

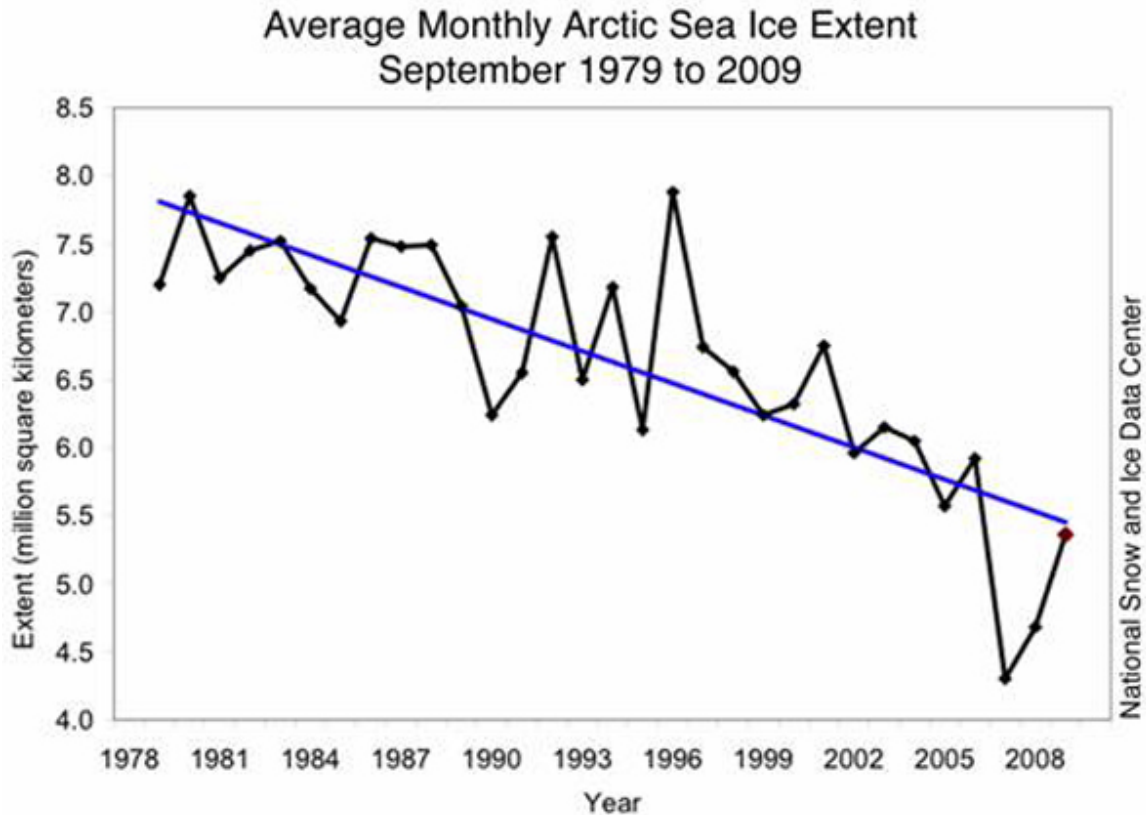
LONG TERM ARCTIC ICE TRENDS AND GLOBAL WARMING

A comment by Tom Goreau

January 8 2010

Those who seek to deny global warming constantly use transparently obvious tricks, selecting data from a single time, a single place, or both, to deny the larger long-term global patterns. This is easily done as climate is constantly fluctuating, so picking out the mean patterns and trends requires that one integrates the data over the largest time and space scales possible. So if one dishonestly wants to misrepresent the larger patterns, one can always find a particular place at a particular time that does not agree with the all the rest averaged together. This is sometimes referred to as the “It’s a cold day in Wagga Wagga” approach, and is repeatedly used by the climate change deniers to fool people who haven’t looked at the data themselves. The changes in Arctic Ice are no exception!

