

# Ice Cores - A Cool Way to Study the Past

## Overview

This lesson is intended to introduce students to the concept of using ice core samples to learn about the past. Students will be “collecting” a sample from a model of ice. They will then evaluate the sample to see how the layers change as the depth changes.

## Objectives

At the completion of this lesson, students will gain a greater understanding of how layers of firn and ice in ice sheets change over time. Students will be able to see how changes in annual accumulation rates coupled with the pressure applied by snow accumulation can affect the layers in ice core samples.

## Lesson Preparation

- Prior to the lesson, the teacher needs to create the model of the ice that will be cored. This can be done using different colors of a modeling compound (such as Playdough).
- The ice model should have at least 10 layers that alternate in color. One color should always be slightly thicker than the other.
- The 2 colors represent the snow that fell in the summer and the winter. The winter layer is always slightly thicker because there is less melting from Sunlight.
- As the layers get higher up, they should get slightly thicker. This is intended to model the fact that the

### Details

- 📘 Lesson
- 🌐 Arctic
- 🕒 About 1 period
- 📄 Download, Share, and Remix
- ✍ Middle School and Up

### Materials

Container for the ice model – It should be a box, cup, or pan that is at least 3 inches deep.  
Modeling compound, two colors – Playdough works well  
Straws, one per student – If possible, clear straws will work best.  
Small beads  
Colored pencils

### Standards

**NGSS**

pressure applied by accumulation of snow will compact deeper layers.

- In the deepest layers, small beads should be included in the modeling compound. This is to simulate the fact that once the layers get deep enough, the pressure from the accumulated snow/ice above is enough to close off the air bubbles, preserving the air. This is extremely important for researchers since it gives them direct evidence of the atmosphere from the past.

## Procedure

1. Start by explaining what ice core samples are and how they are taken. You can show a video such as the following video that was put together by PolarTREC teacher Steve Kirsche.

Drilling A Core Sample



2. Students should each take a straw and insert it into the “ice.” They will then pull out their core sample. Some wiggling of the straw prior to pulling it out should make it easier to extract.
3. Students can either view their sample while in the straw or try to remove it from the straw. Removal can be accomplished by cutting down the side of the straw or using a tool to push the sample out.
4. Students should use their colored pencils to illustrate their core sample. They should then make note next to it about how the layers change throughout the sample.
5. Have students answer the following questions:
  - Would the oldest layers be near the top of the ice or the bottom?

MS-ESS2-1 – Develop a model to describe the cycling of Earth's materials and the flow of energy that drives this process. MS-ESS2-2 – Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales.

### Florida Science Standards

SC.6.E.7.4 - Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere. SC.7.N.3.2 - Identify the benefits and limitations of the use of scientific models.

- As the layers get deeper in the ice, what happens to their thickness? Why do you think this could be?
  - How do the thicknesses of the different colored layers relate to each other? Why do you think this is?
  - The small beads that show up in the lowest layers are intended to model trapped air bubble. How do you scientists can use these air bubbles to study the climate of the past?
6. After the students have finished, the teacher should lead the class in a whole group discussion. It is important that the teacher helps the group come to the following realizations:
- The deeper you go, the older the layers are.
  - The depth of each layer is an indicator of snowfall accumulation for a given year.
  - The deeper layers are slightly thinner because the pressure of the snow/ice above them compresses them.
  - The alternating layers of different colors represent snow that fell in the winter and in the summer. The summer layer is thinner because some of the snow sublimates due to the sunlight.
  - The trapped air bubbles in the deepest layers are very important for scientists because they provide them with direct evidence of the atmosphere from the past.
7. Have students write 1-3 paragraphs explaining how scientists can use ice core samples to study the past.

## Extension

In the Resources section, there is a link to some of the data from the GISP2 ice core that was collected in Greenland. Students can use this data to see what actual layers depths look like.

You can have students compare the chronological buildup of layers to those in sedimentary rocks. This provides a nice connection to the Law of Superposition.

## Resources

- Site for the expedition to Summit Station (can be reached at: [polartrec2017.com](http://polartrec2017.com)): <https://www.polartrec.com/expeditions/dynamic-observations-of-the-micros...> --
- The Two-Mile Time Machine, by Richard Alley is an excellent book that details one of the largest ice core projects ever completed in Greenland.
- This site has the raw data from the GISP2 ice core: <https://www.ncdc.noaa.gov/paleo-search/study/2475>
- This is a video showing how actual ice core samples are taken:

Drilling A Core Sample



## **Assessment**

Students will be assessed by evaluation of their diagram, questions, and the paragraph(s) they write at the end.

## **Author/Credits**

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