Sea Level Change-Floating Ice versus Land Ice

Task Overview

Much of the world's ice can be divided into two major categories: floating ice (icebergs, sea ice) and land ice (glaciers, ice sheets). Both types of ice are at risk of shrinking if temperatures continue to increase, yet each affects global sea level in different ways.

The purpose of this activity is to allow students to see just how changes in sea level happen. In order to fully understandf the full breadth of this activity, one must draw some conclusions as to the long-term implications of global sea-level rise. To view current information on this, please visit the following link that is part of the NASA Earth Science web site:
http://www.nasa.gov/vision/earth/environment/sealevel_feature.html

Standards

National Science Education Standards addressed:

- ✓ **Science as Inquiry-Content Standard A**
- ✓ **Energy in the Earth System-Content Standard D**
- ✓ **History and Nature of Science-Content Standard G**

Benchmarks for Science Literacy addressed:

- ✓ **The Nature of Science**
  - **1_B-Scientific Inquiry**
  - **1_C-The Scientific Enterprise**
- ✓ **The Physical Setting**
  - **4_B-The Earth**
  - **4_C-Processes that Shape the Earth**
- ✓ **Common Themes**
  - **11_A-Systems**

Objectives

Students will demonstrate the difference between floating ice and land ice.
Students will identify how floating ice and land ice affect sea level rise.

In this activity, students will create a "desktop" example of the differences between floating ice and land ice and their melting characteristics.

Materials

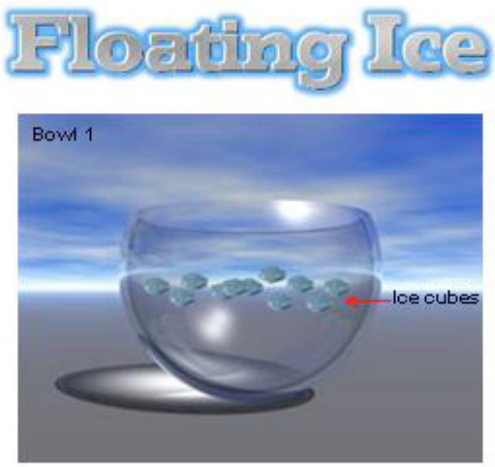
To view an example of a "teacher-led" demonstration set-up, please visit the following web-sites:

Floating Ice:
http://oceandrilling.coe.tamu.edu/curriculum/Sea_Level/Ice_Volume/floatingice.html

Land Ice:
http://oceandrilling.coe.tamu.edu/curriculum/Sea_Level/Ice_Volume/ice.html

2 large bowls (glass or plastic)-Can also use 2 beakers
Flat piece of wood
Ruler (with cm)
Ice cubes
Water

Procedure



1. **Label Bowl 1-Floating Ice and Bowl 2-Land Ice**
2. **Fill each bowl to the same level (about 2/3 full) with cool water**
3. **In Bowl 1, add about 5-7 ice cubes (These will represent Floating Ice)**
4. **In Bowl 2, add wood block and place 5-7 ice cubes on wood block set-up (These will represent Land Ice)**
5. **Measure and record level (depth) of water, radius (at water line) and record in tables below**
6. **Measure the depth and radius at each timed interval and record in tables provided.**
7. **Then, calculate the volume at each timed interval**

Record your observations of the water level from Bowl 1 and Bowl 2 in the table below.

Trial 1:

Depth (cm)	Start	2 min	4 min	6 min	8 min	10 min
Floating Ice						
Land Ice						

radius (r) at water line (cm)	Start	2 min	4 min	6 min	8 min	10 min
Floating Ice						
Land Ice						

How to Calculate Volume: Because we will be using a bowl, we will be using the volume equation for a sphere, then simply dividing the value in half.
For example:

Remember, r= ½ D, where D=Diameter (measured at water line)

$V=\frac{4\pi r^3}{3}$ **if r=15cm, then** $V=\frac{4(3.14)(3375cm^3)}{3}$**, then**

$V=\frac{42390cm^3}{3}$**,** $V=14130cm^3$**, then**

convert for bowl (half of sphere) $V=\frac{14130cm^3}{2}$ $V=7065cm^3$

Volume (cm^3)	Start	2 min	4 min	6 min	8 min	10 min
Floating Ice						
Land Ice						

Trial 2:

Depth (cm)	Start	2 min	4 min	6 min	8 min	10 min
Floating Ice						
Land Ice						

radius (r) at water line (cm)	Start	2 min	4 min	6 min	8 min	10 min

Floating Ice						
Land Ice						

Volume (cm^3)	**Start**	**2 min**	**4 min**	**6 min**	**8 min**	**10 min**
Floating Ice						
Land Ice						

Assessment

1. **Were the results from each trial similar or different?**

2. **Did the depth and volume change at each timed interval?**

3. **How can we translate the small changes you have seen in this activity to larger scale global changes?**

4. **Suggest some reasons why the melting of floating ice and land ice has such different effects on sea level.**