Good data mapping the entire Arctic Ice Cap from space satellites is fairly recent, only since 1979, but the trends are absolutely clear:



But note that there are year to year fluctuations of about 1 million square kilometers, due to annual weather variations. These spatial variations have been used by deniers who simply look at changes since 2007, an exceptionally warm year in the Arctic, to suggest that the Arctic is cooling down! In other words they are simply picking ONE point that falls a bit off the trend of ALL the data to deny the long-term trend.

Another good example of this is a recent posting of the newspaper version of a report made in 1922, that there was much less sea ice than normal at a few places in that year:

NOVEMBER, 1922. MONTHLY WEATHER REVIEW.

THE CHANGING ARCTIC.

By GEORGE NICOLAS IFFT.

[Under date of October 10, 1922, the American consul at Bergen, Norway, submitted the following report to the State Department, Washington, D. C.]

The Arctic seems to be warming up. Reports from fishermen, seal hunters, and explorers who sail the seas about Spitzbergen and the eastern Arctic, all point to a radical change in climatic conditions, and hitherto unheard-of high temperatures in that part of the earth's surface.

In August, 1922, the Norwegian Department of Commerce sent an expedition to Spitzbergen and Bear Island under the leadership of Dr. Adolf Hoel, lecturer on geology at the University of Christiania. Its purpose was to survey and chart the lands adjacent to the Norwegian mines on those islands, take soundings of the adjacent waters, and make other oceanographic investigations.

Dr. Hoel, who has just returned, reports the location of hitherto unknown coal deposits on the eastern shores of Advent Bay—deposits of vast extent and superior quality. This is regarded as of first importance, as so far most of the coal mined by the Norwegian companies on those islands has not been of the best quality.

* R. L. Holmes: Quart. Journ. Royal Meteorol. Soc., January, 1905.

The oceanographic observations have, however, been even more interesting. Ice conditions were exceptional. In fact, so little ice has never before been noted. The expedition all but established a record, sailing as far north as $81^{\circ} 29'$ in ice-free water. This is the farthest north ever reached with modern oceanographic apparatus.

The character of the waters of the great polar basin has heretofore been practically unknown. Dr. Hoel reports that he made a section of the Gulf Stream at 81° north latitude and took soundings to a depth of 3,100 meters. These show the Gulf Stream very warm, and it could be traced as a surface current till beyond the 81^{st} parallel. The warmth of the waters makes it probable that the favorable ice conditions will continue for some time.

Later a section was taken of the Gulf Stream off Bear Island and off the Isfjord, as well as a section of the cold current that comes down along the west coast of Spitzbergen off the south cape.

In connection with Dr. Hoel's report, it is of interest to note the unusually warm summer in Arctic Norway and the observations of Capt. Martin Ingebrigtsen, who has sailed the eastern Arctic for 54 years past. He says that he first noted warmer conditions in 1918, that since that time it has steadily gotten warmer, and that to-day the Arctic of that region is not recognizable as the same region of 1868 to 1917.

Many old landmarks are so changed as to be unrecognizable. Where formerly great masses of ice were found, there are now often moraines, accumulations of earth and stones. At many points where glaciers formerly extended far into the sea they have entirely disappeared.

