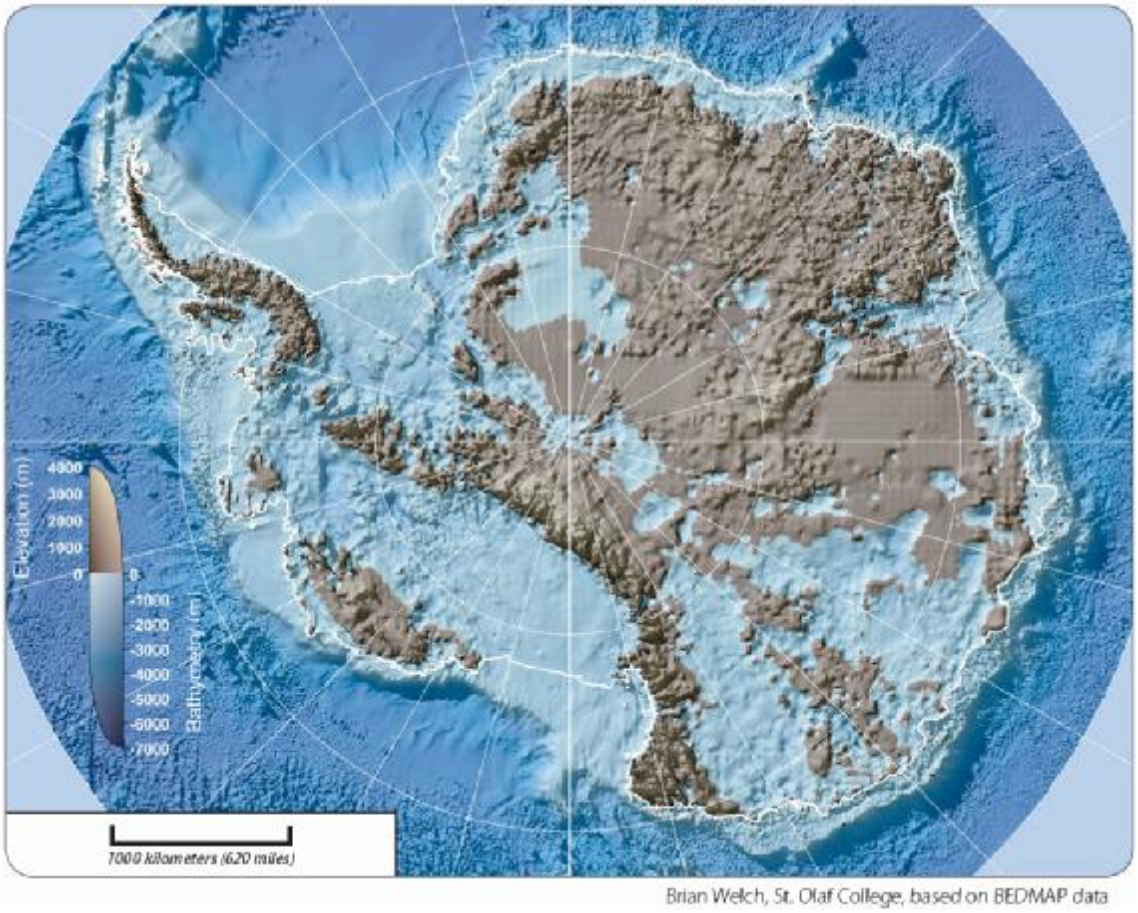
Antarctica

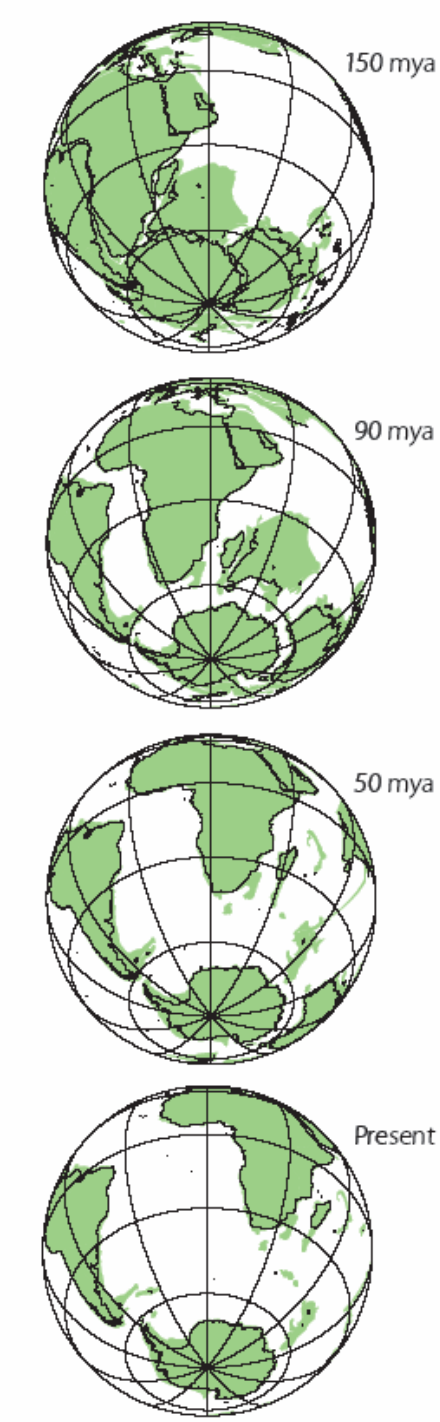
M 3.1 Folie



(Antarctica without ice)

Antarctica

M 3.2 Folie



The breakup of Gondwana, from 150 million years ago to the present. Courtesy of the Ocean Drilling Stratigraphic Network, University of Bremen.

M 3.3 Text (Arbeitsblatt als Material)

