

Moving Plates

What pushes the plates along?

Introduction

Discuss

How does a heater heat up a room?

The air near the heater warms up and moves further out into the room.

Which direction does the warmed air move in?

Unless there is a draft the warm air will rise because warm air is lighter (less dense) than cold air. When air molecules are heated they move faster and further apart so the same number of air molecules will take up more space when they are warm. This is why an inflated balloon will expand on a hot day.

The rising warm air will be replaced by cooler air and this creates a circular current called a convection current. Most students will realise that the top of a house or room is usually the hottest.

Can you see hot air rising?

You cannot easily see it but you can demonstrate that hot air is rising by making a spinner and holding it above a heater. The spinner will twirl as it is pushed by the rising air.

Activities

1. To show hot air rises, make the paper spinners using the instructions provided and complete the drawing to show the air currents.

2. To show convection in liquids

- Heat a pot or wide beaker of water until it is almost boiling.
- Drop a small number of frozen peas into the centre.

As they thaw the rising hot water in the middle of the pot will carry them up and over to the edge of the pot. If you increase the heat a little to get a more rapid boil, you should see peas dropping down at the edge of the pot where it is coolest and rising again as the hottest water pushes them up.

This activity will also work with crushed 2 minute noodles.

See the youtube clip for another demonstration of convection that could also be carried out in the classroom.

<http://www.youtube.com/watch?v=7xWWowXtuvA&feature=related>

Discuss

How are these activities related to the movement of the Earth's plates?

A common explanation for the slow movement of the crustal plates is that they are being carried along by convection currents in the mantle below. The deeper and hotter mantle rocks rise slowly toward the crust and sink down again as they cool, creating a circular current.

Because the mantle is so thick and slow moving, the plates can only move at about 3-4cm per year.

Unlike air or water the plates do not move smoothly. Friction between the two moving surfaces means plates may become locked together for thousands of years. When the pressure becomes too great the rocks rupture and the stored energy is released by an earthquake.

Learning Intentions

- Observe and explain convection currents in air and water

Success Criteria

Students can

- Draw or describe a convection current and relate this to plate movement.

Resources

- Paper spinner instructions.
- Pot or beaker
- Heat source
- Frozen peas

Vocabulary

Circulate, convection, current

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Paper Spinners

1. Draw a circle on photocopy paper. A small paper plate makes a good template.
2. Decorate the circle and cut it out.
3. Beginning at the outside edge, cut a spiral around and around your circle. Keep the cut quite wide so the paper doesn't tear.
4. Make a hole in the centre of the spiral and attach a hanging thread.
5. Hold the spinner over a heater or suspend above a heat source.
6. Watch the rising hot air make your spinner twirl.
7. Draw your spinner in the space below and show the air movement from the heat source that makes it twirl.
8. Explain what happens to the air as it is heated.