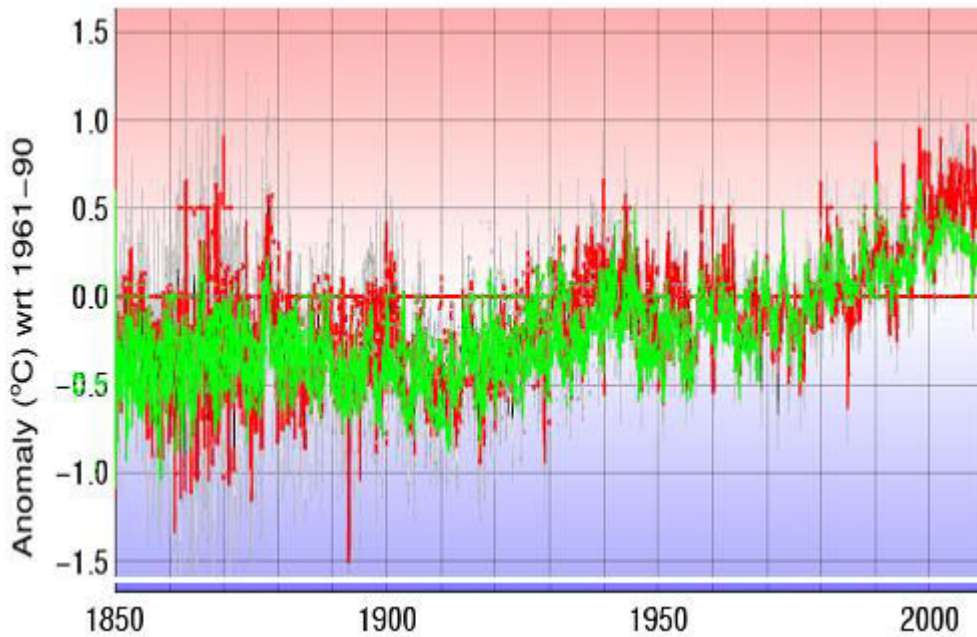
The change in temperature, says Captain Ingebrigtsen, has also brought about great change in the flora and fauna of the Arctic. This summer he sought for white fish in Spitzbergen waters. Formerly great shoals of them were found there. This year he saw none, although he visited all the old fishing grounds.

There were few seal in Spitzbergen waters this year, the catch being far under the average. This, however, did not surprise the captain. He pointed out that formerly the waters about Spitzbergen held an even summer temperature of about 3° Celsius; this year recorded temperatures up to 15° , and last winter the ocean did not freeze over even on the north coast of Spitzbergen.

With the disappearance of white fish and seal has come other life in these waters. This year herring in great shoals were found along the west coast of Spitzbergen, all the way from the fry to the veritable great herring. Shoals of smelt were also met with.

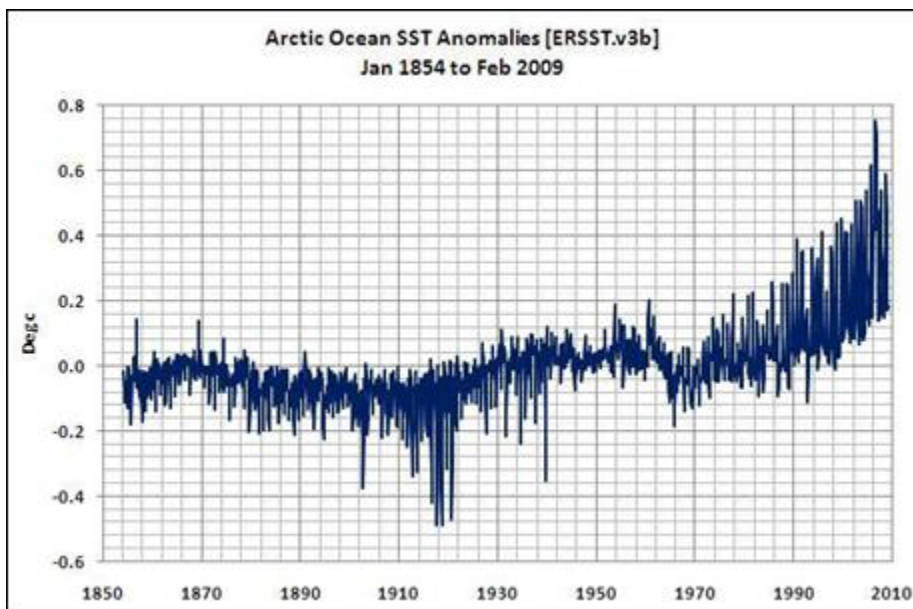
This set of observations from a limited area (Spitzbergen) in one year has been used by deniers to suggest that there are huge natural fluctuations, and to imply that there is no global warming. Now since the satellite data only goes back to 1979, it is perfectly legitimate to suggest that the trends since 1979 may not match the trends when looked at over a longer time period. One has to look at long-term data from ice extent measured in the sea and from shore, and air and water temperature data, over the longest time periods available. So let's look at what this data actually shows!