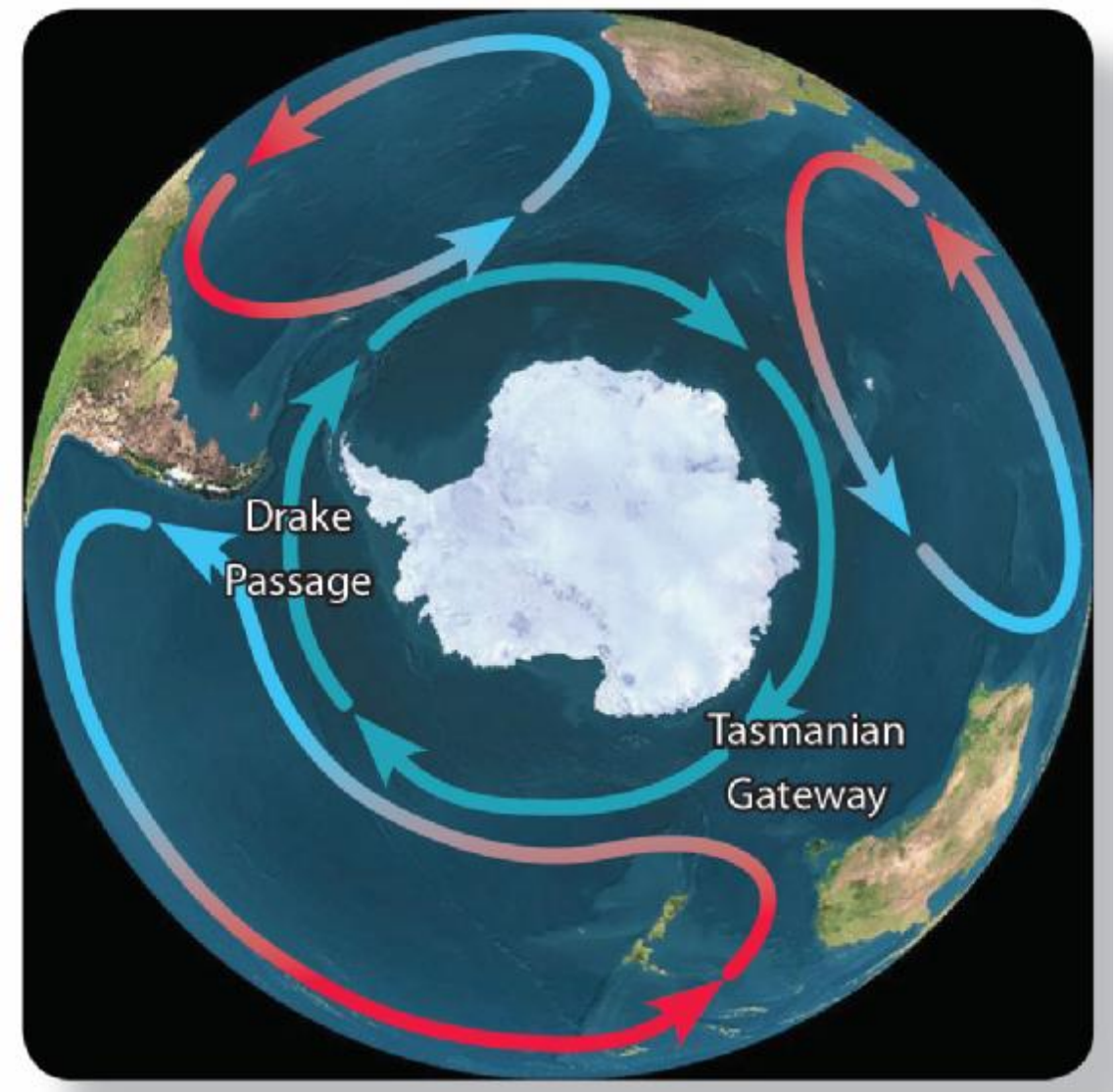
The Role of Plate Tectonics

Over time, movements of Earth's tectonic plates have changed the face of our planet. Many continents have changed shapes and locations. Continents have moved together to form large supercontinents, then moved apart again. The continent of Antarctica has stayed near the South Pole for the past 120 million years. It was once part of a huge southern continent called Gondwana.

By around 40 million years ago, Africa, India, Australia, and South America were all moving away from Antarctica, leaving it behind. This rearrangement of continents resulted in a new ocean around Antarctica. That ocean developed a strong current that flows in a circle around the continent. The fast-moving cold water blocked warmer water from the Pacific, Atlantic, and Indian Oceans from reaching Antarctica's shores. By about 35 million years ago, the entire continent was isolated from the rest of the planet's warmth. Temperatures on Antarctica plunged, and they remained low enough that snow began to accumulate and ice sheets began to grow.

Antarctica

M 3.4 Folie



The Antarctic Circumpolar Current (ACC) flows around Antarctica, blocking warm waters from other oceans from reaching Antarctica.

(Ocean currents influencing the Antarctic ice cover)

M 4.1 Text (Arbeitsblatt als Material)

Climate Change

Compared to 40 million years ago, Earth's overall temperature is now cooler by about 5°C. Evidence from rocks, including fossils of plants and animals, shows that global climate has changed over time. Detailed studies reveal that the average temperature didn't decrease steadily; instead, every 5 or 10 million years, the temperature dropped by a degree or more. Other times, the temperature remained steady or got warmer for a while. The causes and timing of these types of temperature changes are what climate scientists want to learn about as they attempt to predict how Earth's climate will change in the future. In the past 50 years, Earth's average temperature has warmed by 0.6°C.
Projecting current conditions into the future, we can expect another 1°C of warming over the next 50 years. Though we know that natural variations have caused changes in climate throughout Earth's history, the rate of climate change is now much faster than usual. A growing body of evidence indicates that human activity is affecting Earth's climate. People are wondering what impact higher global temperatures will have on Antarctica's ice.

