Curiosity Guide #607
Convection

Accompanies Curious Crew, Season 6, Episode 7 (#607)

Convection Cell

Investigation #3

Description

Around and around we go!

Materials

- Plastic CD case
- Drill
- Drill bit
- Goggles
- Pipettes
- Red and blue food coloring
- Zip-Loc sandwich bag
- Rubber bands
- 2 plastic cups
- Marker
- Ruler
- Scissors
- Tray
- Hot water
- Cold water

Procedure 1: Prepare a stand for the model.

1) You are going to cut a long notch on the side of each cup. Each cup will hold an end of the CD standing on edge.
2) To measure and mark the width of the long notch, hold the thin edge of the CD against the side of the cup. Place a mark on the rim of the cup on either side of the CD's thin edge, about 10 millimeters apart.
3) Cut two parallel lines from the marks 3 inches down the side of each cup. This should create a skinny notch or flap the width of the CD.
4) Bend the flap outward at a 90° angle.

Procedure 2: Prepare the CD.

1) Put on safety goggles.
2) Stand the CD case on end. Drill two holes, one inch in from either end, through the top edge of the CD case.
3) Pour 1 $\frac{1}{2}$ inches of water into the bottom of the plastic bag. Place the bag in the CD case so that the water is on the inside and the top of the bag continues above the case.
4) 7) Secure the top and bottom of the case with a rubber band.

Procedure 3: Set up and test the model.

1) Carefully slide the case into the slots of the cups, one on each side of the case. Place the cup stand and CD onto a shallow tray.
2) Pour hot water into one of the cups so that the water touches the bottom of the CD case.
3) Add cold water to the second cup. The water should touch the bottom of the case.
4) Fill the pipette with drops of red food coloring. Insert the pipette into the top of the plastic bag through the drilled hole above the hot cup and gently squeeze in the red food coloring.
5) Repeat with the blue food coloring in the hole over the cold cup.
6) What do you think will happen? What do you observe?

My Results

Explanation

As the cup of hot water warms the red water in the bag, the red water begins to expand from the increased particle collision. This changes the density of the red water and makes it less dense. The red water rises and moves along the top of the case, where it begins to cool and starts to sink.

The blue water from the cup with cold water slowly moves along the bottom to the area of the hotter cup where the blue water then warms up, decreasing its density. The blue water begins to rise.

This circular motion is called a convection cell. A convection cell occurs in fluids like liquids and gases. The model shows how warmer, less dense liquid rises and cooler, denser liquid sinks. This is the same kind of motion of energy transfer that is observed in the atmosphere, the ocean and even in the mantle of the earth.

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