

TESTIMONY OF DR. SYUN-ICHI AKASOFU
BEFORE THE UNITED STATES SENATE COMMITTEE ON COMMERCE,
SCIENCE, AND TRANSPORTATION
SUBCOMMITTEE ON GLOBAL CLIMATE CHANGE AND IMPACTS
HEARING ON THE PROJECTED AND PAST EFFECTS OF CLIMATE
CHANGE: A FOCUS ON MARINE AND TERRESTRIAL SYSTEMS
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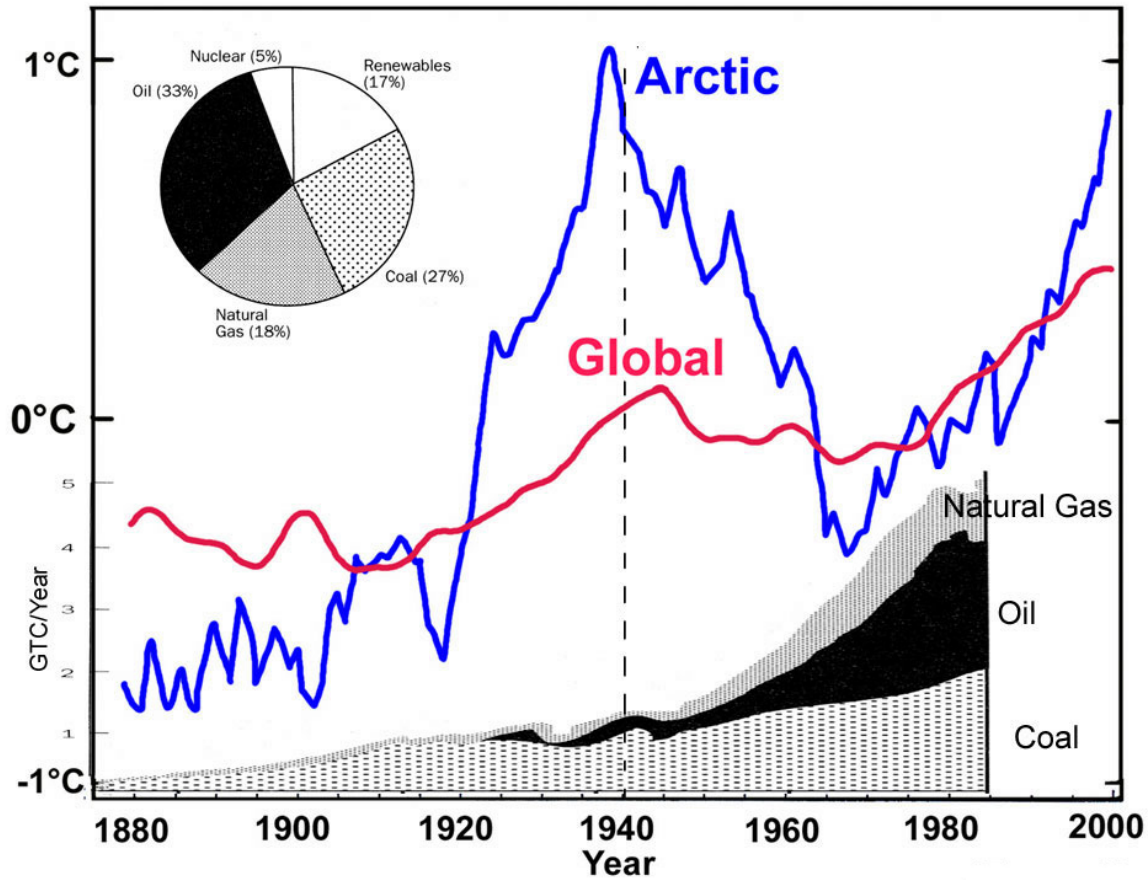
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Thank you for providing me with the opportunity to testify at this important hearing today.

In order to avoid any misunderstanding, I would like to state at the outset that it is in the best interests of mankind to reduce the rate of increase of our release of CO₂. My talk is about the interpretation of the recent trends in the Arctic. For this purpose, I would like to demonstrate that:

- (1) Prominent climate change is in progress in the Arctic, compared with the rest of the world. However,
- (2) arctic climate change consists of *both* natural change and the greenhouse effect, and thus
- (3) it is incorrect to conclude that the present warming in the Arctic is due entirely to the greenhouse effect caused by man.
- (4) Therefore, it is important to find out the contribution of both natural and manmade components to the present climate change in the Arctic.