Arctic Ice Loss

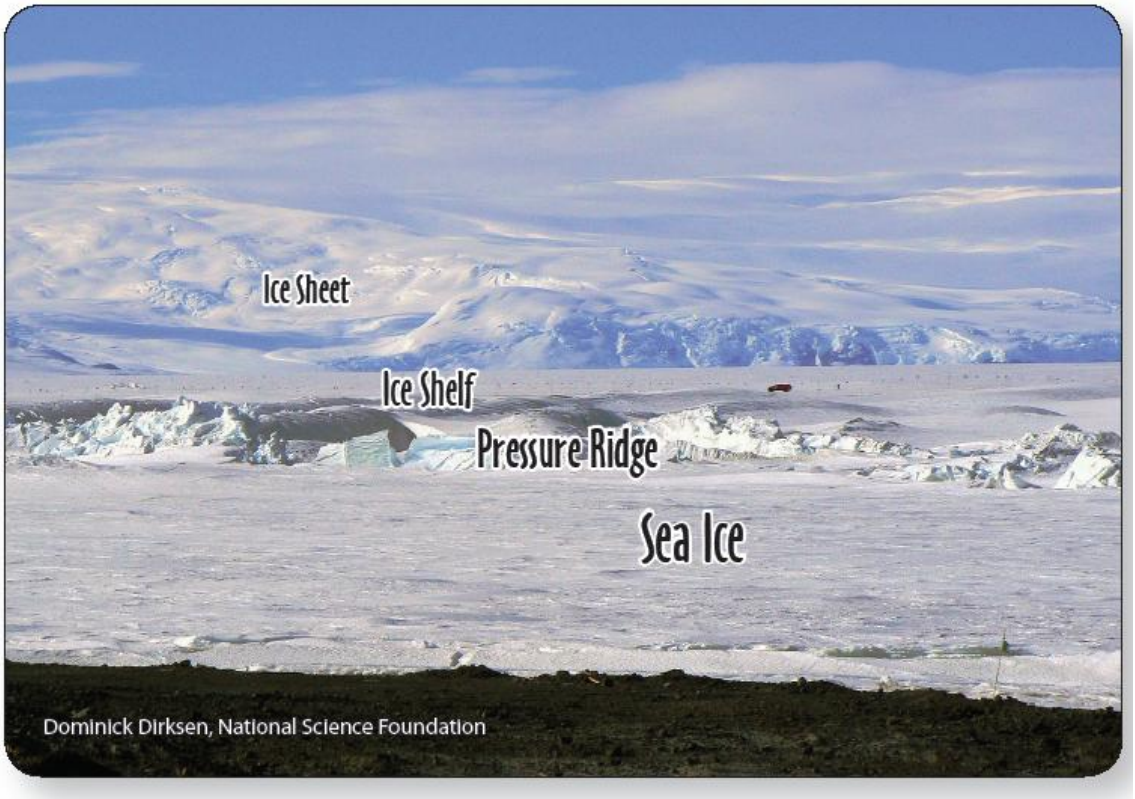
The area covered by sea ice in the Arctic Ocean has been shrinking. For many decades, more sea ice has melted away during summers than has reformed during winters. Projections show that the ocean around the North Pole could be ice-free during summers as early as the year 2030! How might the melting of this sea ice – an area larger than the country of India – affect the rest of the world? The ice sheet on Greenland is also shrinking. Over the past 30 years, the total area of the Greenland ice sheet affected by summer melting has grown. What effect might the melting of Greenland's ice sheet have on the rest of the world? Antarctic Ice Loss Antarctica has ice sheets on land, floating ice shelves, and sea ice surrounding it. How would the melting of these three different kinds of ice affect the rest of the world?

Antarctica

M 4.2 Folie

NASA Scientific Visualization Studio, modified by Angie Fox

M 4.3 Folie



Antarctica

M 4.4 Anleitung für das Experiment

Antarctica

M 4.4 (2. Tei) Text zum Experiment (Arbeitsblatt oder Folie)

Make two identical pieces of ice:

1. *Put water into one of your small plastic containers so it is approximately 2cm deep.*
2. *Pour the water into a measuring cup so you know exactly how much you have.*
3. *Pour that same volume of water into each of the two small plastic containers and put them in the refrigerator.*

Make two models of land and sea:

1. *Put a label on the outside of each of the two rectangular plastic food containers. Write "Ice on Land" on one container and "Ice in Water" on the other.*
2. *Pour 1 cup of aquarium gravel into each container. Tilt and shake each container gently so the gravel is piled in one end to form the "land."*
3. *Gently pour 1½ cups of water into each container. Make sure that the water doesn't cover the surface of the gravel.*
4. *In the Ice on Land container, place one of the pieces of ice (made in a refrigerator) on top of the gravel. No part of the ice should be in the water.*
5. *In the Ice in Water container, put the piece of ice in the water, so no part of it is supported by the gravel.*
6. *On the outside of each container, mark the water level, using an overhead-transparency marker.*
7. *Have a discussion with your team members: What do the different parts of the model represent in the real world? In the model, what is the significance of the water level?*

Wait for the ice to melt:

1. *Put both containers in a place where they won't be disturbed while the ice melts. (If it's necessary to leave them for more than a few hours, put lids on the containers to keep water from evaporating.)*
2. *After both pieces of ice have melted, check and mark the water levels again.*