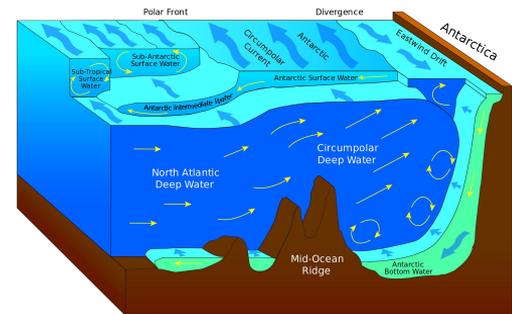
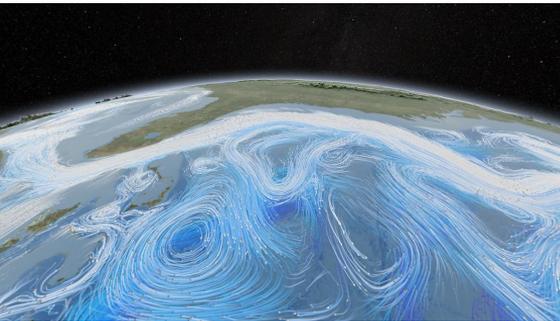


# Modeling Deep Currents

## Unit 1 Lesson 2 Exploration 2

### Objectives:

Use models to represent energy and matter flow within systems and to describe how they are related to deep ocean currents



Observe the online  
experiment with warm and  
cold water and record your  
observations on page 30 in  
your workbooks



**HOT**  
&  
**COLD**  
**WATER**  
**EXPERIMENT**



# Hot and Cold Water

## Properties of cold and hot water

	<b>Cold water</b>	<b>Hot water</b>
<b>Molecules</b>	Close together	Spread apart
<b>Density</b>	More dense	Less dense

# Hands-On Lab Page 31 and 32

You will explore how density differences in water affect water's movement



# Density Differences in Ocean Water

Ocean water is all not the same. Differences in the water's properties (salinity and temperature) affect the movement, both horizontally and vertically.

## **Salinity:**

The amount of salt dissolved in water; the average salinity of all oceans is about 35 g/L

## **Temperature**

Polar surface waters can be as cold as -1.9 degrees celsius (about 29 degrees F)

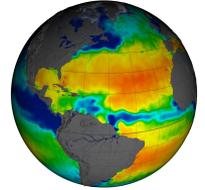
Near the equator waters can be as high as 30 degrees celsius (86 degrees F)





# Temperature and salinity both affect the density of water

As water gets colder, it becomes more dense. An increase in salinity will also make water dense



## Factors that change the salinity of ocean water

- Evaporation - water is removed, but leaves salt - **salinity increases**
- Addition of fresh water - precipitation or the flow of rivers into oceans - **salinity decreases**, water becomes diluted
- Formation of ice in water - dissolved particles are left - **salinity increases**

Complete number 15 on page 34



# The formation of Deep Currents

The density of water will increase if...

- water becomes colder or
- salinity increases.

## **RESULT** - Deep ocean current

**How** - surface ocean water can become denser than the water below it. The denser surface water sinks into the deep ocean.

**Deep ocean current:** movement of water in regular patterns below the surface of the ocean

# HOW DOES THE OCEAN MOVE?





Insert clip from Discovery Education:

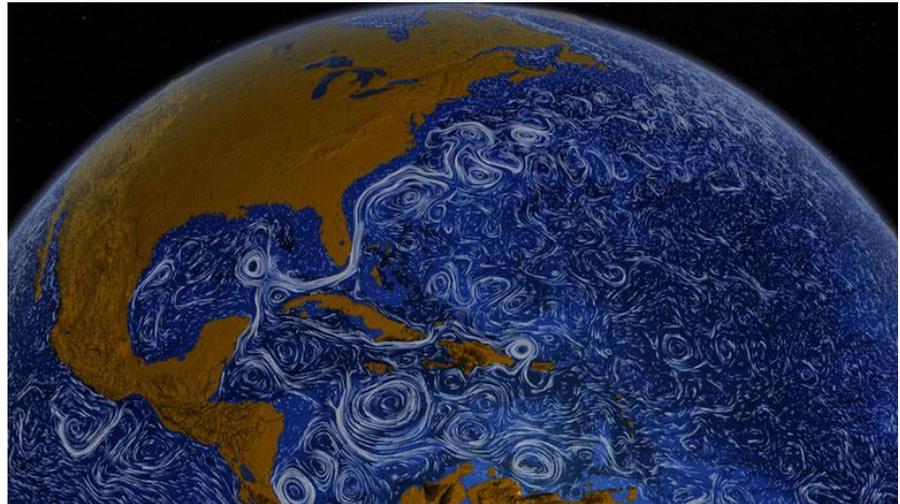
Oceans: Surface currents and deep currents

# Factors that Affect Deep Currents

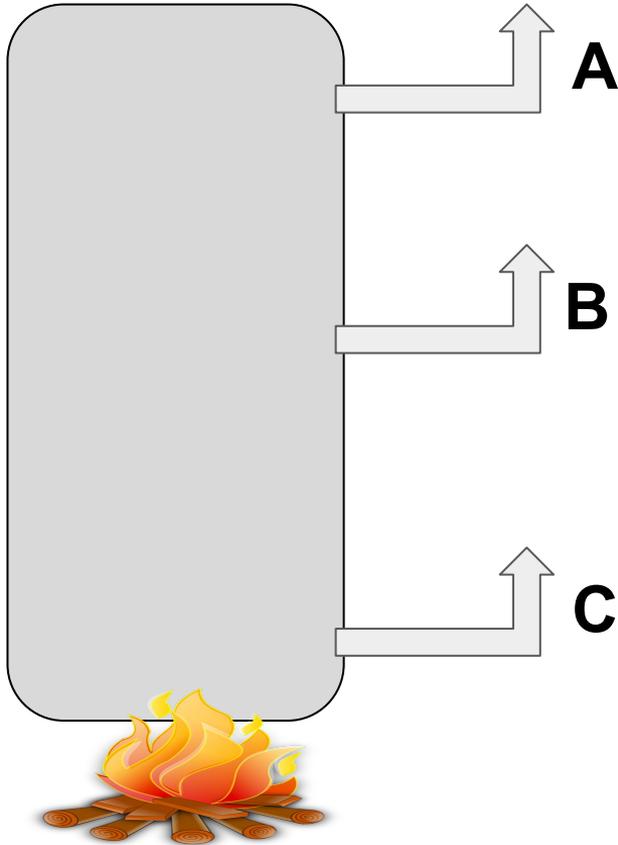
Deep currents are driven by **density** differences in ocean water and by **gravity**.

**Factors that cause deep oceans currents to deflect...**

- Bottom topography (lay of the oceans floor)
- Coriolis effect
- Continents



## Engineer It



A water heater is a tank in which cold water is heated. Cold water flows into the tank to keep it full. A heating element warms the water inside the tank. The heated water can then be sent to hot water faucets in a building. Assume that a water heater design requires that the hottest water possible to be sent to hot water faucets in a building. Where would be the best place for the hot water outlet pipe to be attached to the tank: the top: A, the middle: B, or the bottom of the tank C. Explain your answer.