Here are the measured long-term Arctic (red) and Antarctic (green) temperatures trends:



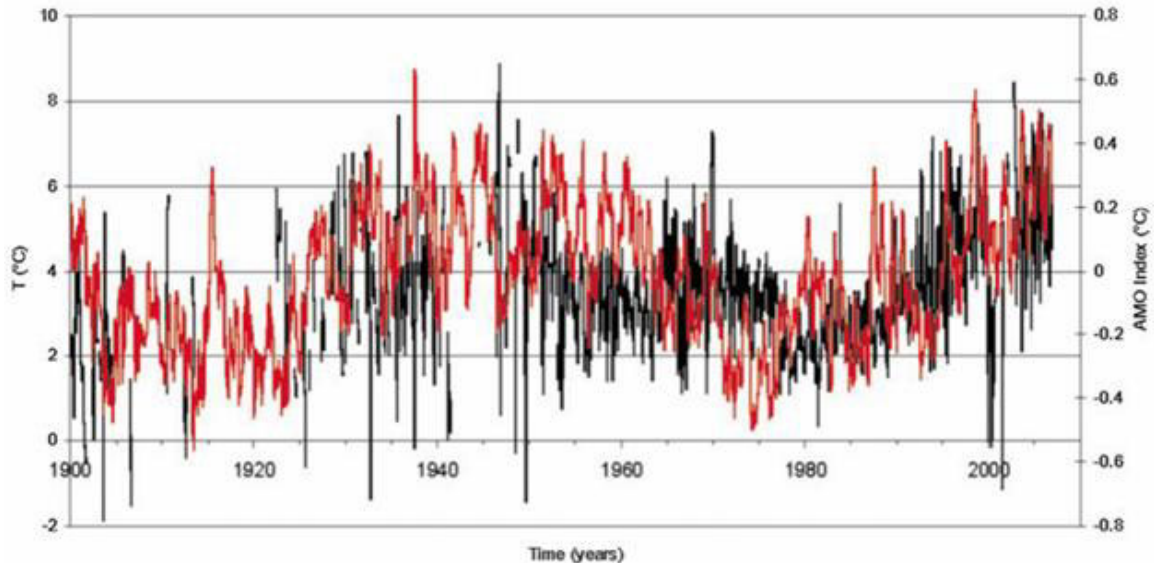
Showing that both ends of the world are undergoing warming, with the last 30 years of record warmth. As would be expected, the ocean-covered north is warming faster than the land-covered south. There is no large-scale warmth during 1922 visible.

Next let's look at the long term measured sea surface temperature anomaly (the difference with the long term average) of Arctic temperature:



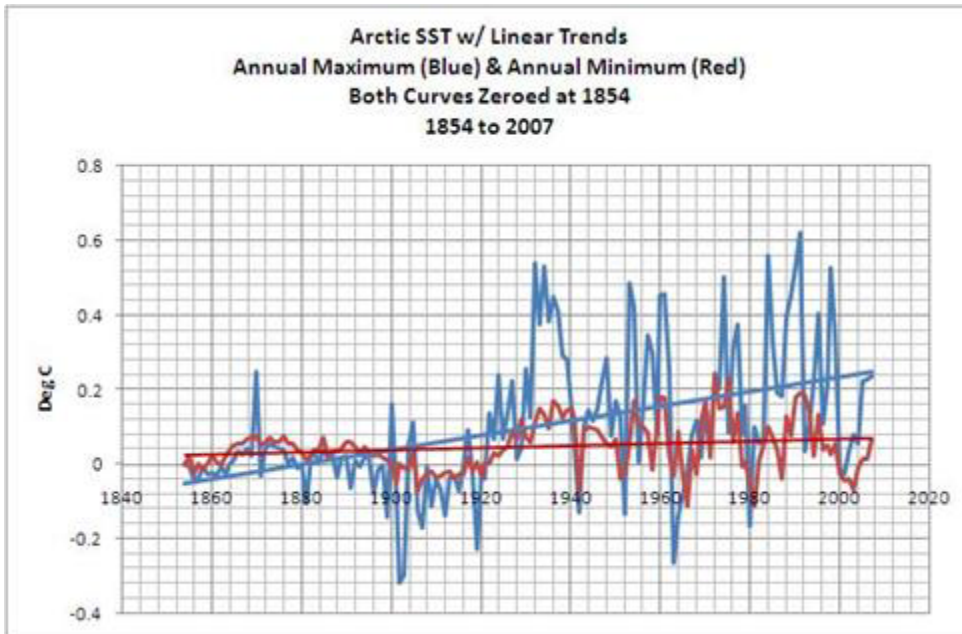
It is clear that what happened in Spitzbergen in 1922 does NOT represent the Arctic as a whole!

