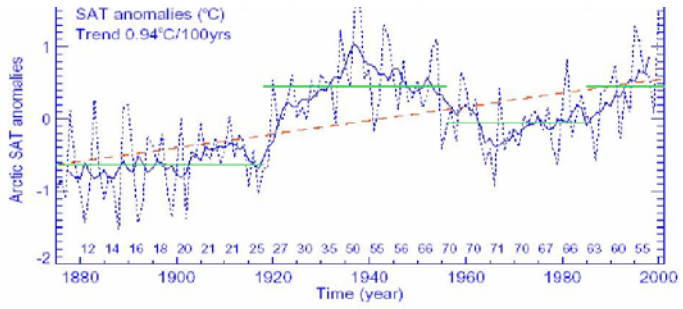
VIII. Arctic Climate

> ***AIT*:** "There are two places on Earth that serve as canaries in the coal mine—regions that are especially sensitive to the effects of global warming," i.e. the Arctic and the Antarctic. In the Arctic, "Temperatures are shooting upward there faster than at any other place on the planet." (*AIT*, p. 126)

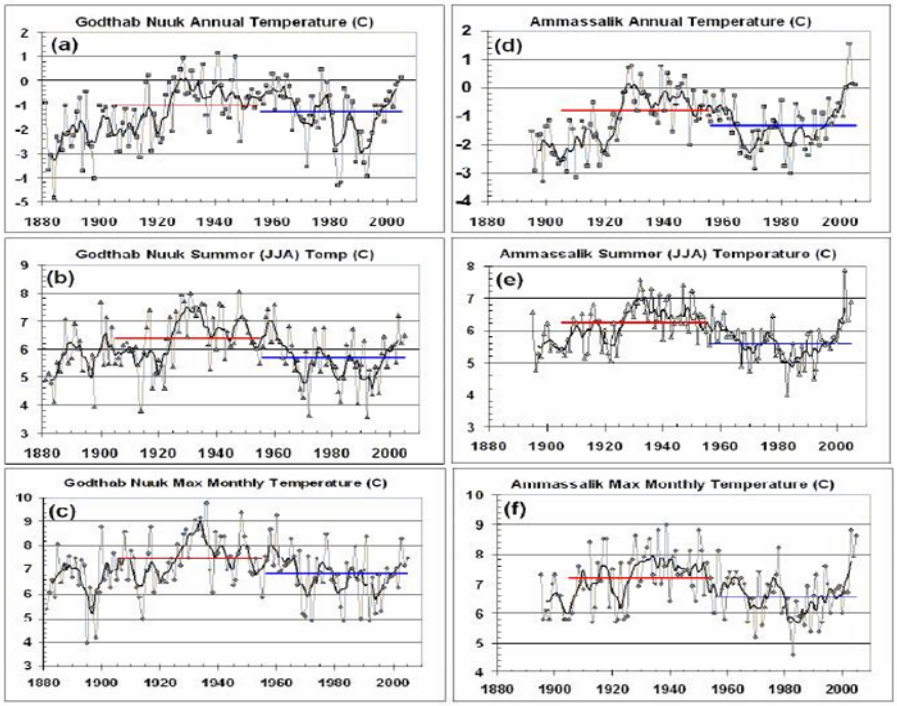
Comment: We would expect the Arctic to warm more rapidly than most other places during a period of global warming, regardless of whether the warming is due to rising greenhouse gas concentrations or natural variability. As Gore explains later on (pages 144-145), polar ice is white and reflects incoming short-wave radiation from the sun whereas sea water is dark and absorbs it; consequently, when sea ice melts, the Arctic ocean absorbs more radiant energy, amplifying the initial warming. Conversely, cooling expands sea ice, producing more cooling. Arctic climate swings!

For example, Polyakov et al. (2003) found that the Arctic (the area poleward of 62°N) was as warm in the late 1930s as it was at the end of the 20th century.[1] See the Figure below.



The Arctic in the 1930s was as warm as or warmer than it was in the late 20th century.
Source: Polyakov et al. (2003)

Consistent with Polyakov's record, Chylek et al. (2006) found that Greenland was as warm during 1920-1930 as it was during 1995-2005, but that the rate of warming during the earlier decade was "50% higher."[2]



Greenland in the 1920s-1940s was as warm as or warmer than it was in the past decade.
Source: Chylek et al. (2006)

