2.2 GLACIER DYNAMICS

How do ice sheets form?

Activity Time: 30 minutes

Background

Ice sheets are the largest ice masses found on Earth, covering huge land areas. The ice sheet in Antarctica covers 13 million sq km (5 million sq mi). It is over 4 km (14,000 ft) thick and its weight has depressed the continent below sea level in many places, especially in West Antarctica. Ice sheets form over thousands to millions of years when the amount of snow falling during cold periods exceeds the amount of water escaping during summer. Over time, layer builds upon layer, re-freezing into glacial ice as the snow layers' air is squished out from the weight of the layers. In some places, water melts and becomes runoff, but in most of Antarctica the temperature is consistently below freezing, so ice is primarily lost at the ocean where the shelf runs into the sea.

Materials

Per team:

- Map of Antarctica in plastic cover sheet (below)
- Timer
- Chart on board with name and time columns
- One half recipe of goo per map
- Goo recipe **(see attached recipe)**

Directions

1. Explain what an ice sheet is and show pictures of the Antarctic ice sheet.
2. You can find images under Ice Sheet Images or at waisdividetraverse.blogspot.com/2010/12/ice.html
3. Practice using timers with the start, stop and reset buttons.
4. Find the East Antarctica label on the map.
5. Ask each team to form their goo mass into a ball.
6. Place the ball of goo on the "East Antarctica" label as one student starts the timer.
7. Do not touch the goo while the timer is running.
8. Push stop when the goo touches the ocean water (not the ice shelf).
9. Record your time with your name on the board.

Discussion

- What happened to your ice cap? *(It spread.)*
- Why? *(gravity and goo composition)*
- Which data shows the ice sheet that spread the fastest? Slowest?
- Why was there a difference in the data on the board? *(goo position, goo amount, goo recipe slightly off, person who timed may have started earlier or later than when goo was placed, goo may have touched ice shelf instead of water)*
- How can this experiment give more reliable data? *(measure goo, place goo correctly, timer exact)*

Assessment

Use **Exit Ticket 2.2** to explain why your ice sheet spread faster or slower than other teams in your class.

Extension

Ask students to measure how far out their ice shelves grew while waiting for the rest of the class to finish. Break off small pieces of goo to show icebergs floating in the water.

Related Activities

- What causes melt water in below freezing temperatures? **(2.5)**
- What makes a glacier slip? **(2.8)**

ALIGNMENT TO NGSS:

Scientific and Engineering Practices
- Asking questions
- Using models
- Planning and carrying out investigations
- Analyzing and interpreting data
- Constructing explanations
- Engaging in argument from evidence
- Obtaining, evaluating, and communicating information

Crosscutting Concepts
- Cause and effect
- Scale, proportion and quantity
- Systems and models
- Stability and change

Disciplinary Core Ideas
- K-5: ESS2A; ESS1.C; ESS2.C
- 6-8: ESS2A; ESS1.C; ESS2.C