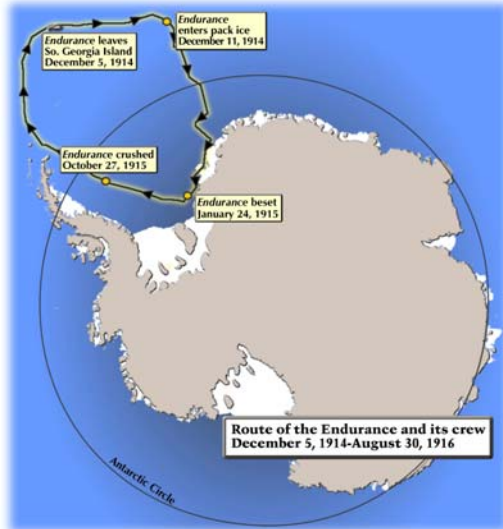


Study of Place

www.studyofplace.com

Antarctic Exploration

Antarctica is the coldest, highest and driest continent and it contains 90% of the world's ice. It is the only continent without an indigenous human population yet it has long held a strong attraction as a center for heroic exploration. This map details the journey of Ernest Shackleton's ship the *Endurance* that was destroyed by the crush of converging and expanding sea ice. Antarctic Exploration uses sea ice as the focus for science inquiry activities in the classroom since it is central to both the Shackleton expedition and contemporary study of global climate. While Antarctica still holds its intrigue for heroic exploration, it now serves as a focal point for global environmental research. While sea ice was Shackleton's misfortune, we now see the dynamics of sea ice as a critical element in shaping global climate. The revised Antarctic Exploration module will be available Spring 2003 at www.studyofplace.com/

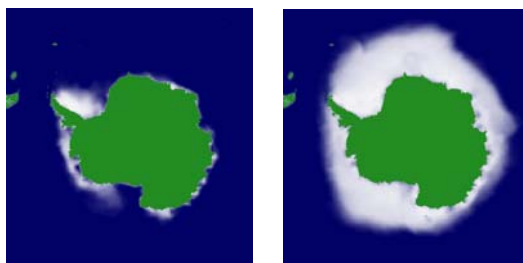


Investigation One: How Can We Explore Antarctica?

This investigation introduces students to six images of Antarctica and gives them a brief description of how each was created. Understanding how to interpret and use images of Antarctica will prepare students to use images to explore seasonal changes in sea ice in Investigation Two. As they become engaged in the Shackleton expedition, students will learn some of the science that deepens understanding of how people experience Antarctica and patterns of change in the physical setting.

Students will understand that

- Maps, aerial photographs and satellite-produced images are resources and tools that help scientists acquire information about Antarctica (and the sea ice surrounding it).
- Each resource and tool used by itself has advantages and disadvantages. The



March September
Polar Sea Ice Concentration, P.N. Schweitzer 1995

choice of tool depends on the information you want to acquire

Investigation Two: How much Sea Ice?

Students develop a sense of how much sea ice there is in Antarctica and how much of that sea ice melts and refreezes from season to season. In order to underscore how the seasons are reversed in the Northern and Southern Hemispheres, students will graph the angle of the Sun in Antarctica and where they live over the course of a year's time and analyze this contrast.

Students understand that

- The seasonal changes in sea ice are related to the amount of solar energy received in the area.
- The angle at which the Sun's rays strike the Earth affect the amount of solar energy an area of the Earth receives.
- The number of hours of daylight is also a factor in the amount of solar energy an area of the Earth receives – although less important than the Sun's angle.

Why is Study of Place special?

Study of Place is where middle school science connects earth science and human geography. The two 2-week modules—*Antarctic Exploration* and *Ocean Currents Exploration*—combine high-tech satellite images and historical narratives to help students picture how Earth's oceans, ice, and atmosphere affect each other and how they affect human habitation.



Consider teaching with Study of Place

Each module:

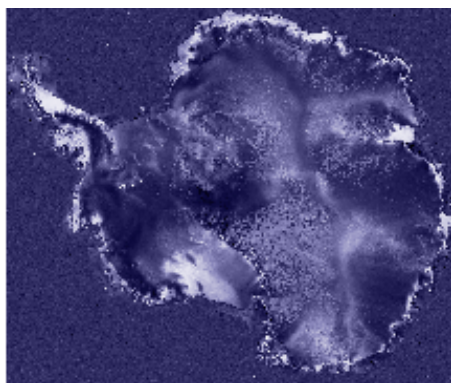
- is short, self-contained, and easy to drop into your current science curriculum.
- engages many different kinds of learners.
- can be taught with a continuous Internet connection or with downloaded materials.
- includes ongoing embedded assessments to keep teachers and students on track.
- connects earth science and human geography.
- uses satellite-based technologies to picture Earth from afar.
- is standards based.

Investigation Three: What Happens When Salt Water Freezes?

Students will explore the science that allowed Shackleton's crew to drink frozen seawater. Students will first mix some water samples, observing how salinity affects the way water sinks, floats, and layers itself. Then students freeze some fresh water and salt water, making their own ice cores. Students make a prediction about how salt will be distributed in a bottle of frozen salt water, then design and carry out a method to test their prediction.

Students will understand that

- Sea ice forms first where it comes in contact with the colder atmosphere above it. When salt water freezes, salt is expelled from the ice and moves away from the place where it freezes first.
- Saltier water sinks in less salty water, the water it displaces rises up to takes its place. This drives the vertical currents in the ocean underneath sea ice.
- Models, such as freezing a bottle of salt water, may be used to understand sea ice phenomena.
- There is more than one method students can use to test their predictions.



RADARSAT Antarctica Mapping Mission, Canadian Space Agency & NASA, 1999.

Investigation Four: How are Sea Ice and Climate Related?

Students explore two properties of sea ice that affect the climate of Antarctica: reflectivity and insulation. Both are crucial to developing students' understanding of heat transfer in the polar context. Understanding the relationships between solar energy, sea ice, ocean water, and atmosphere will help students understand both local climate conditions in Antarctica and global climate past and present.

Students understand that

- Reflectivity is a characteristic property of the Earth's surface that determines how much solar radiation is reflected back to space (and, therefore, how much is absorbed).
- Good insulators block the transfer of heat from one material or substance to another; sea ice and the snow on top of it are good insulators.
- Climate change can be measured by looking for patterns in data collected over time.
- Discussions of global climate change can be informed by analyzing patterns of change in the extent, thickness, and number of days between onset of freezing and melting of sea ice.



What the Study of Place curriculum includes

Among the resources you will find are:

- A gallery of images including satellite pictures, GIS maps, QuickTime movies, historical photographs, and other visualizations
- Step-by-step activity descriptions, including lab sheets for individual and small-group work
- Discussion questions
- Ongoing embedded assessments with scoring rubrics
- Professional support materials for each activity include science and technology background information.
- Web-based mapping and graphing tools



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