

Land and Sea Ice



Russell Glacier

This Glacier is located near Kangerlussuaq Greenland

Sea Ice

- Forms from salty ocean water



Natural Breaks in the Sea Ice in the Arctic

Land Ice

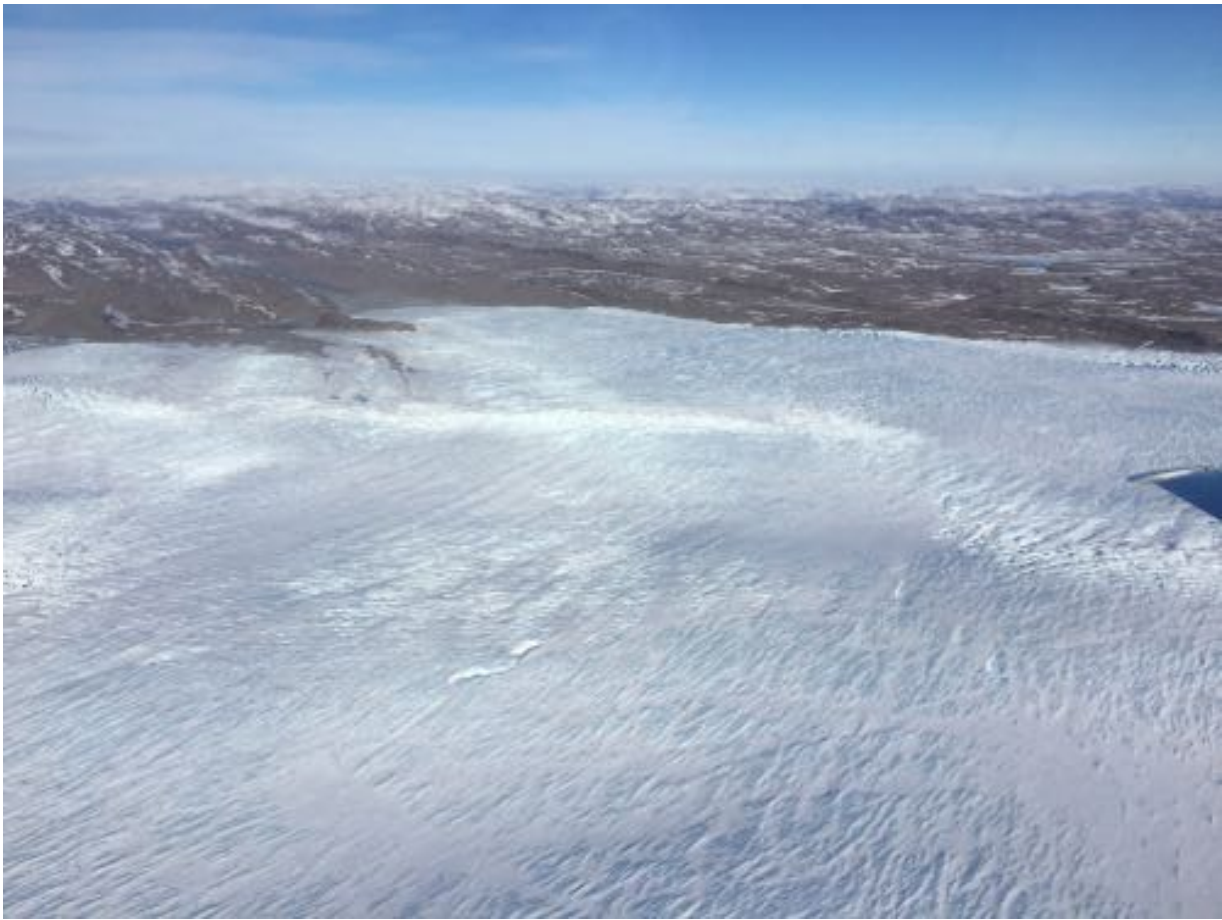
- Forms from fresh water or snow
- Glaciers are a type of land ice
- Icebergs are chunks of ice that fall off glaciers into the sea



The Edge of Devyn Icecap
In Northeastern Canada

Ice and Sea Level Rise

- Only land ice adds to the ocean
- Sea ice does not cause sea level to rise
- The volume of the sea ice is already accounted for because it is in the ocean. Land ice is added to the ocean through melting or when chunks of ice such as icebergs break off into the ocean.



