CLIMATE CHANGE IN THE POLAR REGIONS

HOT TAKES

1 Recent climate change in the polar regions is anything but 'unprecendented'.

2 In 2007 Al Gore predicted the Arctic would be ice-free by 2013, but he was wrong: it's still there. Ice sheets are not falling into the sea.

3 World sea levels continue to rise, slowly, in a centuries-long trend at odds with the theory it is being accelerated by melting ice sheets.

News headlines from the polar regions are grim. We are being told the pack ice is disappearing, the ice sheets are falling into the sea, and the glaciers are retreating at unprecedented rates. This is allegedly causing sea level rise to accelerate, placing all of us in danger. Is this just media-fuelled mythology?

There are four key questions to answer: is polar climate change unprecedented; is the pack ice vanishing; are the ice sheets falling into the sea; and is sea level rise accelerating?

Is Polar Climate Change Unprecedented?

Natural variability has been the norm for the Greenland and Antarctic ice sheets for at least 10,000 years, and probably millions. It is generally accepted that the Mid-Holocene Thermal Maximum between 8,000 to 5,000 years ago was the warmest period in the last 10,000 years[1]. The meltwaters and lakes that appear during summer on the Greenland ice sheet must also have occurred during that period too – yet there was no ice sheet collapse, making it extremely unlikely today as well.

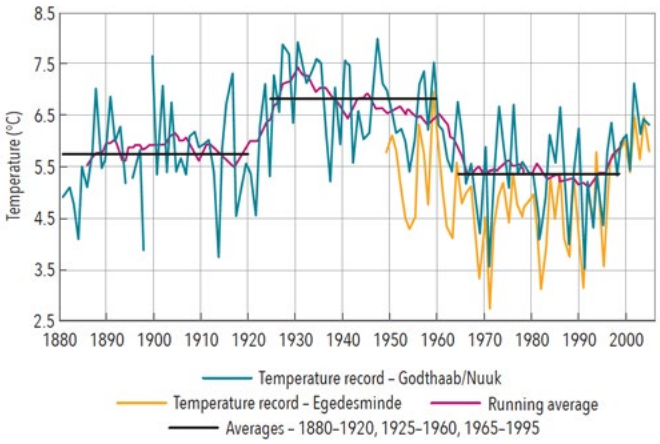
During the Medieval Warm Period, 1,000 years ago, the Vikings had cattle and crops in Southwest Greenland. If Southwest Greenland in the Medieval Warm Period was warmer than today, then today's warming in the Arctic cannot be 'unprecedented'. In Greenland the strongest warming trend last century was in the 1930s, as shown in Figure 1.

In West Antarctica there has been strong retreat of the Pine Island and Thwaites Glaciers in recent decades. However, a recent study[2] indicates there was a strong thinning of the Pine Island Glacier around 8,000 years ago as well, so today's retreat is not unprecedented.

Is the Pack Ice Vanishing?

Pack ice forms as the surface waters of the polar oceans freeze. Our knowledge of the Arctic and Antarctic pack ice is limited to just the past 200 years, while accurate satellite monitoring only began in 1979. It is important to note that increases or decreases in pack ice cannot affect world sea levels because the ice is already floating.

Figure 1: Average summer temperatures at Godthaab/Nuuk and Egedesminde[3]



Temperatures on the West Greenland coast in the 1930s were higher than today. This is consistent with the 1912-2010 record of the island of Svalbard in the Greenland Sea where the warming between 1920 and 1925 was the fastest recorded anywhere in the 20th century. Records for 37 Arctic stations and seven sub-Arctic stations also showed the highest temperatures were in the 1930s.

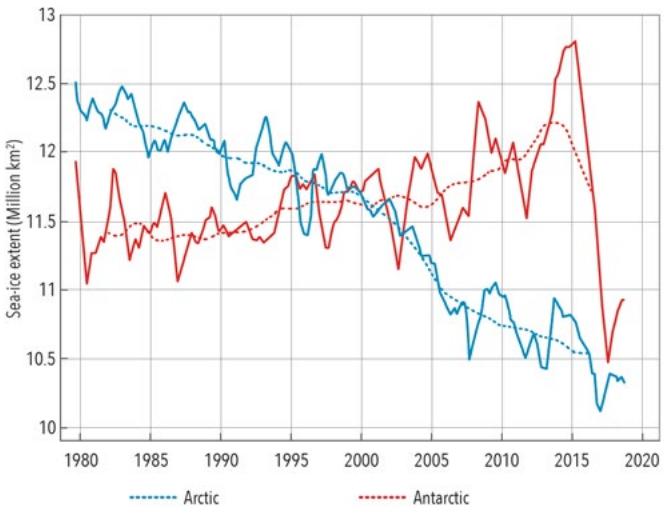
The earliest annual Arctic pack ice maps document a very warm Arctic period in the 1920s and 1930s and a cooling trend from 1938 onwards, with pack ice extent increasing again in the 1950s.