The first statement can be illustrated in Figure 1. The range of temperature change along the coastline of the Arctic Ocean is much greater than that of the global average. Please note a rapid increase from 1920 to 1940, a decrease from 1940 to 1970, and a rapid increase again from 1970 on.

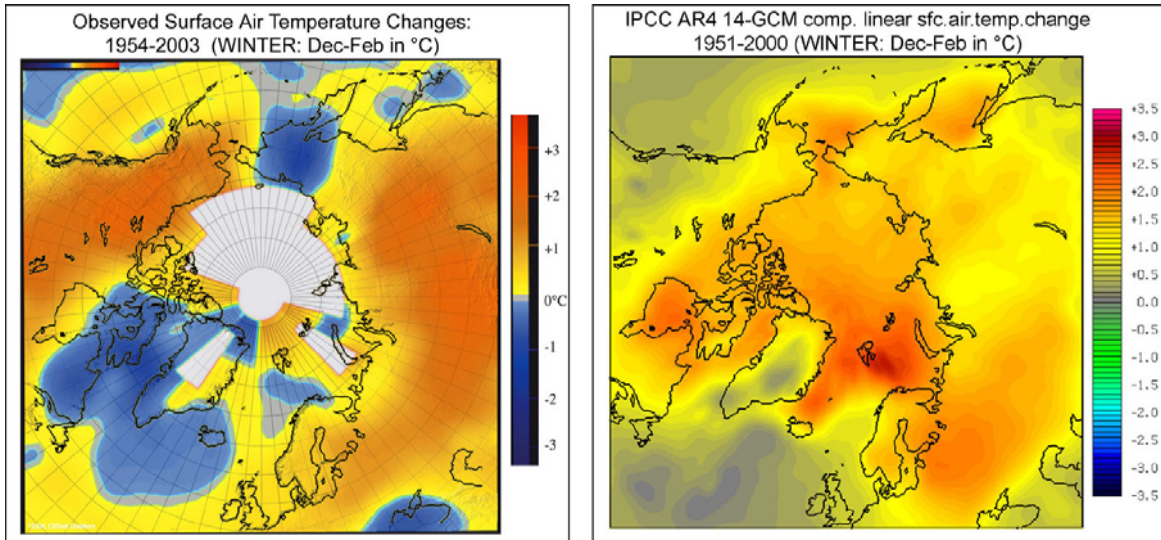


(Figure 1)

(IPCC and I. Polyakov)

It is also important to note that both the Arctic and global temperatures began to decrease in about 1940, when our release of greenhouse gases began to increase rapidly. Thus, the increase-decrease between 1920 and 1970 must be natural change. One important task we have is to find out the nature of the warming periods from 1920 to 1940, and from 1970 to the present time. An important question is whether or not the present rise will continue or whether future temperatures will decrease, as was the case during 1940 to 1970.

Let us examine where in the Arctic temperature changes occurred during the last half of the last century. The left-hand side of Figure 2 shows clearly that the most prominent warming was in the continental Arctic (Siberia, Alaska, and Canada), except in Greenland, where it cooled.



