



This is the print version of the [Skeptical Science](http://sks.to/antarctica) article '[Antarctica is gaining ice](http://sks.to/antarctica)', which can be found at <http://sks.to/antarctica>.

Is Antarctica losing or gaining ice?

What The Science Says:

Antarctic sea ice is gaining sea ice but Antarctica is losing land ice at an accelerating rate, which has implications for sea level rise.

Climate Myth: Antarctica is gaining ice

"[Ice] is expanding in much of Antarctica, contrary to the widespread public belief that global warming is melting the continental ice cap." ([Greg Roberts, The Australian](#))

Arguments that we needn't worry about loss of ice in the Antarctic because sea ice is growing or even that sea ice in the Antarctic disproves that global warming is a real concern hinge on confusion about differences between sea and land ice, and what our best information about Antarctic ice tells us.

As well, the trend in Antarctic sea ice is not a permanent feature, as we'll see. But let's look at the main issues first.

- **Sea ice doesn't play a role in sea level rise or fall.**
- **Melting land ice contributes to sea level rise.**
- **The net, total behavior of all ice in the Antarctic is causing a significant and accelerating rise in sea level.**

Antarctic sea ice is ice which forms in salt water mostly during winter months. When sea ice melts, sea level does not change.

Antarctic land ice is the ice which has accumulated over thousands of years in Antarctica by snowfall. This land ice is stored ocean water that once fell as precipitation. When this ice melts, the resulting water returns to the ocean, raising sea level.

What's up with Antarctic sea ice?

At both poles, sea ice grows and shrinks on an annual basis. While the maximum amount of cover varies from year to year, there is no effect on sea level due to this cyclic process.

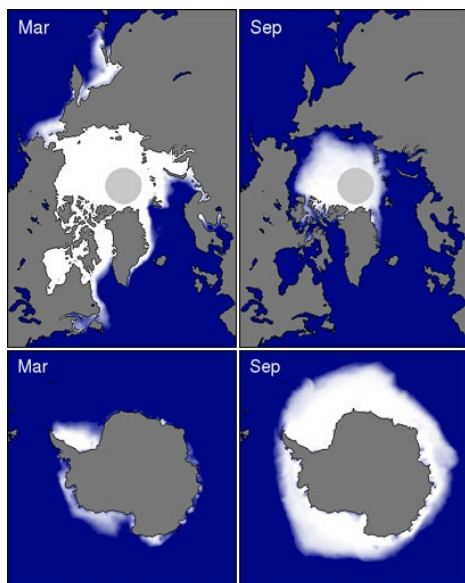


Figure 1: Coverage of sea ice in both the Arctic (Top) and Antarctica (Bottom) for both summer minimums and winter maximums. Source: [National Snow and Ice Data Center](#)

Trends in Antarctic sea ice are easily deceptive. For many years, Antarctic sea was increasing overall, but that [shows signs of changing](#) as ice extent has sharply declined more recently. Meanwhile, what's the relationship of sea ice to our activities? Ironically, plausible reasons for change may be of our own making:

- Ozone levels over Antarctica have dropped causing stratospheric cooling and increasing winds which lead to more areas of open water that can be frozen ([Gillett & Thompson 2003](#), [Thompson & Solomon 2002](#), [Turner et al. 2009](#)).
- The Southern Ocean is freshening because of increased rain and snowfall as well as an increase in meltwater coming from the edges of Antarctica's land ice ([Zhang 2007](#), [Bintanja et al. 2013](#)). Together, these change the composition of the different layers in the ocean there causing less mixing between warm and cold layers and thus less melted sea and coastal land ice.

Against those factors, we continue to search for final answers to why certain areas of Antarctic sea ice grew over the past few decades ([Turner et al. 2015](#)).

More lately, sea ice in southern latitudes has shown a precipitous year-on-year decline ([Parkinson, 2019](#)). While there's a remaining net increase in annual high point sea ice, the total increase has been sharply reduced and continues to decline.

How is Antarctic land ice doing?

We've seen that Antarctic sea ice is irrelevant to the main problem we're facing with overall loss of ice in the Antarctic: rising sea level. That leaves land ice to consider.

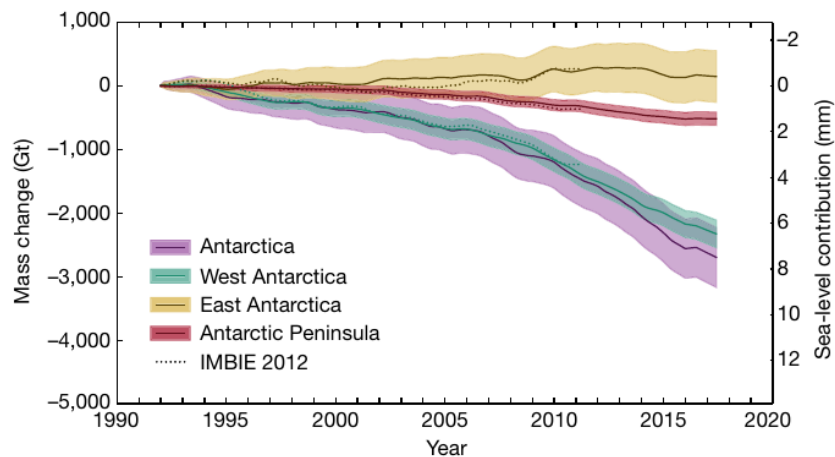


Figure 2: Total Antarctic land ice changes and approximate sea level contributions using a combination of different measurement techniques ([IMBIE, 2017](#)). Shaded areas represent measurement uncertainty.

Estimates of recent changes in Antarctic land ice (Figure 2) show an increasing contribution to sea level. Between 1992 and 2017, the Antarctic Ice Sheets overall lost 2,720 giga-tonnes (Gt) or 2,720,000,000,000 tonnes into the oceans, at an average rate of 108 Gt per year (Gt/yr). Because a reduction in mass of 360 Gt/year represents an annual global-average sea level rise of 1 mm, these estimates equate to an increase in global-average sea levels by 0.3 mm/yr.

There is variation between regions within Antarctica as can be seen in Figure 2. The West Antarctic Ice Sheet and the Antarctic Peninsula Ice Sheet are losing a lot of ice mass, at an overall increasing rate. The East Antarctic Ice Sheet has grown slightly over the period shown. The net result is a massive loss of ice.

Takeaway

Independent data from multiple measurement techniques (explained [here](#)) show the same thing: Antarctica is losing land ice as a whole and these losses are accelerating. Meanwhile, Antarctic sea ice is irrelevant to what's important about Antarctic ice in general.

Basic rebuttal written by mattking

Update July 2015:

Here is the relevant lecture-video from [Denial101x - Making Sense of Climate Science Denial](#)

[see video at [this link](#).]



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