What should we make of what appears to be small, possibly natural, blip in temperatures in the 1940s? Below are the LOCAL temperatures in the Barents Sea and the Atlantic Meridional Oscillation (AMO), a large-scale Atlantic Ocean pressure difference that fluctuates with ocean current circulation rates, and affects Arctic wind speeds and temperatures:



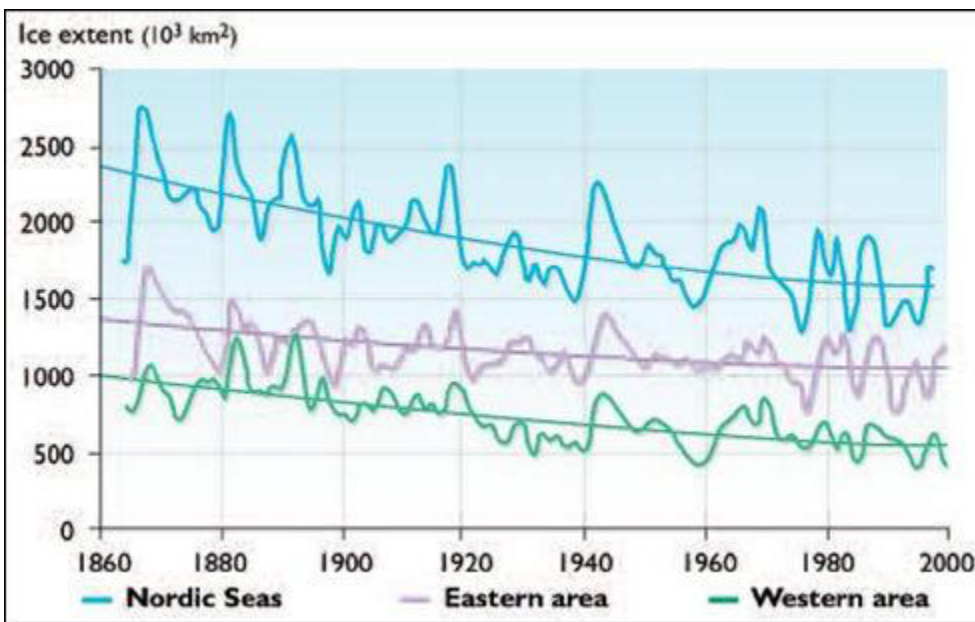
Here black is the temperature, and red is the AMO Index. There is no doubt that weather differences do have natural fluctuations but average temperatures are now higher than they were in the last high AMO index period because of the additional effects of global warming. The AMO seems to cause about 2-3 degrees oscillations in temperature at this site, but there has been a global warming of over half a degree added on top during this period.

Now let's look at how measured maximum summer and minimum winter sea surface temperatures are changing in the Arctic:



It is clear that summer temperatures are rising faster than winter temperatures are rising, but again that 1922 was a purely LOCAL event in Spitzbergen, not a REGIONAL one.

