Sea Ice: Global Warming

Middle School Grades

Lesson Summary
Students will view a data-visualization on Sea Ice and create a labeled diagram depicting the flow of energy in the positive feedback loop of ice melt.

Prior Knowledge & Skills

- Knowledge of global warming
- Knowledge of albedo
- Knowledge of feedback loops

AAAS Science Benchmarks
The Nature of Technology
Technology and Science
Common Themes
Systems
Constancy and Change

NSES Science Standards
Physical Science
Transfer of Energy
Earth and Space Science
Structure of the Earth system
Science in Personal and Social Perspectives
Natural Hazards

Teaching Time: One 50 minute period

Materials

- Computer with internet access
- Paper and pens or pencils for creating diagrams

Advanced Planning
Preparation Time: 10 minutes

1. Review the instructions
2. Gather the necessary supplies.

Recommended Reading:

- Supplementary information and diagrams on feedback loops

http://sciencebulletins.amnh.org/earth/v/si.20040625/activities/activity_2.php

LASP
LABORATORY FOR ATMOSPHERIC AND SPACE PHYSICS

SCIENCE BULLETINS

Learning Activity: Sea Ice: Global Warming

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Earth Feature: **Sea Ice**
http://sciencebulletins.amnh.org/earth/v/si.20040625/index.php

ACTIVITY

Have students watch the sea ice data visualization at the website listed above and read the accompanying information. Discuss the cycle of freezing and thawing sea ice in the Arctic. Use the following questions to guide a discussion:

- What do you know about the geography of the Arctic? (A frozen sea surrounded by land)
- What does this data visualization show? (The cycle of thawing and freezing sea ice over a 10-year period)
- The visualization shows the thawing and freezing of sea ice from 1993 to the present. Do you notice any significant changes in the pattern of freezing and thawing over the 10-year period?
- What does the visualization say about the pattern of freezing and thawing over the last three decades? (The amount of sea ice has been dwindling)
- The science behind global warming is very complex and highly debated in the scientific community. How does the data about the thawing and freezing of sea ice in the Arctic support the global warming theory? (For more information about global warming, go to: What Causes Climate and Climate Change? Ice Ages, at http://learn.amnh.org/courses/earth_resource4.php)
- How does the positive feedback loop cycle created by dwindling sea ice contribute to the warming trend in the Arctic? (If necessary direct students to the second paragraph in the data visualization which reads: "Over the past few decades, the amount of sea ice in the Arctic has gradually been dwindling. While the white Arctic ice reflects the Sun's rays back into the upper atmosphere, the surrounding water absorbs heat and increases in temperature. The warmer water continues to melt more ice, decreasing the amount of solar energy that can be reflected and increasing the energy absorbed by the water. This effect, called a positive feedback loop, contributes to a trend towards warmer global temperatures.")
- Have students work with a partner. Have the description of the positive feedback loop available for students to refer to. Call on partners to create and label a diagram showing the flow of energy through the positive feedback loop.

Purpose:
After viewing the data visualization on sea ice, students will discuss what impact the event has on global warming. Students will create a diagram illustrating the positive feedback loop.

Suitable For:
Entire class

Time:
One class period

PRESENTATION

Call on volunteers to share their diagrams with the class and explain the flow of energy through the positive feedback loop. Ask students to consider what might be some of the far-reaching effects of the global warming trend.

EXTENSION

Invite volunteers to further investigate the topic of global warming. Have them prepare a presentation of their findings and share their findings with the rest of the class.

Review global warming and the positive feedback loop with students. Ask them to debate this question: Is the reduction of sea ice in the Arctic region a cause or a result of the positive feedback loop?

Invite students who are interested to continue to investigate the topic of sea ice. Suggest they visit the Web sites listed on the data visualization Web page as well as looking for news articles on the topic. Students could be asked to update the class when new information becomes available.