ICESat-2 Ice Cores Activity

Audience: Grades 4-8
Duration (60-75 minutes to complete)

Background

The NASA Ice, Cloud, and land Elevation Satellite-2 or ICESat-2, measures the height over our planet. It looks at how fast the sea ice and ice sheets are melting. ICESat-2 will provide scientists with height measurements that create a global portrait of Earth's 3rd dimension, gathering data that can precisely track changes of terrain including glaciers, sea ice, forests, buildings and more.
Learn more at the official ICESat-2 website

Ice is a vital for our planet, it helps keep the planet cool. Over our Earth's history, we have seen many changes, environmentally, geologically, atmospherically. One way that we can look how our planet responded to change in the past is by examining ice cores.

An ice core is a vertical, continuous, cylindrical piece of ice that is removed from an ice sheet or glacier. Ice cores have been recovered from the polar ice sheets of Antarctica and Greenland as well as from mountain glaciers and ice caps around the planet.
As snow falls to the Earth, in the high latitudes and at high altitudes, there is incremental buildup of annual layers of snow. Snow that lasts more one season is termed firn. Firn is denser than snow, yet not as dense as ice. Ice forms from firn as it is compressed and thinned over time by the ever-increasing buildup of snow above it. Deeper layers of ice are therefore older than shallower layers of ice. An ice core contains ice formed over a range of years.

Ice cores are recovered from ice sheets, mountain glaciers and ice caps all over the world.
The aggregate collection and analysis of these cores allow us to understand how regional and global climate changes over time.
Ice cores contain an abundance of information about our Earth's climate. Substances in the snow of each year remain in the ice, such as dust, ash, pollen, sea salts, atmospheric gases, pollutants and sometimes, radioactive substances. Analyses of these substances within the context of a known timescale for the ice core can then be used to reconstruct a climate record over the age range of the core. Reconstruction of local, regional, hemispheric, and global temperature records and the history of atmospheric composition can then be made by comparing the timing and extent of the events recorded in cores from around the world.

Antarctica and Greenland provide environmental records of hundreds of thousands of years before present, while mountain glaciers provide environmental records several hundreds to a couple of thousand years before present. Mountain glaciers are many times important if not primary water sources for populations downstream (e.g. Peru, Himalaya).

Places like Afghanistan and Turkey depend on primary glacier meltwater for their summertime base flow. This is going to disappear when the glaciers do. Equally important for many areas in South America is the generation of hydropower from glacier meltwater. This too will go away. The loss of ice from mountain glaciers reduces not only local water supplies, but also the ability to recover ice cores and understand local and regional environmental conditions.

SAFETY

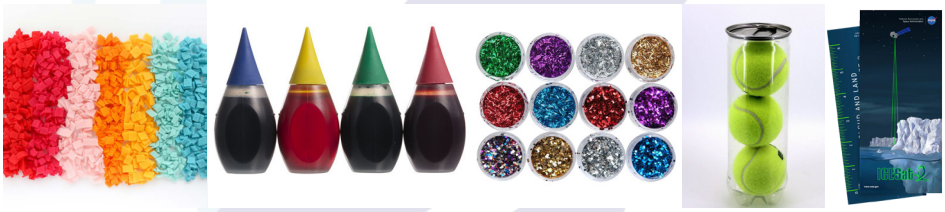
When choosing the craft supplies to add to the ice core layers, please make sure that everything is non-toxic.

TASK

Students will learn why scientists need to collect ice cores by creating their own using simple craft supplies.

What You Need

A tall, cylindrical container (preferably a 3 or 4-ball tennis ball tube)
Food dyes and other craft supplies to layer in the ice. (Glitter, confetti, etc.)
Pen or pencil
ICESat-2 Bookmark or ruler



What to Do

1. Using the cylindrical container, add a few ounces/milliliters of water and put it in the freezer until completely frozen.
2. Repeat step 1 until entire container is filled and frozen with ice layers
    a. It is recommended that you add food coloring, glitter, confetti into the container as you are creating the ice layers.
3. Once you have filled up the cylinder and it is completely frozen, take your ice core out of the tube. (*Note-if you cannot get the ice core out of the tube, it may need to be cut out. Please inform your teacher or parent and have them cut it out for you.)

4. Using your ruler, measure out each layer's thickness in inches or centimeters.
    a. Record this is the table below
    b. Each inch equals 90 years (or every centimeter equals 30 years)
    c. How old is each of your layers. Record this in the table below.
5. As an extension activity, make up a story about events that happened in your environment when your ice core was forming, if in the real world.

Ice Core Activity	Thickness (inches or cm)	Age (years)
Layer 1		
Layer 2		
Layer 3		
Layer 4		
Layer 5		
Layer 6		
Layer 7		
Layer 8		
Layer 9		
Layer 10		
Layer 11		
Layer 12		
Layer 13		
Layer 14		
Layer 15		
Layer 16		
Layer 17		
Layer 18		
Layer 19		
Layer 20		

My Ice Core Story

Next Generation Science Standards

4-ESS2-1: Make observations and/or measurements to provide evidence of the effect weathering or the rate of erosion by water, ice, wind, or vegetation.

5-ESS2-1 Earth's Systems: Develop a model using an example to describe ways the geosphere, biosphere. Hydrosphere, and/or atmosphere interact.

MS-ESS2-2 Earth's Systems: Construct an explanation based on evidence for how geoscience processes have changed Earth's surface at varying time and spatial scales