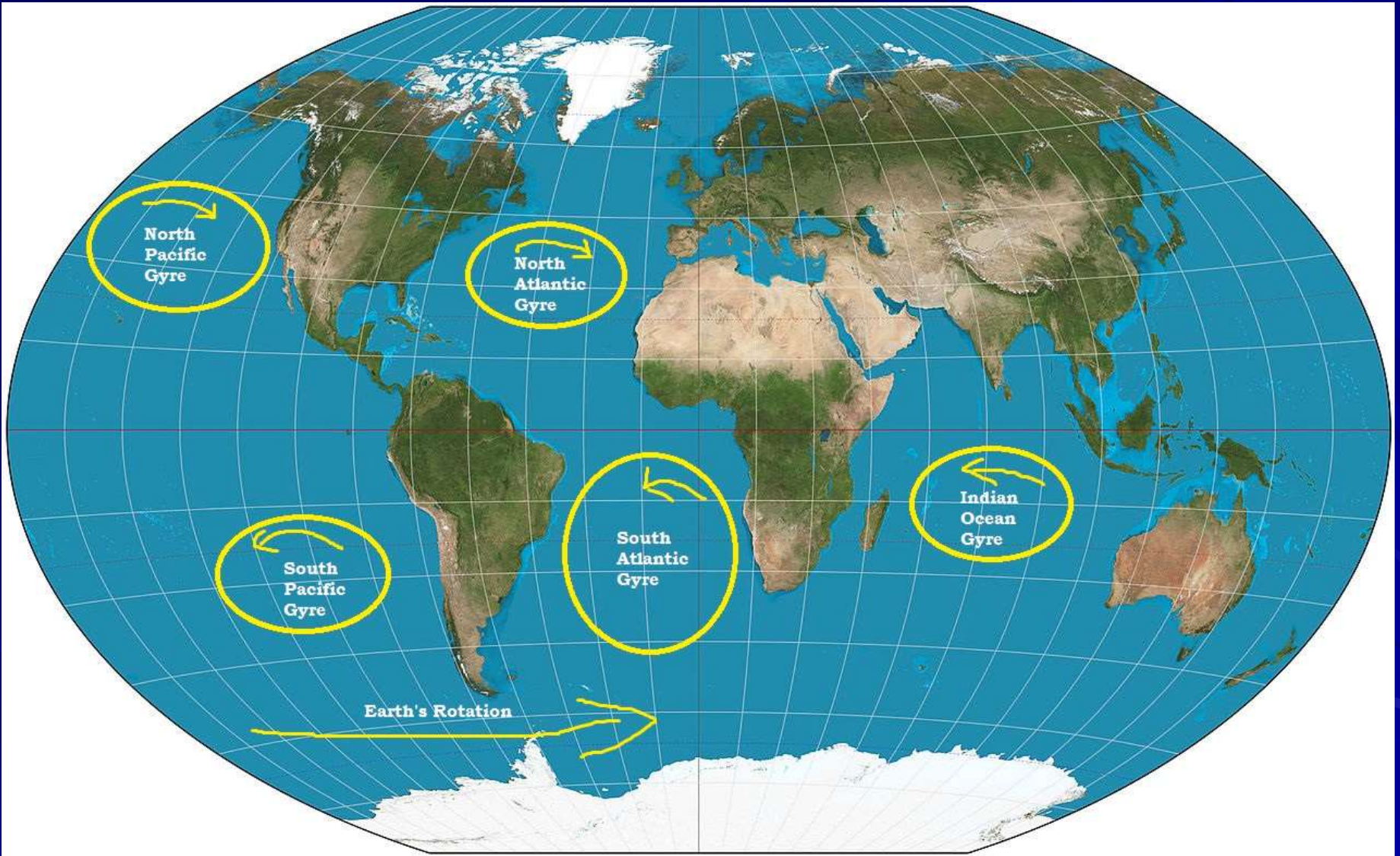


Gyres and the Coriolis effect

- The continents deflect the currents, causing them to move in giant circles called gyres.

