

ICE CORES (1 HOUR)



Addresses NGSS

Level of Difficulty: 1

Grade Range: 3-5 (Plus Grade 6 Extensions)

OVERVIEW

Students will evaluate water ice balloons to reconstruct recent climate history by sorting different layers of evidence.

Topic: Climate Trends

Real-World Science Topics

- A comparison of the ice balloon to an ice core taken from a glacier.
- An understanding of how glaciologists remove ice cores from glaciers.

Objective

After completing this activity, students should have a better understanding of the way scientists study ice cores in order to learn the history of Earth's climate change.

NGSS Three-Dimensions

Science and Engineering Practices	Disciplinary Core Ideas	Crosscutting Concepts
<p>Asking Questions and Defining Problems</p> <ul style="list-style-type: none">• Asking questions and defining problems 6-8 builds on K-5 experiences and progresses to specifying relationships between variables and clarifying arguments and models• Asks questions to identify and clarify evidence of an argument (MS-ESS3-5)	<p>ESS3.D: Global Climate Change</p> <ul style="list-style-type: none">• Human activities, such as the release of greenhouse gases from burning fossil fuels, are major factors in the current rise in Earth's mean surface temperature (global warming). Reducing the level of climate change and reducing human vulnerability to whatever climate changes do occur depend on the understanding of climate science, engineering capabilities, and other kinds of knowledge. For example, understanding human behavior and applying that knowledge wisely in decisions and activities. (MS-ESS3 -5)	<p>Stability and Change</p> <ul style="list-style-type: none">• Stability might be disturbed either by sudden events or gradual changes that accumulate over time. (MS-ESS3-5)

Background Information

What are ice cores?

Ice core samples are removed from an ice sheet, most commonly from the Polar ice caps or from high mountain glaciers elsewhere. Ice cores provide the most direct and detailed way to investigate past climate and atmospheric conditions by observing and taking measurements of what they contain.

How do you obtain an ice core sample?

A core sample is collected by separating it from the surrounding material. If the ice is soft, coring may be done with a hollow tube. If the ice is hard, scientists use a hollow drill to remove a long cylindrical sample.

What information can we observe in ice cores?

Ice cores contain information about climate. The presence of snow from each year remains in the ice and could include wind-blown dust, ash, pollen, bubbles of atmospheric gas, and radioactive substances. Ice is one of the best preservers of the remains of prehistoric life. Although rare, they are sometimes found when drilling for ice cores.

Key Vocabulary

Ice core- a core sample that is typically removed from an ice sheet

Climate change- a change in regional or global climate patterns

Glacier- large, moving sheet of ice

Glaciologist- a person who studies glaciers, or more generally ice and natural phenomena that involve ice

Materials Needed for Activity

- Balloon
- Water
- Freezer
- Photograph of an ice core
- “Ice Cores” activity sheet

Teacher Preparation

- Frozen water balloons prepared ahead of lab activity- Fill a balloon with water and place it in the freezer for at least 24 hours. Remove the frozen water balloon from the freezer right before students will use it to investigate. Remove the balloon from the ball of ice.
- Divide students into small groups of 2 or 3.
- The outside rubber of the balloon should be removed.

