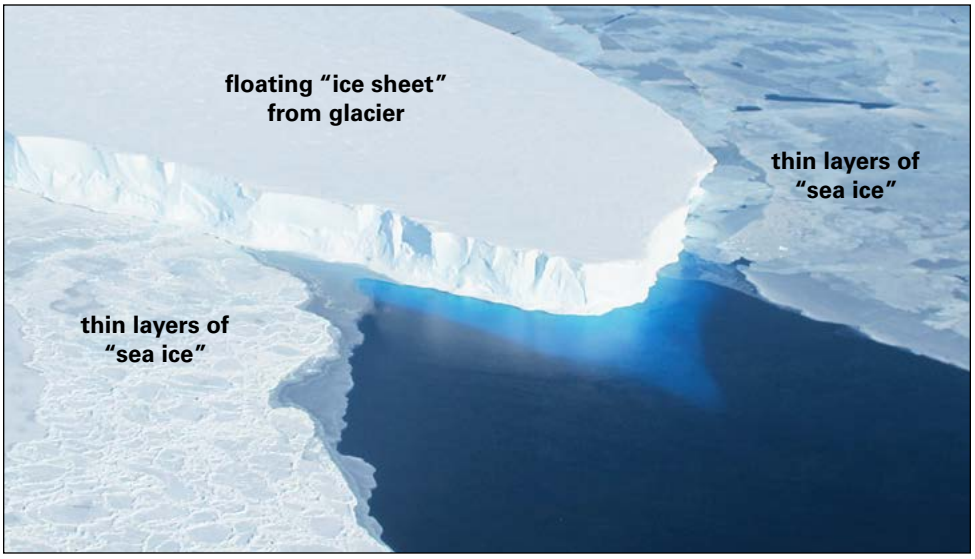
Meltdown

Antarctic ice is melting faster than ever before

Antarctica is the world's coldest, driest, and windiest continent. It is surrounded by the Southern Ocean and is located at the South Pole. It has large mountains (some over 16,000 feet tall) and massive ice sheets that cover the entire continent with ice. The ice has been building up there for millions of years, and in places the ice is over a mile thick.

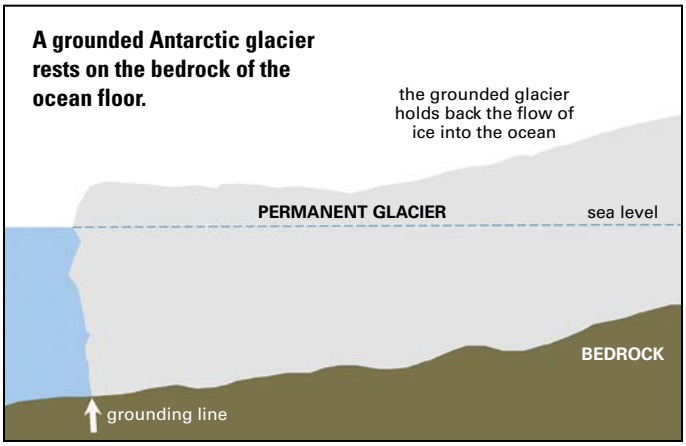
The weight of all this ice and snow pushes huge ice fields, or glaciers, downhill—flowing slowly down the mountain valleys toward the sea. When the Antarctic glaciers reach the sea, some of the ice spreads out and forms a *floating* ice sheet on the top of the ocean's surface. When the largest glaciers reach the sea, however, they may stand tall as a *grounded glacier*, resting directly on the sea floor, with cliffs of ice towering over the water below.

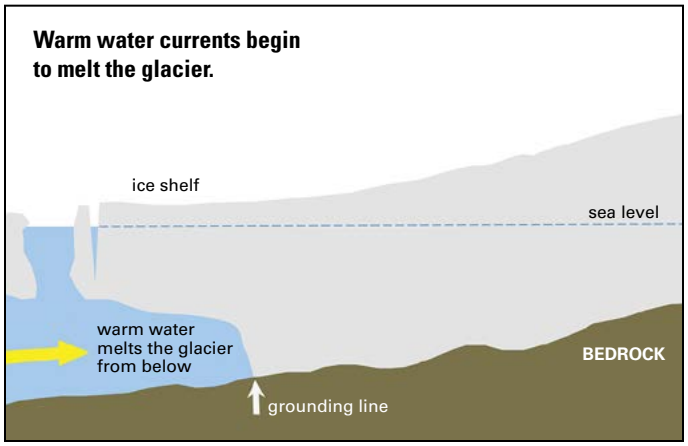
Until recently, the Antarctic ice has moved very slowly, with the grounded glaciers acting like a dam, holding back the advancing ice. However, scientists studying Antarctica have discovered that the Southern Ocean's slowly warming waters and changing currents are now bringing warmer water to the Antarctic coastline and speeding the melting of the grounded ice. As the bottom of the glacier melts, giant chunks of ice come crashing down from above and fall into the sea. With the collapse of the grounded glacier, *the flow of ice into the sea increases* and contributes to the rise in sea levels worldwide. In the West Antarctic region