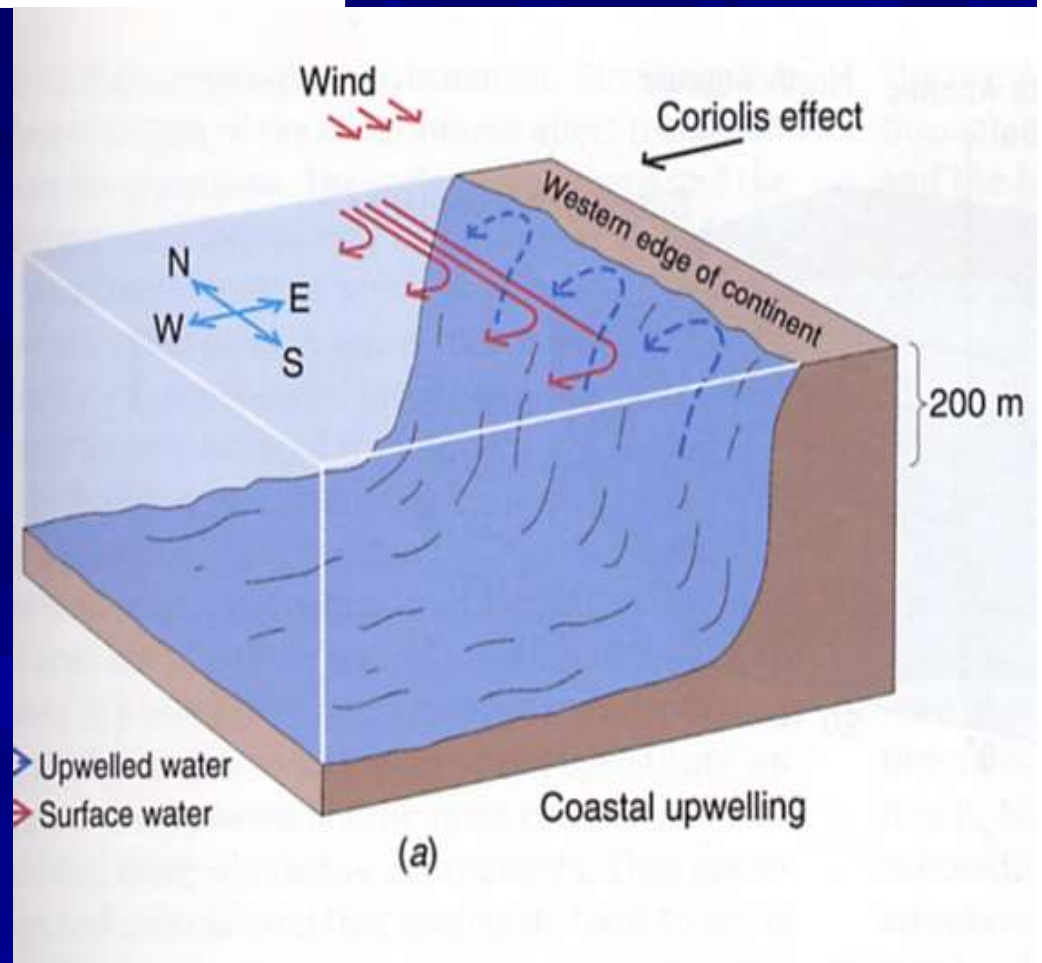


http://www.youtube.com/results?search_query=coriolis+effect+merry+go+round&safe=active



Upwellings

- The rising of vertical currents from the deep.
- Significant b/c nutrients such as phosphates and nitrates are brought up. Important for the growth of plankton.



- Caused by wind blowing offshore or sometimes parallel to shore & the Coriolis effect

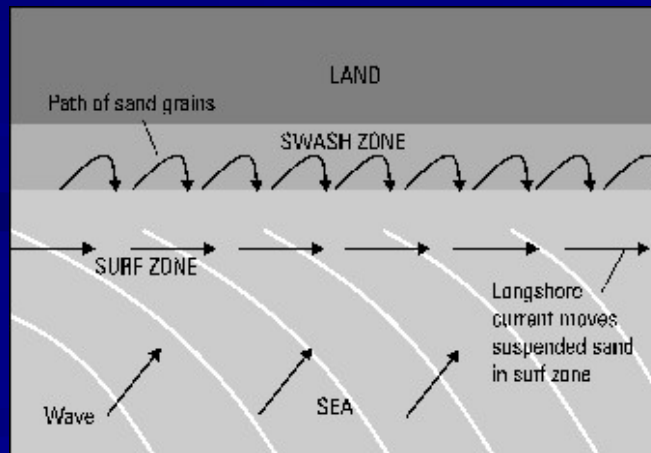
Wave-Induced Currents

■ Longshore Currents-

– run along the shore and are responsible for sand movement.

■ Undertow – after a wave breaks, it is the returning current; caused by wave action

■ Rip Current – (not a “Rip Tide”) occurs when enough water builds up behind a sandbar to break through, it causes a fast, narrow rush of water out to sea.