Going back further in time, three studies reviewed by Patrick Michaels found greater-than-present Arctic warmth in the early Holocene.[3] Briner et al. (2006) found that, 10,000 to 8,500 years ago, Canada's Baffin Bay was ~ 5°C warmer than it is today.[4] Kaufman et al. (2004) found that, 9,000-7,000 years ago, northern Russia (including Siberia) was 2-7.5°C warmer than it is today.[5] McDonald et al. (2000) found 120 sites out of 140 in the Arctic Western hemisphere where proxy data indicate warmer-than-present conditions during the early Holocene.[6] Darby et al. (2001), reviewed by the Center for the Study of Carbon Dioxide and Global Change, found that during the middle Holocene (about 5,000 years ago), Western Arctic sea surface temperature in August was 3-7°C warmer than it is today.[7] A forthcoming study by Caseldine et al. (2006) finds that from roughly 8,000 to 6,700 years ago, July surface air temperatures in northern Iceland were at least 1.5°C warmer than the 1961-1990 average and possibly 2-3°C warmer.[8]

To sum up, the Arctic warming of the 1930s was comparable to the warming of recent decades, and both Arctic air and sea surface temperatures were significantly warmer than the present during the early- and mid-Holocene. Arctic climate is naturally variable—a fact *AIT* never acknowledges.

> ***AIT*:** "Three years ago the Ward Hunt shelf cracked in half, to the astonishment of scientists. This had never happened before." (*AIT*, p. 128)

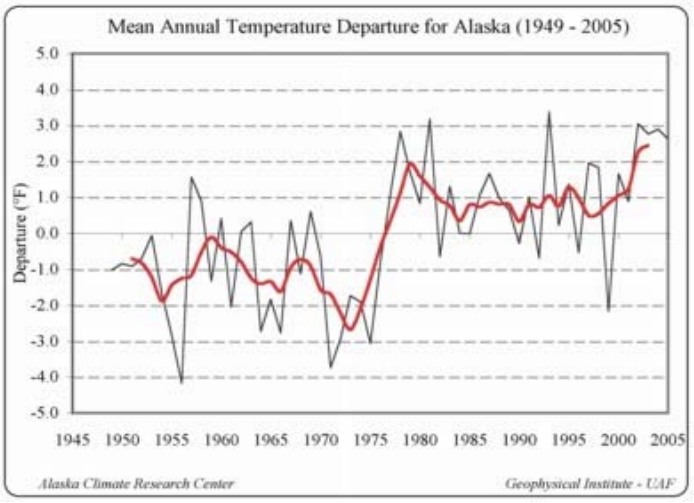
Photo of crack in the Ward Hunt Shelf

Comment: Gore makes this sound like a portent of doom. The Center for the Study of Carbon Dioxide and Global Change, in a review of Mueller et al. (2003), observes that changes of the same kind had been under way since the early 20th century,[9] when CO_2 concentrations were still fairly close to pre-industrial levels.

> As noted by Mueller *et al.* …the Ward Hunt Ice Shelf was merely "a 443 km^2 remnant of a much larger feature that extended along the northern coast of Ellsmere Island at the beginning of the last century (Peary, 1907)." They report, for example, that the original ice shelf had already "contracted 90% during the period 1906-1982 by calving from its northern edge (Vincent *et al*., 2001)…" So what do we say about the ice shelf's demise? We say what Mueler *et al*. say: "The cumulative effects of a long-term warming trend since the Little Ice Age (Overpeck *et al*., 1997) likely caused the ongoing changes in the Ward Hunt Ice Shelf," including "the abrupt break-up and loss of integrity that we observed over the period 2000-2002."

***AIT*:** "In Alaska these are called 'drunken trees' because they are leaning every which way. And this is caused neither by wind damage nor alcohol consumption. These trees put their roots deep into the frozen tundra decades—even centuries—ago and now as the tundra melts they lose their anchor, causing them to sway in all directions." (*AIT*, p. 130-131)

Comment: All of Alaska warmed suddenly in 1976 when a natural cycle known as the Pacific Decadal Oscillation (PDO) shifted from its cooler negative to its warmer positive phase. The Alaska Climate Research Center (ACRC) shows that there is no linear trend in Alaska temperatures from 1949 to 2005, as might be expected from the fairly steady increase in CO_2 levels during this period. Rather, there were two slight cooling trends—the first from 1949 to 1975, the second from 1977 to 2001—interrupted by an overriding step-like warming in 1976 corresponding to the PDO phase shift.[10] See the Figure below.



The 1976 PDO Shift
Source: Alaska Climate Research Center, Temperature Change in Alaska, 1949-2005[11]

No greenhouse warming computer model has ever been able to simulate the 1976 temperature jump. Drunken trees may partly be a consequence of the PDO shift.

