

Teacher Document: Preparing Students for the Climate Activity

This document is intended to help teachers prepare students for the climate activity. It identifies background knowledge students need to know to do the activity. Teachers may wish to take some time to review these concepts prior to the activity, or allow extra time during the activity for supplementary instruction.

Introduction

In this activity, students will work in groups to investigate the question: Can Global Warming Cause Global Cooling? This activity is a 2-4 day activity that uses maps to explore a critical area of climate change research - glacial melting and its potential impact on the ocean currents.

Day 1: Setting the stage - Classroom presentation and reading activities

Day 2: Activity sets 1 A and 1 B

Day 3: Student classroom presentations and discussion

Day 4: Activity set 2

Day 5: Whole class classroom discussion and summary

What students need to know

Prior to this activity, students should have some familiarity with

- The formation and movement of glaciers over the landscape
- Ocean circulation (i.e. wind and density currents) and its physical properties (salinity, Density, temperature)
- Basic concepts of meteorology including data collected from weather stations

Background Information

The following websites provide useful background for the Climate activity:

<http://www.pcds.org/share/arctic/> – Betsy Youngman’s web page about experiences in Climate Change research.

http://www.pcds.org/share/arctic/greenland/GreenlandMeltGIS_TBM.htm – Detailed teacher background page

<http://www.pcds.org/share/arctic/greenland/resourcesGM.htm> – Supplemental science resources page

Preparing Students: Climate (cont.)

Suggested Activities

Discussion: *As a whole class, begin with a brainstorm about climate, ice caps, and ocean currents.*

Optional Demonstrations and Simulations: *These activities can be done in the days leading up to the climate activity. Each one corresponds to a specific day in the activity.*

Demo #1 *(corresponds to Activity 1_A – Greenland)*

See the web site - What will happen if the ice sheet melts?

http://www.pcds.org/share/sci8/labs/ice_melt.htm

Demo #2 *(corresponds to Activity 1_B – North Atlantic)*

1. *Evaporation and Heat:* Fill two small dishes with the same amount of salty water. Put one on a sunny windowsill or under a lamp. Put the other in a shady place. Turn on the lamp. Leave the experiment for 24–48 hours. After that time return and measure the amount of liquid in each container and notice any other changes. What has happened?

2. *Density Currents:* Freeze a block of water with blue food coloring in it. Put the block of ice in one side of a large clear bowl or aquarium filled with room temperature water. Observe where the blue cold water goes. Add a drop of red food coloring to the other side of the tank. Observe the motion of the colored water.

Demo #3 *(Activity 2 - Climate Current Connection)*

1. *Surface Currents and Winds:* Fill a shallow dish such as a pyrex baking pan with water. Add a few sprinkles of glitter or pepper flakes. Blow (gently) on the pan with a straw. Observe the glitter and water's motion.

2. *Convection:* Blow gently over a cup of hot liquid (tea, soup, coffee). How does the blowing over the liquid cool the liquid? Put your hand behind the cup so that you can feel the temperature of the air you are blowing. Does it feel warmer than your breath?

On Day 5, following Activity 2, use the CD ROM and your image viewing software to see the 3-D animated version of this circulation created by Jack Cook of the Wood's Hole Institute graphics department. Choose "NA_circulation" first, then the "NA_circulation_shutdown" second.

Compare the two. The arrows flowing over the top of the current represent the air currents that pick up and transfer heat to the continents. In the second video the Greenland Ice Sheet is delivering additional freshwater to the North Atlantic, blocking the Gulf Stream. You may need to watch these videos more than once to understand them. You may also want to click on the web link (below) to read more about the graphics and the concern scientists have about the patterns they are observing in the North Atlantic.

Graphics / Animations are from

http://www.who.edu/institutes/occi/currenttopics/abruptclimate_currents10no2_riverruns.html and
http://www.who.edu/institutes/occi/currenttopics/climatechange_wef.html#n1