

When Ice Meets the Sea

Preview

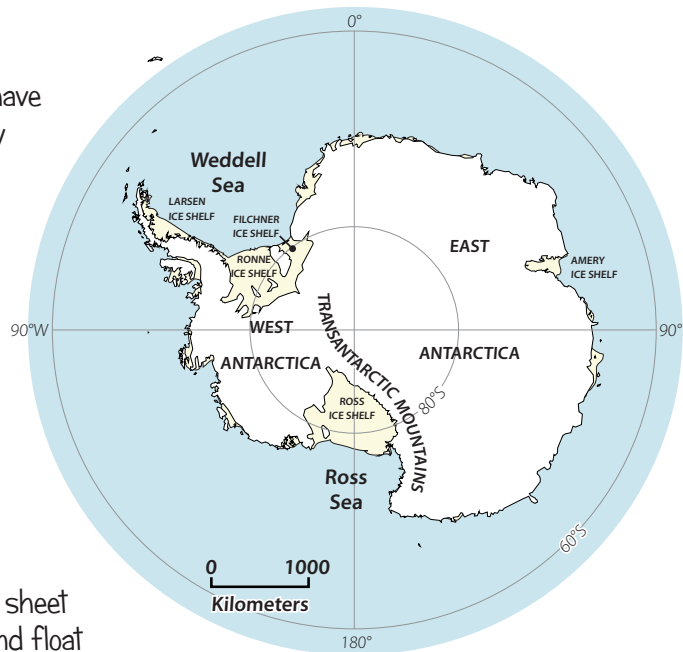
On Antarctica, glaciers have grown so large that they have merged to cover large areas of land. These thick masses of glacial ice on East and West Antarctica are called **ice sheets**. In the northern hemisphere, an ice sheet also covers Greenland.

Over time, ice flows downhill. Parts of an ice sheet flow off the continent and float on ocean water. Floating ice that is still connected to land is called an **ice shelf**.

At the leading edge of ice shelves, sections of the ice occasionally break off: free-floating chunks of this glacial ice are called **icebergs**.

Frozen seawater on the ocean surface is called **sea ice**. Each winter, the area covered by sea ice around Antarctica expands. By summer, much of it melts away again, leaving **open ocean** in its place.

In this activity, you'll make a model to show all five of these environments, and check out what happens on the seafloor when ice meets the sea.



Ice sheets cover both East and West Antarctica. The Ross Ice Shelf is Antarctica's largest ice shelf; it is about the same size as France. The Ronne-Filchner Ice Shelf is the second largest.

Time

⌚ 1 hour

Tools & Materials

- Mixture of pebbles, gravel, & sand (2 tablespoons)
- Rectangular baking pan (glass or metal)
- Paint roller tray
- Paint roller tray liner
- Water pitcher
- Blue food coloring
- Salt (2 tablespoons)
- + Water
- + Freezer

📖 Items found in this book

- Items included in the Flexhibit Kit, available from <http://www.andrill.org/flexhibit>.
- + Additional items



Antarctica in Summer



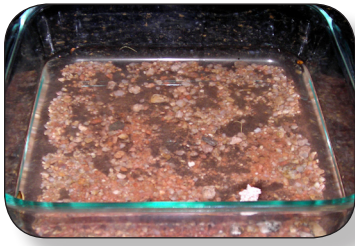
Color code

- white = ice sheet
- yellow = ice shelf
- gray = sea ice
- blue = open ocean

Prepare

Make a model ice shelf

1. Add water to your baking pan until it is about ½ inch (1 cm) deep.
2. Sprinkle two tablespoons of pebbles, gravel, and sand across the bottom of the pan, then place it in the freezer.
3. Leave the pan in the freezer until it is frozen solid (several hours).



Prepare your Antarctic coastline

1. The paint roller pan represents a section of the coastline of Antarctica. Set the pan on a sturdy surface and put the liner in the pan. Keep a towel nearby for wiping up spills.
2. Mix up a pitcher of model seawater by adding 2 tablespoons of salt to 2 quarts of **warm** tap water. Add a few drops of blue food coloring to help you tell the difference between the water and the ice.

Ice terms

ice sheets—enormous masses of glacial ice and snow that cover huge areas of land

ice shelf—portions of an ice sheet that extend off a continent and float on sea water

iceberg—A chunk of ice that breaks off an ice shelf

sea ice—frozen ocean water



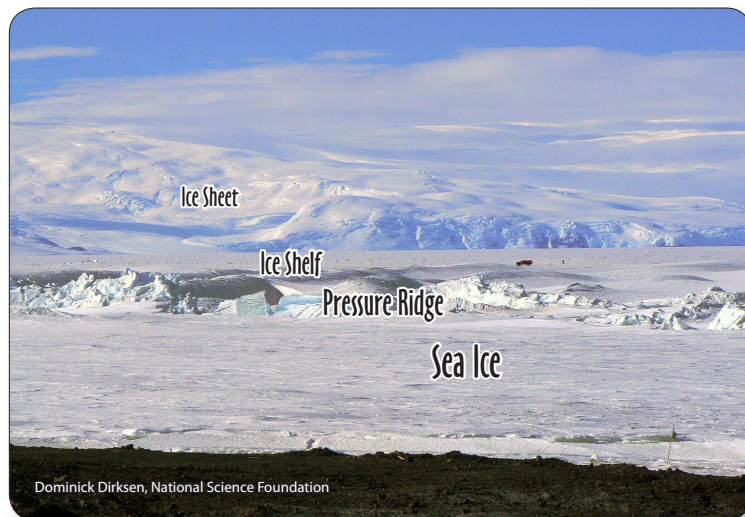
The thickness of the model sea ice (paper-thin) is about right compared to the thickness of your model ice shelf.