Finally, let's look at the measured ice extent in the places where there is good long-term data, in Iceland, the Nordic Sea, and the Norwegian Sea (in other words in the region of the Arctic most affected by fluctuations in the Gulf Stream) and including Spitzbergen where the 1922 observation came from. First let's look at the Nordic Sea, where the ice is retreating in both east and west, and 1922 is not a blip:



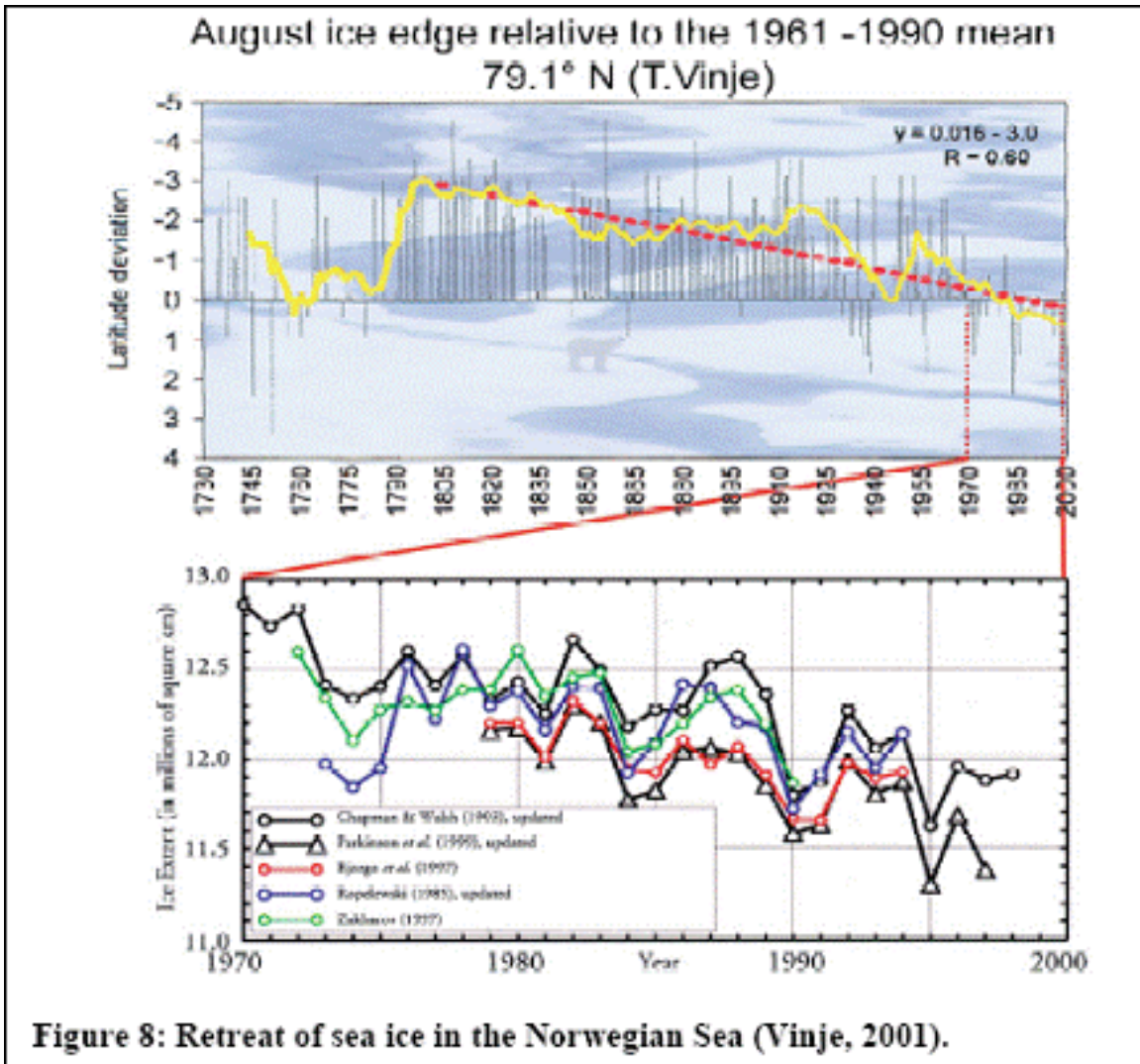
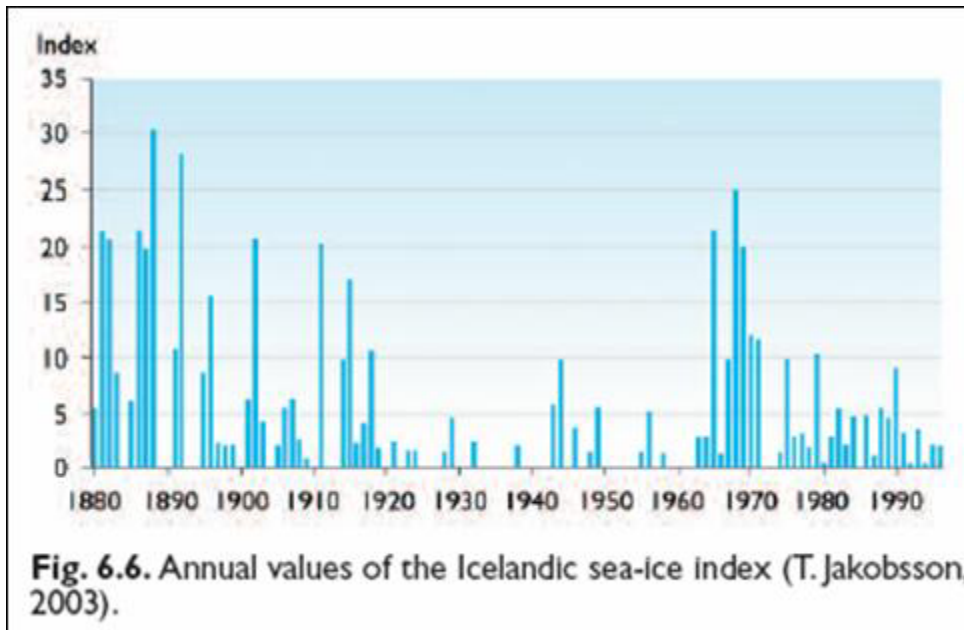


