Heat and Climate

Science Film Festival Knowledge Through Entertainment

KEY OBJECTIVES

Gain insights into the dynamics of weather and how changing temperatures can influence the intensity of climate systems

INTRODUCTION

These days we frequently hear of climate change and global warming. Communities around the world are experiencing extremes of weather, destroying infrastructure, agriculture and displacing an increasing number of people.

While we hear of global temperatures rising, and heading towards two degrees above trend, it is not so clearly understood by students how an increase in temperatures leads to changes in the nature of weather events.

The activity below provides students with some insights into the dynamics of weather and how changing temperatures can influence the intensity of climate systems.

KEYWORDS

global warming, climate systems, convection, diffusion, extreme weather

LEVEL

Primary & Secondary School

TIME FOR ACTIVITY

15 min

GUIDING QUESTIONS

How do changing temperatures influence the intensity of climate systems? ?

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MATERIALS & PREPARATION

- **Two large identical clear vessels (each to hold about a liter of water), and be about 25 to 35 cm tall. These might be two tall glass vases, or could be two plastic water bottles**
- **Access to some cold and hot water**
- **A small amount of food dye**

TASKS & PROCEDURE

1. Fill the two vessels with water, one as hot as is safe to do so, and one as cold as possible. Water as it comes from a hot and cold tap will do.
2. Place them on a flat surface about 20 cm apart. Leave them still for at least 2 minutes.
3. Then at the same time drop a single large drop of food dye into each bottle from near the surface. Do NOT stir the liquid.
4. Carefully observe how the food coloring moves through the liquid, and how different it is between the hot and cool situations.

What you will observe is that the food dye in the hot water moves around quickly, flowing down, and then back up, and quickly mixes. The food coloring in the cool water may sink slowly, and even after a long time may still not have mixed or circulated about the bottle.

POSSIBLE EXTENSIONS

This demonstration is sometimes explained as showing how heat affects DIFFUSION, but it is really a demonstration of CONVECTION. The extra heat in the water causes it to expand (compared to cool water), but as the water loses heat to the surroundings the water becomes more dense, and sinks, causing a flow, a circulation of water around the bottle. We see this in the movement of the food dye.

The more heat that is pumped into a system, the more energy it has. In our climate systems the more heat that is pumped in, the greater imbalances become and the more violent and energetic these circulation patterns are. They can even cause some of the earth's big circulation patterns to change direction as well as intensity. Monsoon rains fall in different areas, bringing flood to one area and drought to others.

SOURCES

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