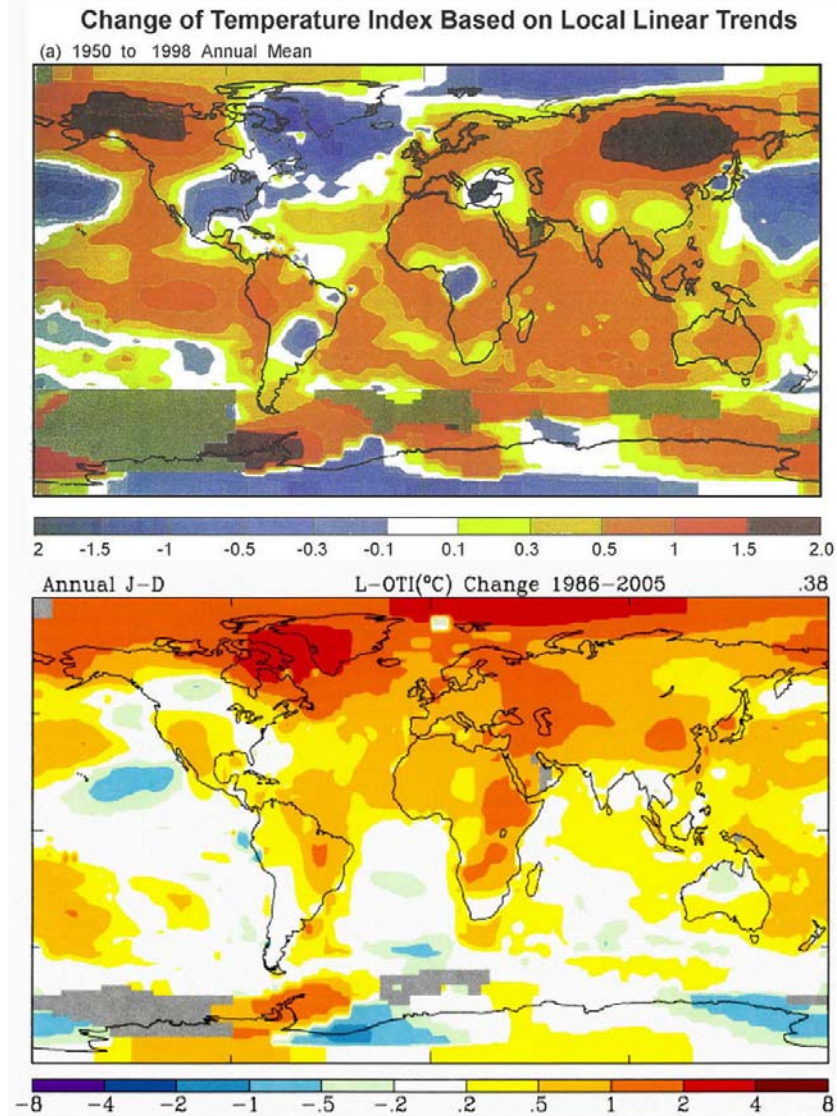
(Figure 2)

(ACIA Report)

(IPCC-GCM – W. Chapman)

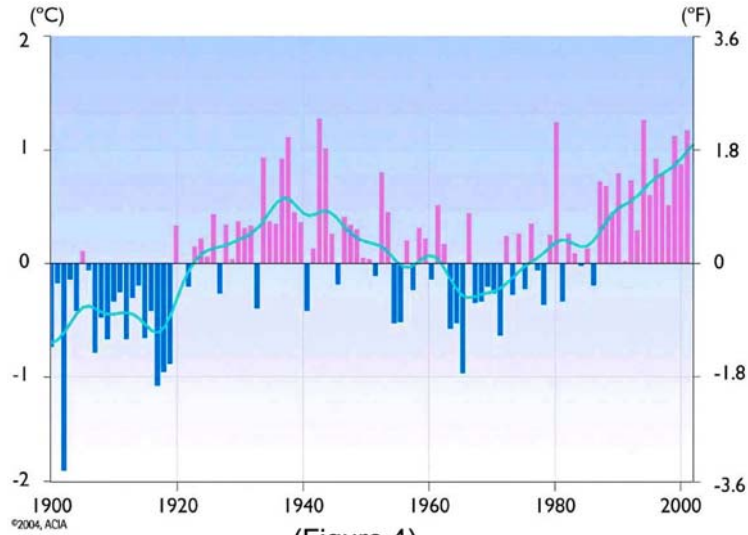
The IPCC Arctic Group, headed by V. Kattsov, examined the IPCC model simulations of Arctic temperature change for about the same time. Their results are shown in the right-hand side of Figure 2. The simulation results bears no resemblance to the observed, real temperatures in the continental Arctic. If the simulation were reasonably accurate, the results should be similar. This is the most quantitative test to date to examine if the continental arctic warming during the last half of the last century was caused by the manmade greenhouse effect. This comparison shows clearly that much of the prominent warming in the continental Arctic after 1970 was *not* caused by the human-induced greenhouse effect.

If, in fact, the continental warming indicated in the right-hand side of Figure 2 were caused by the greenhouse effect, this trend should have been intensified during the last few decades. However, that is not the case. The continental warming in the upper part of Figure 3 (which is similar to the left-hand side of Figure 2) is absent during the last 20 years (the lower part of Figure 3). Thus, the continuous increase of the warming is not taking place any more. Instead, intense warming is now in progress in Greenland, which experienced cooling in the recent past.



