OCEAN CLASSROOMS
Inspire New Depths

2.1.1 Convection Model Video

Overview

Convection is the motion of a fluid that results from uneven heating. When a fluid is heated, it expands slightly. This lowers its density. A fluid with lower density rises up, much in the same way that a party balloon filled with helium rises up. Once the fluid moves away from its heat source and reaches cooler surroundings, it begins to cool. As it cools, it contracts slightly and its density increases. It sinks down toward where it was first heated and the process begins again. The circular movement up and down and back up again, over and over, is called a convection cell. This movement has the ability to carry with it other materials; the convection cells in the upper part of the Earth's mantle move the rigid crust.

Learning Objectives

- Convection is a movement of fluid created by uneven heating.
- Convection cells in the Earth's asthenosphere are responsible for major movements of the Earth's lithosphere.
- Scientists can create models to demonstrate phenomena that occur over long periods of time (millions of years) or in places too difficult to observe.

Student Activity: Convection Model Video

Materials

Materials will depend on the model you decide to build. Some possibilities include:

- Lava lamp
- Vegetable oil
- Corn syrup
- Cardboard
- Oatmeal
- Heat source (candle, Bunsen burner, hotplate, stove top)
- Water
- Beaker
- Food color

Video camera or phone
Access to the Internet
Access to movie-making software, such as iMovie

Advance Preparation

Divide into teams of 2 or 3 students. Because the work for this activity might take place at home, be sure that each team has access to a video camera or phone and an area for experimentation, plus the ability to gather outside of school. To make each collaborative group as strong as possible, identify which classmates can offer each of these essential components and make up teams based on these essentials rather than on social ties.

Determine where you will be able to edit your video footage and add titles, credits, and voice-over if necessary. This might be on a personal computer or in the computer lab at your school.

Process and Procedures

1. Research the concept of convection that drives plate movement. Find examples of convection in other Earth processes (i.e. weather) and in household situations (i.e. boiling water). You will need to be knowledgeable about convection and plate tectonics in order to write an accurate narration or voice-over for your convection video.

2. Look for demonstrations of convection online that make use of common materials that you could easily find. How do others make a model of convection? What do they use for a heat source? Identify a model that you would like to use or come up with one of your own. Determine how you will demonstrate the cause-and-effect relationship between convection and plate movement. Collect the necessary materials.

3. Meet with your team so that you can set up your convection model. Test your model and make adjustments, as necessary.

4. Once you know how your model works, write a script that will narrate a video of your model in action. Make sure to explain how the convection cell works and how it is related to the movement of plates. Also, don't forget to identify the parts of your model that correspond to parts of the system in the real world.

5. When you have your script ready, make your convection model video. Record footage of the model in action and either use the script to narrate it in real time or plan to add voice-over later. Strive to make your video last about three minutes by discussing the demonstration in detail.

6. Once you have your footage complete, transfer it to a movie-making program on a computer. Add a title with the names of the members of your team, voice-over if necessary, credits, and any other creative embellishments.

7. Save your convection video as a file that you can share with your teacher.

8. As a class, watch each video. What similarities do you see? What differences?

Assessment

Describe why convection cells depend on uneven heating. Why wouldn't overall, even heating result in the movement you saw in your models? Where does the heat come from to create convection cells in Earth's asthenosphere and what is "uneven" about it? How did each model made by the teams in your class create uneven heating?

Bonus: Uneven heating drives Earth's weather, too. Where is the source of heat for convection cells in Earth's atmosphere? What makes heat on the surface of Earth uneven?