

What is a “convection cell”?

A laboratory experiment from the
Little Shop of Physics at
Colorado State University

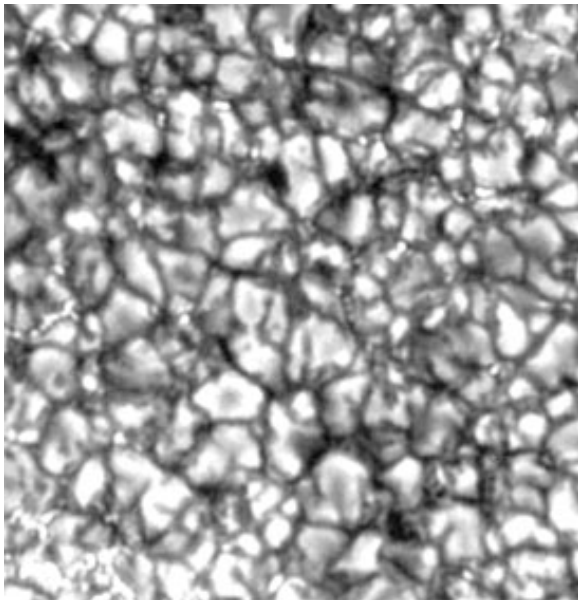


Overview

In this demo, students can observe a number of small convection cells, which will help them visualize what is occurring in the atmosphere and oceans. Convection cells are a mechanism to transport energy to the escape zones of the world.

Theory

Convection cells have an important role in thunderstorms and other weather phenomenon. Convection cells occur due to that fact that the earth is heated differentially. At the poles, sunlight shines at an angle and is spread out over a much larger area. This creates a high pressure area of colder, denser air. As the cold air sinks, it becomes even colder. It moves away from the poles to low pressure areas with warmer, less dense air. This warm air is pushed up by the buoyant force of the colder denser air. As the warm air rises, it cools, and the convection cell recycles itself, over and over again.



Convection cells happen on the surface of the sun too.

Necessary materials:

- One hot plate
- One round metal fry pan or cake pan
- Silicon oil
- Aluminum powder
- Rubber spatula

The aluminum powder and silicon oil are crucial to this demo. We obtained ours from the chemistry supply stockroom at CSU.

Doing the Experiment

IMPORTANT SAFETY NOTE: The hot plate, pan, and oil can become very hot. Please warn students to be careful around these two items when observing the demo.

- Turn on the hot plate to low.
- Mix the aluminum powder into the silicon oil and pour it in the pan.
- Place the pan on the warm hot plate.
- Have students observe as the magic of the convection cells happens!
- Discuss the dark spot in the middle of each cell and what is occurring.

Summing Up

The atmosphere is all about the movement of energy.

This demonstration is a way to have students observe a method that the atmosphere uses to transport energy from one area to another.

For More Information

CMMAP, the Center for Multi-Scale Modeling of Atmospheric Processes: <http://cmmmap.colostate.edu>

Little Shop of Physics: <http://littleshop.physics.colostate.edu>