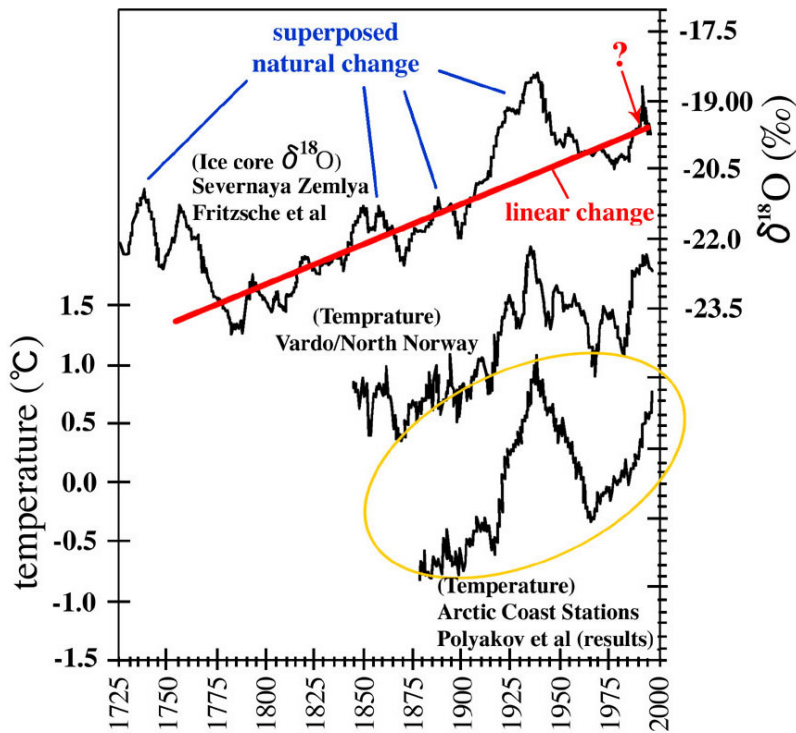
(Figure 3)
(J. Hansen)

Further, let us examine temperature changes during the last century. Figure 4 is similar to Figure 1, except it includes the Subarctic, and the zero line represents the average value of the last century. One can see that warming and cooling continuously occurred during the last century. Thus, it is not difficult to infer that the rise after 1970 is not entirely due to the manmade greenhouse effect.



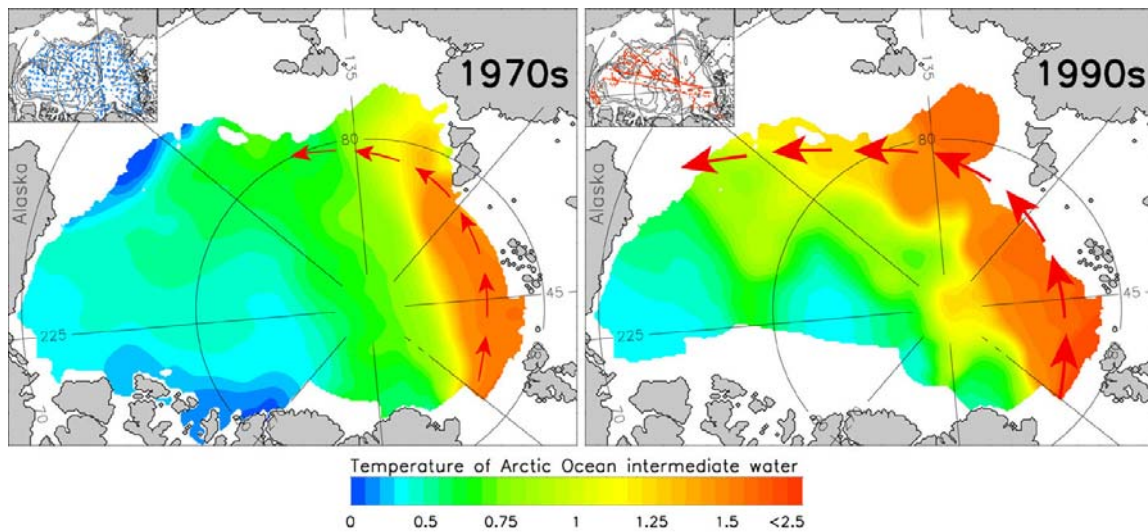
(Figure 4)
(ACIA Report)

Fortunately, we now have longer-period ice core data from an island in the Arctic Ocean. It is shown at the top of Figure 5. The bottom trace is the reproduction of Figure 1, and the middle one is the temperature record in northern Norway. All three traces show similar change from 1900. In addition, the ice core data show clearly that there are both linear and irregular changes from 1725, well before the effects of the Industrial Revolution became serious. Thus, it is clear that the last rise since 1970 is *not* entirely due to the greenhouse effect.



