Ice Cube Ocean Density Lab

Task: You will be conducting a lab to investigate whether ice cubes melt faster in salt water or fresh water.

Background:

As surface sea water freezes in the polar ocean, salt is squeezed out of the ice as it forms and is trapped in pockets within the ice. The increasing salinity of the water trapped within the honeycomb of ice prevents this water from freezing. Being extremely dense, it slowly drips out of the ice matrix and sinks to the sea bottom. This creates a density driven current, also called a thermohaline current (thermo- for heat and -haline for salt). When it reaches the ocean floor, it is called Antarctic Bottom Water. It moves very, very slowly north. It is estimated that it may take this water 1,000 years to reach the North Pacific basin.

Thermohaline circulation is a major part of the oceanic convective system, which distributes heat energy from the equatorial oceans to the polar regions. This ocean conveyor belt has a large impact on the climate of our planet. A breakdown of this circulation system probably would cause major changes in local climates throughout the world.

Materials:

* Salt Water
* Fresh Water
* Ice Cubes
* Cups
* Food Dye

Independent variable:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Dependent variable:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Hypothesis:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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Procedure:

1. Place one ice cup in the cup labeled fresh water and one ice cube in the cup labeled salt water at the exact same time.
2. Immediately add two drops of food dye on top of each of the ice cubes.
3. Record your observations—i.e. which ice cube is melting faster? What is happening to the food dye?

Data Table:

|  |  |  |
| --- | --- | --- |
|  | Ice cubes | Food dye |
| Fresh water |  |  |
| Salt water |  |  |

Analysis Questions:

1. In which type of water did the ice cube melt faster? Why do you think that is?
2. What happened in the fresh water cup after you added food dye?
3. What happened to the salt water cup after you added food dye?
4. What do you think explains the different dispersion patterns of the food dye between the two cups? (hint… think about density)

El Nino Video

1. How do trade winds affect ocean water temperatures near Australia?
2. How do weakened trade winds affect upwelling near South America?