> ***AIT*:** "In Siberia, approximately 1 million square km of land frozen since the last ice age is expected to thaw. This tundra contains 70 billion tons of stored carbon, which is becoming unstable as the permafrost melts. The carbon in these Siberian soils is 10 times the amount emitted annually from man-made sources." (*AIT*, p. 132)

Comment: A positive feedback effect, whereby warming releases more CO_2 from soils, which leads to more warming, is a possibility. Another possibility is that the range of carbon-storing vegetation will expand as the tundra thaws. The Center for the Study of Carbon Dioxide and Global Change's extensive literature review (17 studies) concludes:

> > In conclusion, it would appear that all of these many observations suggest that Arctic tundra ecosystems tend to sequester much more carbon in warm times than in cold times, and that old fears of runaway global warming fueled by warming-induced increases in CO_2 emissions from Arctic tundra ecosystems are nothing more than that, i.e., *old fears* that have no basis in fact.[12]

> ***AIT*:** "The graph below shows the number of days each year that the tundra in Alaska is frozen solidly enough to drive on [more than 200 winter travel days in 1970 down to fewer than 80 in 2002]." (*AIT*, p. 135)

Comment: The 1976 PDO shift may account for part of the trend depicted in Gore's graph.

> ***AIT*:** "Since the 1970s, the extent and thickness of the Arctic ice cap has diminished precipitously. There are studies now showing that if we continue with business as usual, the Arctic ice cap will completely disappear each year during the summertime." (*AIT*, p. 143)

Comment: The graph accompanying these statements shows a decline in Arctic sea-ice area from about 13.7 million km^2 in 1970 to about 11.8 million km^2 in 2005—a roughly 15% decrease. As usual, Gore breathes not a word about the potential role of natural variability, but changes in wind patterns and ocean currents can produce significant changes in Arctic sea ice extent.[13] A recent study of sea ice extent in the Nordic Seas region, which includes the Iceland, Greenland, Norwegian, and Barents seas, noted that "a similar shrinkage of ice cover was observed in the 1920s–1930s, during the previous warm phase of the low-frequency oscillation, when any anthropogenic influence is believed to have still been negligible."[14]

But let's assume for the sake of argument that the decrease in Arctic sea ice is mainly due to global warming from greenhouse gas emissions. How worried should we be about this?

Ice cores, ocean sediment cores, and mammalian bone fragments indicate that, during the early Holocene, the Canadian Arctic Archipelago had less summer ice than occurs today, according to an article by 10 scientists in the journal *EOS*.[15] For the past 8,900 years, Bearing Sea and Davis Strait stocks of bowhead whales have been unable to intermingle due to a persistent sea ice barrier separating the two populations. The barrier existed during the last glaciation but disappeared during the warmth of the early Holocene. At the height of that warmth, which was about 3°C warmer than now, "the Pacific and Atlantic bowhead whales could visit each other through the Northwest Passage."

Again, an obvious question arises. What evidence is there that humanity or other species suffered because of the extra Arctic warmth in the early Holocene and the consequent reduction in Arctic sea ice? Did the loss of sea ice make the planet less habitable? Or did warmth actually help our low-tech ancestors survive and begin the march of civilization?

> ***AIT*:** "At present, it [the Arctic ice cap] plays a crucial role in cooling the Earth. Preventing its disappearance must be one of our highest priorities." (*AIT*, p. 143)

Comment: Gore cites no references and offers no explanation for this portentous statement. For example, what harmful effects on weather patterns, global food supplies, or global water supplies can reasonably be traced to the 15% decrease in Arctic summer sea ice observed since 1970?

> ***AIT*:** "A new scientific study shows that, for the first time, polar bears have been drowning in significant numbers." (*AIT*, p. 146)

Comment: "Have been drowning" suggests an ongoing process; "significant numbers" suggests a lot of drowned bears—enough to affect population dynamics. The study in

question reports that in September 2004, "4 dead bears were seen floating far offshore," apparently drowned by "an abrupt wind storm."[16] So the study may have uncovered an unusual case, related to a specific storm, rather than a trend, and the "significant numbers" turns out to be four.

Patrick Michaels, analyzing World Wildlife Fund data, found that polar bear populations are increasing in Arctic areas where it is warming and declining in areas where it is cooling.[17] A leading Canadian bear biologist wrote recently, "Climate change is having an effect on the West Hudson population of polar bears, but really, there is no need to panic. Of the 13 populations of polar bears in Canada, 11 are stable or increasing in number. They are not going extinct, or even appear to be affected at present."[18]

> ***AIT*:** Gore suggests that even a mid-range warming of 2.7°C (5°F) would be a planetary-scale disaster: "An increase of five degrees [Fahrenheit] actually means an increase of only one or two degrees at the Equator, but more than 12° at the North Pole, and a large increase on the periphery of Antarctica as well." (*AIT*, p. 149)

Comment: The temperature record of the past three decades suggests that if global warming continues, average air temperatures will rise about 1.7°C (3°F) during the 21st century. This implies a polar warming comparable to the Arctic warmth of the early Holocene. If our Stone Age ancestors survived (and likely benefited from) that "disaster," also known as the Holocene Climate Optimum, why should we be worried?

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[3] Patrick Michaels, "More Evidence of Arctic Warmth (a long time ago)," *World Climate Rep*ort, http://www.worldclimatereport.com/index.php/2006/05/25/more-evidence-of-arctic-warmth-a-long-time-ago/

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