The cyclic extent of Arctic pack ice is influenced by a periodic multi-decadal swing in surface ocean temperatures in the North Pacific Ocean known as the Pacific Decadal Oscillation (PDO), with a similar oscillation in the North Atlantic. These can explain the decrease in Arctic ice during the 1920s and 1930s and an increase during global cooling between 1945 and 1970. In 2007 Al Gore made the embarrassing statement that the Arctic would be ice-free by 2013. It's still there.

The pack ice in the Antarctic surrounds a huge continent that is separated from the rest of the world's oceans by the Antarctic Circumpolar Current. Antarctic pack ice can form there at rates well in excess of 100,000 square kilometres a day. From winter to summer its area ranges from 18 to 3 million square kilometres.

If climate change was driving changes in the level of pack ice, you would expect to see similar effects in both of the polar regions. However, over the past 40 years there has been no correlation between the change in area of Arctic and Antarctic pack ice (see Figure 2).

Figure 2: Arctic and Antarctic pack ice extent 1979–2018[4]



Average surface extent of the Arctic and Antarctic pack ice are out of sync. The maximum extent of the Antarctic pack ice has been steadily increasing since 1981, except for the dramatic decrease in 2018. The maximum extent of the Arctic pack ice has been decreasing since 1979.

Are the Ice Sheets Falling into the Sea?

Large ice sheets, 2–4 kilometres thick, cover Greenland and Antarctica. In Greenland, ocean currents are causing the retreat of coastal glaciers but satellite data indicates the annual ice loss from Greenland varies from year to year. During the summer there are melt days where the surface is an icy mush and in many places small lakes form, sometimes draining quickly into rifts in the ice sheet.

At Antarctica, the average annual temperature over the polar plateau is between –50 °C and –60 °C. Accordingly, there are no 'mush' days, as on the Greenland ice sheet, nor are there surface lakes feeding water through rifts to its base.

Satellite data shows the main East Antarctic Ice Sheet is growing more than the West Antarctic Ice Sheet is shrinking[5]. As a result, Antarctica may be contributing little to sea-level rise.

Is Sea Level Rising at an Increasing Rate?

Around two-thirds of global sea-level rise results from warming-linked thermal expansion of the oceans and a third from land-based ice[6]. The largest sources of freshwater for sea level rise are the ice sheets in Greenland, West Antarctica and East Antarctica. The general estimate is that they hold around 6, 6 and 57 metres of world sea level, respectively.

If melting is accelerating, the extra meltwater should be detectable in sea levels. Satellite data have been interpreted by some to show an acceleration in sea levels[7], but satellites have only been measuring sea level since 1993 – a relatively short period and also (coincidentally?), the year that the rate of sea level rise supposedly doubled. However if the satellites are correct, then the acceleration should also be detectable by now as a world-wide inflection in sea level trends recorded in the world's tide gauges. But no such inflection is seen[8] and, unlike the satellite data, some tide gauge records go back more than two centuries.

Final Observations

Natural periodic climate variability is known over at least the last 10,000 years. More recently there have been strong polar warming pulses in the 18th and 19th centuries, and a marked warming in the 1930s. This should put recently reported warming into perspective.

The scaremongering in the mainstream media when it comes to climate change in the polar regions is unfounded.

SEE ALSO

FACT SHEET #6: Monitoring Temperatures and Sea Ice with Satellites
FACT SHEET #7: Winter Temperature Trends in Antarctica
FACT SHEET #17: Perspectives on Sea Levels

Information in this fact sheet has been drawn from Climate Change: The Facts 2020 (IPA 2020), Chapter 2, by Dr Howard Brady. Fact Sheet series general editor: Dr Arthur Day

1. Folland, et al. 1990, *Observed Climate Variations and Change. In: CLIMATE CHANGE The IPCC Scientific Assessment. Report Prepared for IPCC by Working Group 1*, https://archive.ipcc.ch/ipccreports/far/wg_I/ipcc_far_wg_I_chapter_07.pdf.
2. Johnson et al. 2014, 'Rapid Thinning of Pine Island Glacier in the Early Holocene', *Science*, vol. 343, pp. 999–1001.
3. Source: Chýlek et al. 2006, 'Greenland Warming of 1920–1930 and 1995–2005', *Geophysical Research Letters*, vol. 33, iss. 11.
4. Source: National Snow and Ice Center, USA.
5. Zwally et al. 2015, 'Mass gains of the Antarctic ice sheet exceed losses', *Journal of Glaciology*, vol. 61, pp. 1019–1036.
6. Church et al. 2013, *Sea Level Rise*, https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_Chapter13_FINAL.pdf
7. Nerem et al. 2018, 'Climate-change–driven accelerated sea-level rise detected in the altimeter era'. *Proceedings of the National Academy of Sciences.*
8. For example, see 375 long term trend tide stations at: http://www.sealevel.info/MSL_global_thumbnails5.html

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