A large, floating Antarctic "ice sheet" surrounded by thin layers of "sea ice" (frozen ocean water)

NASA





alone, this may now add as much ice to the Southern Ocean as if a Mt. Everest-sized mountain of ice were to drop into the ocean every two years.

Why is this happening?

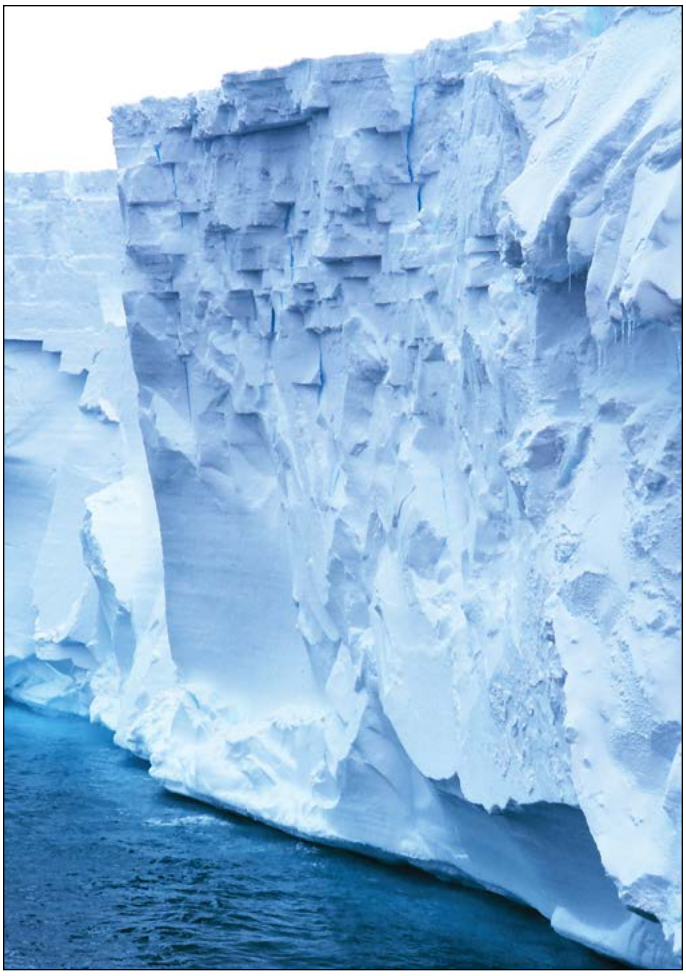
Although scientists can observe the movement of the glaciers and the increased flow of ice into the ocean, they are still working to understand the changes to the Antarctic environment that are responsible for these changes. The slowly increasing temperatures caused by global warming, for example, affect both the air and the ocean and can change the normal wind patterns and ocean currents. In this case, the "warm" water currents that are melting the grounded glaciers are only slightly warmer than in the past (only 1–2 degrees warmer), but they are estimated to have tripled the rate at which the glaciers are melting. More importantly, the glaciers are no longer acting as a dam that blocks the flow of ice into the ocean, and Antarctic ice is rapidly sliding into the ocean as floating ice sheets or breaking apart into icebergs.

This is a case where small but widespread changes in the environment can have large effects.

Consequences?

Antarctica is a large continent and will always be one of the coldest places on the Earth, so there is no danger that all the Antarctic ice will melt. During the Antarctic summer, however, the melting ice and glaciers flowing into the ocean are already making a significant contribution to the worldwide increase in sea levels. Although it is hard to predict exactly how fast the ice will melt, the Antarctic ice *alone* may well be responsible for raising sea levels by as much as a meter (roughly three feet). At the current rate of melting, this may take as long as 100 years, but since the melting rate has been increasing, the sea level rise is likely to speed up as well.

While raising sea levels by a couple of feet doesn't seem to be much of a problem, low-level areas near coastlines are very sensitive to small increases in sea level.



National Oceanic and Atmospheric Administration (NOAA)/Department of Commerce

A grounded glacier resting on the ocean floor.