3. Pour the blue water into the paint pan until the water level is about 1 inch (2 cm) from the top edge of the pan.
4. Cut a piece of white printer or copier paper that will fit on your ocean. Float it on top of the blue water to represent sea ice.

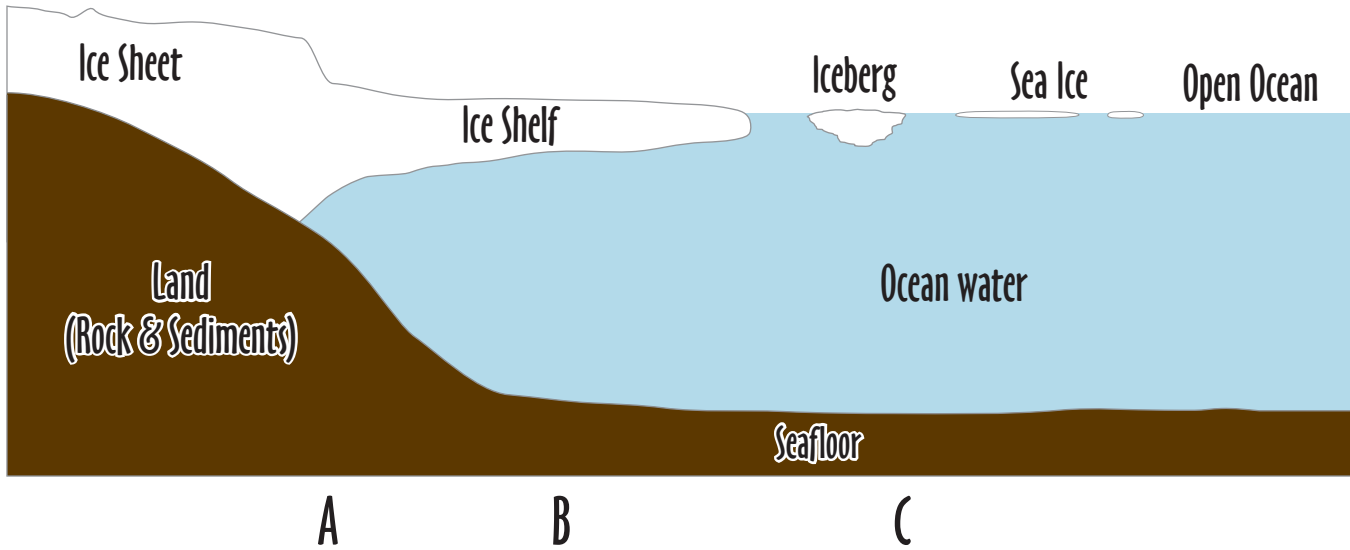
Move your ice sheet into the ocean

1. Get your model ice sheet out of the freezer. Dip the bottom of the pan into warm water for 30 seconds or so to make it easier to remove the ice sheet from the pan.
2. Set the ice, sediment side down, on the land part of the paint pan. It's okay if some of the ice extends beyond the pan. In this position, the ice represents an ice sheet.
3. Model the slow downhill motion of the ice sheet by pushing your ice down the slope about $\frac{1}{2}$ inch (1 cm) every minute. Carefully apply some gentle downward pressure on the ice as you move it forward—this will model the grinding action of sediments in the bottom of the ice scraping over the land.
4. After about 10 minutes, lift one side of your ice sheet to check what's happening right at the leading edge of the ice.
5. As your ice sheet moves into your model ocean and becomes an ice shelf, the sea ice (paper) will likely buckle and fold, forming a **pressure ridge**, just as real sea ice does. Once you've compared the ice shelf with the sea ice, remove the sea ice to avoid a mess.
6. Stop moving your ice sheet when part of it is still on land but much of it is floating in your model ocean.
7. After the leading edge of the ice shelf has been thinned by melting, you may be able to break off some chunks of ice to show how icebergs form.
8. Once most of the "ice shelf" has melted, examine the bottom of your paint tray. What does the result tell you about what happens underneath a real ice shelf? Discuss your ideas with your team.



Ponder. . .

Compare your model to the diagram below. Based on what you saw in your model, describe the type of sediments you would expect to find on the seafloor at letters A, B, and C on the diagram.



How is ice on Antarctica similar to rivers on other continents?

Practice

Got the Big Idea?

Ice sheets move downhill over land, taking rocks with them. Where the ice sheet meets the sea, rocks frozen into the bottom of the ice melt out and are deposited on the seafloor. Parts of an ice sheet that extend out over the ocean are known as ice shelves. Chunks of ice that break off the leading edge of an ice shelf are called icebergs. Sea ice forms when the surface of the ocean freezes.

Get ready to present

Come up with a short statement you can use to tell visitors what your model shows. Make sure you can tell which parts of the model represent land and the ocean, and which parts of the ice represent an ice sheet versus an ice shelf. Compare the model to the pictures on the Antarctica's Ice on the Move banner. You may also want to make a poster that shows one or more diagrams from this activity.

Special preparations for this station

The ice sheet/ice shelf will melt during the Flexhibit, so you may want to prepare two or three model ice sheets in advance. Plan ahead so you have an ice chest or freezer to keep your supply of ice sheets frozen until you use them.

Present

Show visitors your model and explain what it represents. You may want to point to pictures on the Antarctica's Ice on the Move banner to help explain the differences among the four types of ice. Also, draw visitors' attention to what happens on the bottom of the ice in your model. You may want to lift one edge of the ice to show them where the sediments accumulate.

Keep a towel or cloth available to wipe up spills. Be especially careful not to spill the water with the food coloring onto surfaces that might stain.