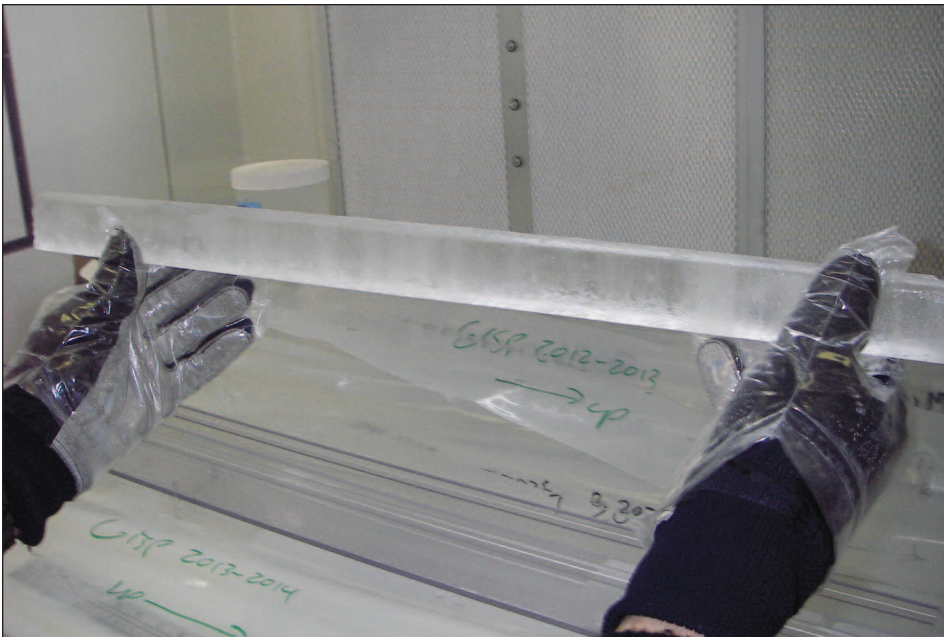
- 1. Warm-up Activity:** Show students the photograph of the ice core, and guide them to make four observations; at least one should use numbers. Students might notice layers in the ice image or bubbles and attempt to count them as their quantifiable data. Explain that humans use observations all the time. Observations help us monitor and interact with the world. Students can record their observations by describing or drawing.
Grades 3-5: Ask students to explain what they observed. Did they use any senses? Did factors such as tools or knowledge impact their observations? Explain that glaciologists are scientists who study glaciers. They travel to Polar Regions to learn about Earth's past and present climate. One method of studying Earth's climatic history is to drill ice cores. Once the column is extracted, glaciologists make observations to recreate Earth's climatic history.
Grade 6 extension: Ask students to explain what they observed. Did they use any senses? Did factors such as tools or knowledge impact their observations? Glaciologists use ice cores to reconstruct the climate of the past. Ice cores contain layers, millimeters to centimeters thick, which can be counted to determine the age of the ice core. This is similar to counting rings of a tree trunk to determine the age of a tree. The cores contain bubbles of dissolved gas, which provide information about the composition of the atmosphere.
- 2.** Explain to students that they will be examining their own model of an ice core, using a water ice balloon. Show students the ice balloon. Invite them to wash off the outer surface of the ice and observe the air bubbles within the ice. Then, Invite students to write down observations of what they see trapped within the ice on the handout. They likely will see lots of cracks and holes.
- 3.** Guide students to share some of their observations.
- 4.** Refer to one of the listed websites to help explain how glaciologists extract ice cores from glaciers. Guide students to relate their experience to real life experiences by asking the following questions:
Grades 3-5: How do we as humans measure our age? How do we know how we have changed as we have grown up? How do scientists measure the age of Earth using ice core samples? How do scientists know how the climate on Earth has changed over time?
Grade 6 extension: How do we find out what the weather is? What types of information do humans want to know about the weather that day? What types of atmospheric data might be useful when scientists are looking for evidence of climate change? How would they find that evidence in ice core samples?
- 5.** Allow students to reflect on how ice cores show the history of Earth's climate using the last question on the handout. They may use examples from the lesson to answer the reflection.

Sources

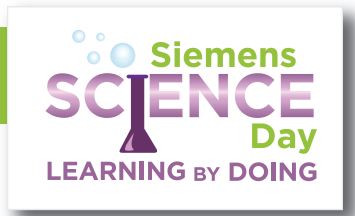
<http://www.ncdc.noaa.gov/data-access/paleoclimatology-data/datasets/ice-core>

http://www.nasa.gov/pdf/186121main_Ice_Core_Procedures.pdf

STEPS FOR *ICE CORES*



Ice core photo



Name:

Date:

Ice Cores

Directions: Wash off the outer surface of the water ice balloon and observe the air bubbles within the ice. Write down your observations in the chart below.

<p>What are some of the things you observe within the ice balloon?</p>	<p>What do you think is trapped within the ice? How did it get there?</p>	<p>What information can you observe that includes measurements?</p>
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Reflection: How can ice cores help scientists learn about the history of Earth's climate?
