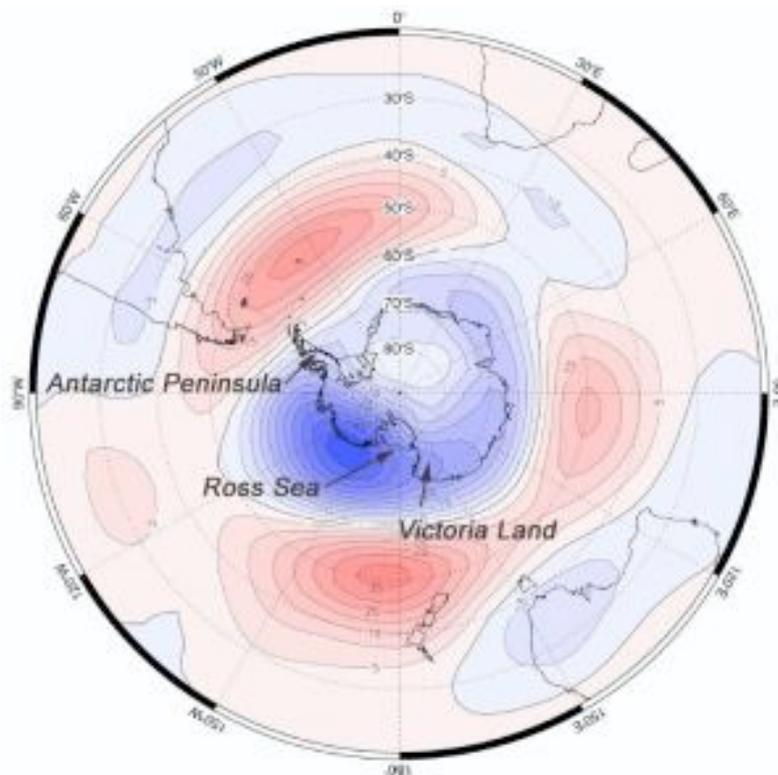


Why Antarctic ice is growing despite global warming

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Winds circle clockwise around Antarctica, whip off Victoria Land and create a vortex of cold storms (dark blue) off the Ross Sea, where sea ice is expanding. The vortex also draws in warm (red) air from South America, which warms the Antarctic Peninsula (Image: modified from Turner/AGU)

It's the southern ozone hole whatdunit. That's why Antarctic sea ice is growing while at the other pole, Arctic ice is shrinking at record rates. It seems CFCs and other ozone-depleting chemicals have given the South Pole respite from global warming.

But only temporarily. According to John Turner of the British Antarctic Survey, the effect will last roughly another decade before Antarctic sea ice starts to decline as well.

Arctic sea ice is decreasing dramatically and reached a record low in 2007. But satellite images studied by Turner and his colleagues show that Antarctic sea ice is increasing in every month of the year except January. "By the end of the century we expect one third of Antarctic sea ice to disappear," says Turner. "So we're trying to understand why it's increasing now, at a time of global warming."

In a new study, Turner and colleagues show how the ozone hole has changed weather patterns around Antarctica. These changes have drawn in warm air over the Antarctic Peninsula in West Antarctica and cooled the air above East Antarctica.

The Southern Ocean is home to some of the strongest ocean winds on the planet. The region between 40° and 60° South is well-known to sailors who call it the "roaring forties" and "furious fifties".

Wind vortex

If the South Pole were smack in the middle of Antarctica, the winds would circle neatly around it in a clockwise direction. But in fact the continent is set slightly off-centre relative to the South Pole. As a result, the winds whip off Victoria Land and create a vortex over the Southern Ocean north of the Ross Sea (see blue area in figure). Turner compares this to the way wind going down a line of buildings will whip into a vortex when it comes to a corner.

The vortex generates a large area of storm activity. It also draws in warm air from South America over the Antarctic Peninsula, making this the warmest region of the continent.

By running an atmospheric computer model with and without the ozone hole, Turner and his colleagues found that the depletion of the ozone has intensified the winds of the roaring forties and furious fifties. The net result has been to draw more warm air in from Chile – which has warmed the Antarctic peninsula and caused the collapse of several ice shelves – and generate stronger cool-air storms around the Ross Sea.

Satellite data shows that sea ice has shrunk west of the Antarctic Peninsula and grown in the Ross Sea. Because the increase in sea ice extent has been greater than the reduction around the Antarctic peninsula the net effect is that since the ozone hole appeared 30 years ago, Antarctic ice has grown. The researchers say their models suggest this is most likely a result of the ozone hole although they cannot rule out the possibility that natural variations in sea ice extent have also played a role.

Ozone healing

"Over the next 50 to 100 years, the ozone hole will heal," says Turner. "At the same time, greenhouse gases will rise. In next decade or so we should see sea ice plateauing and then decreasing massively if greenhouse gases continue to increase."

Earlier this year, research led by Eric Steig of the University of Washington, Seattle showed that although the Antarctic continent as a whole has warmed by 0.5°C in the last 50 years – on a par with the global average – the figure hides strong regional differences. West Antarctica has warmed while temperatures over East Antarctica have dropped.

Accordingly, the disintegration of large ice shelves have all been in West Antarctica, the most famous example being the Larsen ice shelf. More recently, scientists have been anxiously expecting the Wilkins ice shelf to collapse as well.

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