Greenland Icecap taken as NASA's P-3 Orion was leaving Kangerlussuaq.



This is where one section of Jakobshavn Glacier meets the ocean. The glacier is located in Greenland.

Land Ice, Sea Ice and Sea Level Rise Teacher Notes

- 1. Overview:** Operation IceBridge is an aerial survey that measures both land and sea ice in the Arctic and the Antarctic. There are many reasons to monitor the Polar Regions. The cryosphere is essential in helping to maintain global climate. One important reason is to investigate sea level rise. Land ice can cause sea levels to rise, when it melts, by adding water into the ocean. This activity will demonstrate the difference between sea ice and land ice and visually show the students how land ice increases water level.
- 2. Objectives:**

Students will learn about sea level rise and whether sea ice or land ice adds water to the global oceans.

Students will learn the importance of monitoring the ice sheets in the Arctic and Antarctic.
- 3. Lesson Preparation:**

Go through the slides on the PowerPoint to learn about land and sea ice.

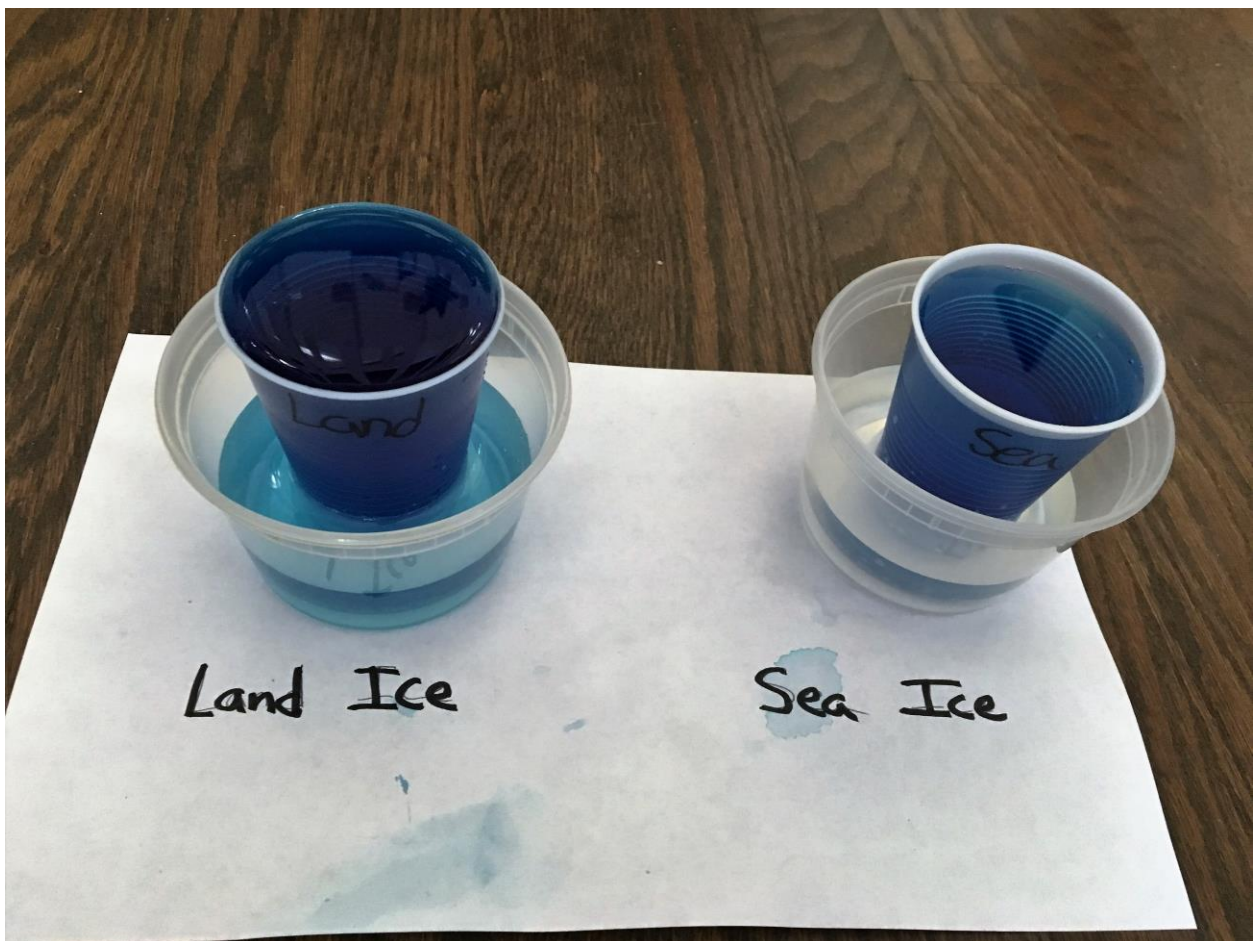
Materials:

