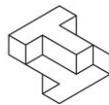


Convection Currents

Lab Related Activity: *Engineering for Earthquakes*



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In this model, students will discover how convection currents in the Earth's mantle cause tectonic movement. This activity is meant to be done as a teacher demonstration due to the use of very hot water.

Grades 6-8

Approximate time: 20 minutes (some preparation required the night before)

Student Outcomes:

1. Students will be able to describe and model how convection currents cause tectonic plate motion.

Next Generation Science Standards

Earth Sciences **Grades 6-8:** MS-ESS2-1, MS-ESS2-2

Disciplinary Core Idea (NGSS)

Earth Sciences: ESS2-C

Common Core ELA Standards

Writing **Grade 6:** W.7, W.8; **Grade 7:** W.7

Grade 8: W.7

Speaking and Listening **Grades 6-8:** SL.1

Vocabulary

Familiarity with these terms and concepts will enhance your students' experience in the activity

- Current: a continuous directed flow
- Convection currents: movement caused by the gain and loss of heat energy. In the Earth's mantle, the mantle closest to the core gains heat energy and becomes less dense than the surrounding cooler mantle. As it becomes less dense, it rises towards the crust. As it reaches the crust, the mantle cools and becomes denser than the surrounding mantle and sinks back down toward the core.

Materials

- 5 gallon fish tank or 16 qt. clear plastic tub
- Small plastic container or glass beaker
- Aluminum foil
- Rubber bands
- Sharp skewer or other sharp pointy device
- Tongs
- Hot plate, electric tea pot, or microwave
- Red and blue food coloring
- Freezer access
- 1 ice tray
- Gloves
- Hand towels
- Cardstock or heavy construction paper cut into continent shapes

Preparation

The following steps need to be done the night before the activity is to be done in the classroom

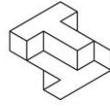
1. Prepare the ice tray by adding water to the mold and adding 3 drops of blue food coloring to each cube mold.
2. Freeze cubes overnight.

Setting up the activity

1. Fill tank or plastic tub $\frac{3}{4}$ full with water. Try to make sure this is done about 30-40 minutes prior to doing the demo so the water comes to room temperature.
2. For best viewing circumstances, tape white paper to the back of the tank so students can clearly see the color currents.
3. Start heating your water in the electric tea pot or hot plate. If you have easy access to a microwave, the water can also be microwaved until it is just about to boil (about 4 minutes).

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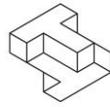
4. Once the water is hot, pour it into the small plastic container or glass beaker until the container is completely full and add 6 drops of red food coloring.
5. Quickly cover the container with foil and secure to the container with the rubber band.
6. Have your blue ice cubes ready in a cup. Only take them out right as you are about to begin the demonstration.

Demonstration procedure:

1. Begin by having students make their hypotheses about what will happen when the ice cubes are added to the tank and when the hot water container is added to the tank.
2. Gently place the paper continents on the top of the water-try not to make a large disturbance in the water.
3. If the hot water container is too hot to handle with bare hands, use the tongs to pick up the hot water container and gently place it at the bottom of one side of the tank without greatly disturbing the water and continents.
4. Use the skewer or pointy device to poke 2-3 small holes in the foil so that the hot water can escape.
5. Have students make observations on what happens to the hot water and the continents.
6. After approximately 30 seconds and before all the hot water has escaped from the container, put on the gloves and take out a handful of the blue ice cubes. Place 5 ice cubes on the water surface not disturbing the continents.
7. Have students make observations on what happens when the ice cubes are added. What conclusions can be drawn about the relationship between temperature and density? What happened to the continents?

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Objective:

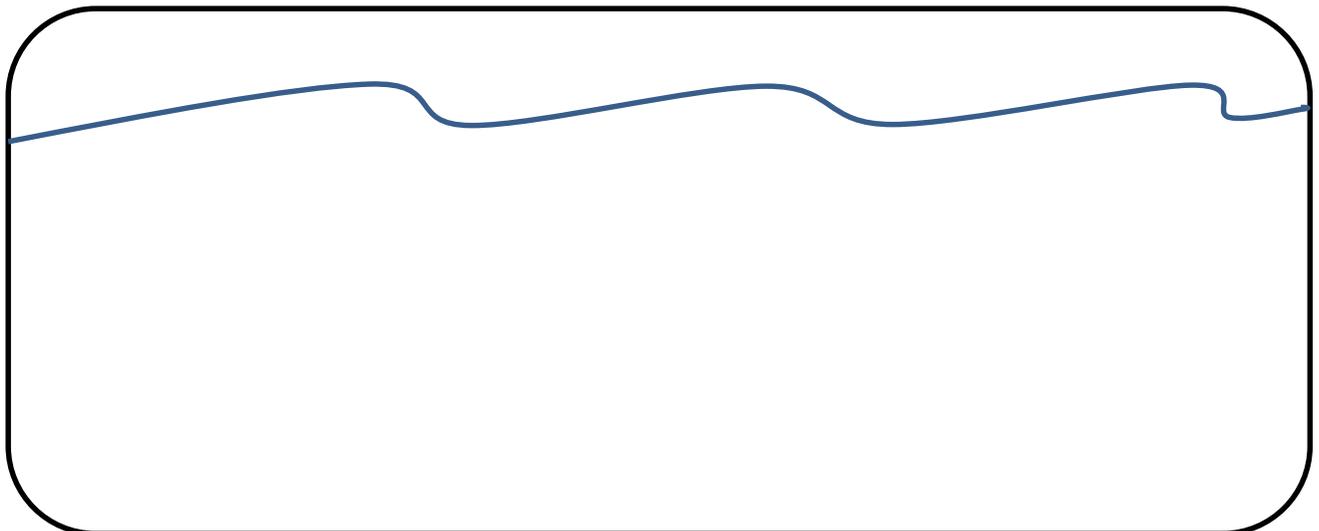
Today you will observe a demonstration of convection currents.

1. Make a Hypothesis:

What will happen when the ice cubes are placed in the water tank? What will happen when a container of hot water is placed in the water tank? What will happen to the continents?

2. Collect Data

Draw and label your observations in the tank below!



3. Analyze Data and Draw Conclusions

Group Discussion: Why did the blue water sink while the red water flowed upwards? Draw conclusions about the relationship between mantle temperature and density. How did the convection currents affect the continents on the surface?
