



Try This at Home Science: Convection Currents

Activity Overview:

Observe how convection currents are formed and how air currents interact in the atmosphere.

Advance preparation:

Microwave a small amount of water in a microwave-safe container for 20-30 seconds, or until hot. Use adult supervision if using the stove to heat water.

Materials:

- Clear rectangular storage container or large vase with room temperature water filling two-thirds of the container
- Small container filled with hot water (empty film canisters or condiment containers work great)
- Small container filled with icy cold water
- Red and blue food coloring
- Two sheets of aluminum foil large enough to cover the tops and sides of the small containers
- Two rubber bands
- Pennies or marbles
- Pencil

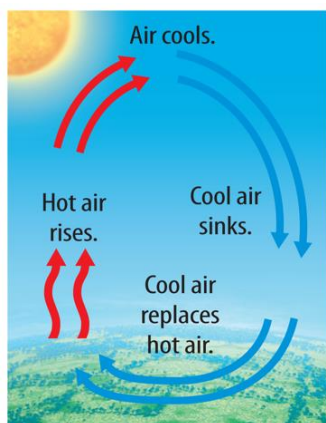
Try this!

1. Add 4 pennies or 1 marble to each small container. Then add five drops of blue food coloring to the icy water container and five drops of red to the hot water container.
2. Cover both containers with aluminum foil, then secure with a rubber band so the foil stays in place.
3. Poke several holes into the foil covering.
4. Place the cold container upside down on one side of the large bin or vase. Then place the container with the hot water right side up on the opposite side of the bin.
5. Watch the red and blue water interact.

What's happening?

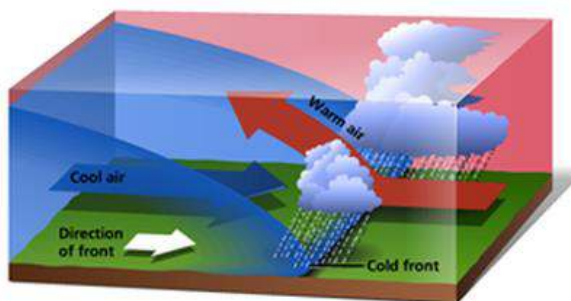
In the experiment you will notice that the blue water will stay close to the bottom of the container while the red will rise to the top. This happens for the same reason that hot air rises in the atmosphere. Hot air is less dense than cold air. When something is less dense than its surroundings, it will tend to float or to rise. Cold air is denser than its surroundings so it will sink to Earth's surface. We see the same thing happening with our hot and cold water. We call this process convection.

How does this relate to weather on Earth?



During the day the energy from the Sun heats up the Earth's surface along with air and water molecules. As the air warms, it rises until it reaches a height where the temperature begins to drop. As the temperature drops in the atmosphere, the warm air cools and sinks back down to Earth where it then replaces the hot air that has risen. This creates an air current which can result in anything from a light breeze to gusts of wind.

The act of the cold air sinking and the warm air rising is what creates the convection current. The cold air slides underneath the warm air to replace it. This is what can be observed in our experiment. Now, the mixing observed in the experiment would be similar to when a cool and warm front of air collide in our atmosphere, and this is when storms occur in nature. When cold and warm fronts collide the cold front slides underneath the warm front rapidly, causing the air on the edges to mix which creates condensation resulting in clouds and the precipitation that follows. If this process happens very quickly, this can result in tornadoes on land or hurricanes over water.



Now try...

- What happens when you slowly pour or drip the ice cold blue or hot red water into the rectangle container? What did you notice?
- Use warm-hot water in the large rectangle container instead of room temperature water and repeat the experiment. What do you notice?
- Use cool-cold water in the large rectangle container instead of room temperature water and repeat the experiment. What do you notice?
- Replace the ice-cold water with a dyed ice cube. Repeat the experiment and observe.

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