 - Ice Cube Trays
 - Blue Food Coloring
 - 2 plastic 6oz cups (label one sea and one land)
 - 2 small clear plastic containers of equal size and shape in which the 6oz cups will fit, no larger than a pint. Note: The plastic container should be an inch wider in diameter on all sides than the 6oz cup.
 - Ruler
 - Student question sheet
 - 2 pieces of white paper
- 4. Procedure:**
 1. Add blue coloring to water and fill the 6oz cups to the rim making sure the water is not higher than the edge of the rim. Label one cup land and one cup ice. Freeze the cups. Add blue food coloring to water and freeze into ice cubes. Make sure you add enough food coloring so the water in the cups and the ice cubes are dark blue in color. You will only need a few pieces of ice for the land cup. Fill the land cup until the ice cubes are higher than the rim of the cup but they should not be falling out. **Be careful the blue food coloring can stain hands.**
 2. Place a piece of white paper under the clear plastic container before adding the water. This will allow you to see any color change that takes place. Add 2.5cm of water to each clear plastic container. Make sure the water level is the same in both containers.

3. Put the sea cup one in the center of one plastic container and the land cup in the center of the other container.
4. Use a heat lamp to help melt the ice. As the ice melts, record the depth of the water in 2 minute intervals. **Make sure the lamp is heating both cups evenly**
5. After the ice has melted, find the depth of the water in each container. Record the color of the water in both plastic containers.
6. Create a graph showing the amount of water in each container over time. Put the data for the sea cup and land cup on the same graph. **The sea ice graph will be a straight line**

Questions:

1. What happens to the water in cup 1? Where did the melted water go?
2. What happens to the water in cup 2? Where did the melted water go?
3. Which plastic container has a greater volume of water at the end of the experiment? Why do you think this is?



Picture of end result

Land Ice, Sea Ice and Sea Level Rise

Student Worksheet

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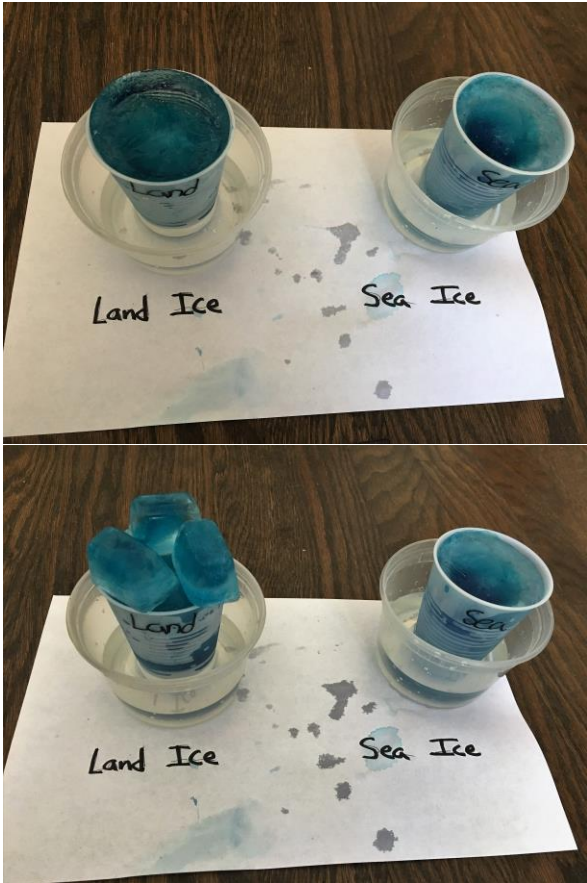
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Cups before adding ice

Cups after adding ice

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