

# Land Ice, Sea Ice and Sea Level Rise

## 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.

## 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.

## Lesson Preparation

Use the PowerPoint presentation to learn about land and sea ice.

## 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

### Details

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

### Materials

Land and Sea Ice PowerPoint  
Student Lab Sheet  
Ice Cube Trays  
Blue Food Coloring  
2 plastic 6oz cups  
2 small clear plastic containers of equal size and shape in which the 6oz cups will fit  
Ruler  
2 pieces of white paper

### Standards

**Sunshine State Standards**  
**SC.6.E.7.4**

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.

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 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.
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.

## 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?

## Extension

Research thermal expansion of water which can also lead to sea level rise.

## Resources

See attached PDF for background information.

## Assessment

Students will answer the questions attached to the activity and they will analyze their data.

Differentiate and show interactions among the geosphere, hydrosphere, cryosphere, atmosphere, and biosphere.

### **3SC.912.E.7.3**

Differentiate and describe the various interactions among Earth systems, including: atmosphere, hydrosphere, cryosphere, geosphere, and biosphere.

### **3SC.912.L.17.4**

Describe changes in ecosystems resulting from seasonal variations, climate change and succession.

## **Next Generation Science Standards**

### **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. Performance Expectation Grade: Middle School (6-8)

### **HS-ESS2-2 Earth's Systems**

Analyze geoscience data to make the claim that one change to Earth's surface can create feedbacks that cause changes to other Earth

## **Author / Credits**

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systems. Performance  
Expectation Grade: High  
School (9-12)

### **HS-ESS2-4 Earth's Systems**

Use a model to describe how  
variations in the flow of energy  
into and out of Earth's systems  
result in changes in climate.

Performance Expectation  
Grade: High School (9-12)

### **HS-ESS2-2 Earth's Systems**

Analyze geoscience data to  
make the claim that one  
change to Earth's surface can  
create feedbacks that cause  
changes to other Earth  
systems. Performance

Expectation Grade: High  
School (9-12)