Figure 8: Retreat of sea ice in the Norwegian Sea (Vinje, 2001).

The Norwegian Sea ice limit, from an area where this is well mapped because it has been a major fishing area since the days of the Vikings, is steadily retreating northwards for 300 years and losing area. Note that this area includes Sptizbergen, and 1922 was at best minor blip on the mean trend.

Then finally let's look at Iceland, which is near the very southern limit affected by icebergs and is strongly affected by the Gulf Stream. As can be seen there were years in the 1920s with fairly low drift ice, but the long-term trend is clearly downward:



All of this data is freely available on the web, and it took me only minutes to find it searching on “long term arctic ice change 1922” and similar terms. The best compilation of data, from which most of the above comes, along with much more data and detailed analysis is:

http://www.appinsys.com/GlobalWarming/RS_Arctic.htm

Interested readers are referred to that site to go into these issues in more depth.

To end, let’s point out that the Arctic region will be the site of some of the major global positive climate feedbacks, that is to say those processes that will act strongly to AMPLIFY global warming, and whose effects are only STARTING to be felt and will get much stronger in coming years:

- 1) Ice albedo feedback. An aerial image of the Arctic Ice cap shows that the ocean looks deep blue, nearly black in comparison with ice. The white ice reflects sunlight back to space, reducing warming, while the dark ocean absorbs the light, increasing warming. As ice is replaced by ocean, global warming will accelerate.
- 2) Land albedo feedback. As the land warms up, trees and forests migrate north. White snow that reflects sunlight back to space is covered with dark green leaves or dark brown tree trunks and branches, which absorb sunlight and convert it to heat, with the same effect of amplifying global warming.
- 3) Tundra permafrost melting Greenhouse gas release feedback. As the tundra permafrost is steadily melting, vast amounts of methane gas trapped beneath in soils, peat, sediments, and ice-like methane hydrates are bubbling up into the

atmosphere. This is a greenhouse gas many times more potent than CO₂, and its release is rapidly escalating in Siberia, Canada, Alaska, and the Arctic Ocean.

4) Peat oxidation feedback. As frozen tundra peat melts, the frozen organic matter, the world's largest store of soil carbon, several times larger than that in the atmosphere, is being broken down by microorganisms and released as CO₂ to the atmosphere.

People are urged to look at all the data and make up their own mind, not to be the sheep who base their opinion on politically motivated lies instead of thinking for themselves!