<http://www.onr.navy.mil/focus/ocean/motion/currents2.htm>

Rip Current

Tide-Induced Currents

- Tidal Currents –swift moving currents that run parallel to the shore and occur when the tide enters or leaves bays and inlets
- Significant b/c they carry nutrients and small organisms back and forth b/w the bays and oceans.
- Whirlpool – A rapid movement of surface waters in a circle.
 - Caused by tidal currents moving past each other, strong winds, or when ocean currents flow against tides.
 - Often form b/w islands

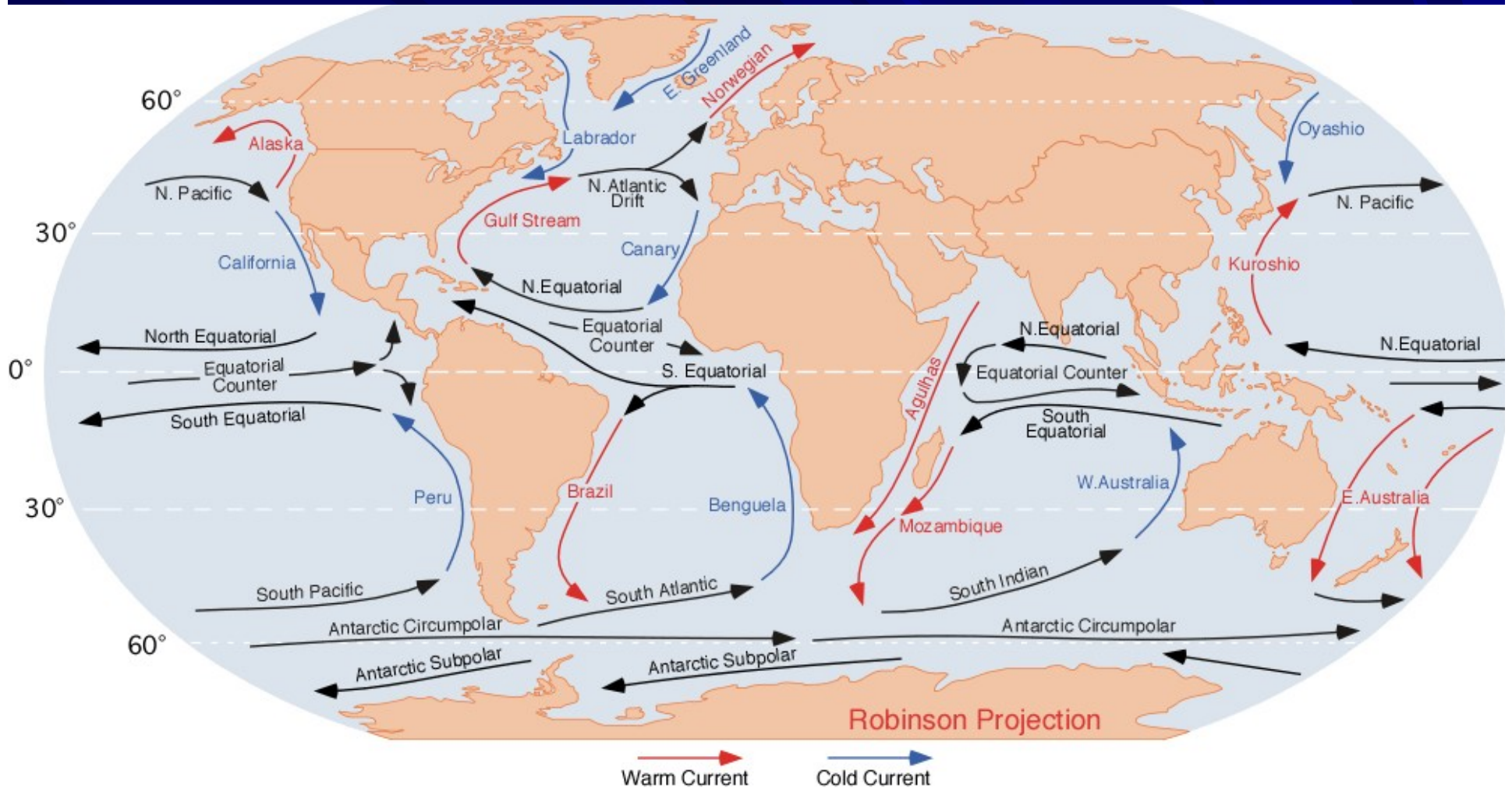


eddieotero -



Bill Nye Currents

- http://www.youtube.com/watch?v=w_8mw-1HYFg&safety_mode=true&persist_safety_mode=1&safe=active



Major ocean currents of the world. On this illustration **red** arrows indicate warm currents, while cold currents are displayed in **blue**.

Whirlpool After Tsunami

- http://www.youtube.com/watch?v=Y6HpgyTVRYY&safety_mode=true&persist_safety_mode=1&safe=active

Thermohaline circulation clips

- http://www.youtube.com/watch?v=FuOX23yXhZ8&safety_mode=true&persist_safety_mode=1&safe=active
- http://www.youtube.com/watch?v=SdgUyLTUYkg&feature=related&safety_mode=true&persist_safety_mode=1&safe=active