Low-Cost Experiments in STEM Education

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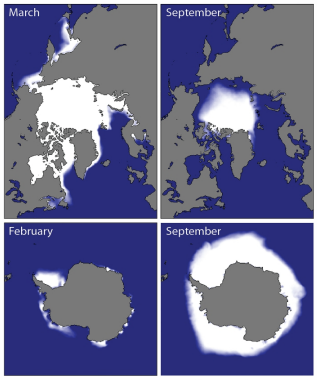
Albedo and ice

A feedback in action



Credit: NSIDC - https://nsidc.org/learn/ask-scientist/how-does-antarctic-sea-ice-differ-arctic-sea-ice

What is albedo?

Albedo is the measure of how well a surface reflects solar radiation. Natural surfaces with a high albedo, such as snow and ice, reflect a high percentage of incoming solar radiation. In contrast, surfaces with a low albedo, such as the ocean, absorb more solar radiation.

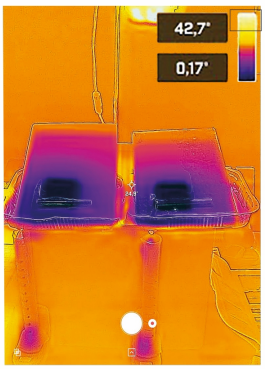
How does albedo affect ice melt?

The color of a surface impacts its albedo and its ability to convert solar energy into heat. Darker surfaces absorb more solar energy and warm faster than lighter surfaces.

Experiment Setup

This experiment simulates the natural system of the polar ocean, where vast areas of sea ice interact with the ocean underneath. Two identical containers, one with a white surface and one with a black surface (emulating the ocean), are placed under a heat lamp (emulating the sun). A layer of frozen milk (emulating sea ice) is placed in each container, and the volumes of melted milk are recorded over time.

Beyond the obvious conclusion that the frozen layer on the black surface melts faster, students gain a hands-on and experimental demonstration of a feedback response identified as an essential principle of climate literacy (*"Climate literacy"* principle #2F).



Why is this important?

The ice-albedo feedback mechanism is a crucial component of Earth's climate system. Changes in the amount of ice cover can significantly impact ocean and global temperatures.

This experiment provides a practical way to understand the role of feedback interactions (in general) and albedo (in particular) in the climate system.

WEBSITE OF THIS LAB

VIDEO OF THIS LAB

Changes in the amount of ice cover can significantly impact ocean and global temperatures. This experiment not only illustrates the importance of albedo in climate processes but also highlights the feedback model of control.