(Figure 5)
(D. Fritzsche, et al. and I. Polyakov)

It is likely that part of the rises and falls of temperature in 1920-1970 can be identified as what is called a “multi-decadal change.” One possible cause of this multi-decadal change is the changing intensity of the intruding warm North Atlantic water into the Arctic Ocean (Figure 6), which is associated with a natural phenomenon called the North Atlantic Oscillation (NAO). At the present, the warm water is flowing toward the Alaska coast. Studying and tracking this warm-water pulse, which may be a natural reason for some loss of sea ice, is one of the major projects of the International Arctic Research Center (IARC), conducted with the help of the Russian Icebreaker Kapitan Dranitsyn.

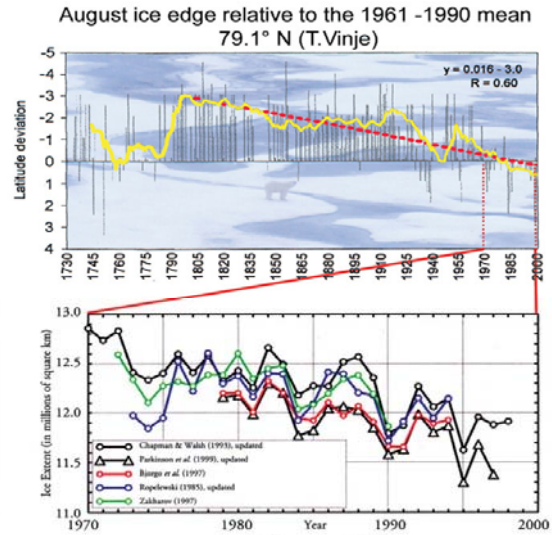


(Figure 6)
(I. Polyakov)

In recent years, there have been a large number of reports that both glaciers and sea ice in the Arctic Ocean have been receding. However, longer-term records show that such phenomena have been in progress continuously since 1800 or earlier (Figures 7a and 7b), and are not phenomena that began after 1970. Glaciers in the Glacier Bay National Park began to recede at least by the time Captain Vancouver passed by in 1794, and the ice edge in the Norwegian Sea began to recede in about 1800.



(Figure 7a)
(S.D. Wiley)



(Figure 7b)
(T. Vinje)

These data show clearly that it is dangerous to infer causes of climate change using only data that cover the last 40 years or so. In recent years, there have been a large number of excellent papers that describe arctic climate change since about 1970. This is because high quality satellite data became available only after 1970. Fortuitously, this period also coincides with the beginning of temperature rise during the last several decades. Thus, all such reports on scientific results are naturally related to the topic of rising temperatures.

Although I respect the authors of those papers, I cringe somewhat when the papers are consumed immediately by the media and then the public. Unfortunately, members of the press often champion these papers as showing examples of the greenhouse effect, which tends to sensationalize the results. Thus, the general public often interprets the results to mean that all climate change in the Arctic must be caused by the manmade greenhouse effect.

These scientific reports should be treated like any other scientific papers in professional journals. Any significant conclusions should be scrutinized by the scientific community before they become material for public consumption. This requires a certain period of time. Although I am happy to have the present great public interest in our research topic of global warming, such instant reporting of results for relatively short time periods can cause much confusion in the minds of the public. It is not as simple as stating that "warming melts ice."

Unfortunately, data gathering for periods before the 1970s is much more difficult and much more time consuming than obtaining satellite data. Today, many climatologists tend to avoid dealing with the topic of climate change before the 1970s. Further, those data may not be of the quality researchers desire, and some researchers tend to discredit results based on data before 1970, which is a good excuse to avoid longer-period data. Therefore, these days there are only a

handful of researchers who deal with climate changes over the last century in great detail. In fact, it is alarming that only a few researchers in the world are studying the sharp increase of temperature that occurred from about 1920 to 1940 and the sharp decrease that occurred from 1940 to 1970.

Our understanding of the change between 1920 and 1970 is crucial for interpreting the rapid rise from 1970 on and also for future predictions, because the change between 1920 and 1940 is most likely a natural one. If computer modeling were adjusted to reproduce the present rise, assuming that the present rise is due entirely to the greenhouse effect, its prediction for future years will not be accurate.

We tend to forget that some climatologists, who were studying the temperature decrease from 1940 to 1970, warned the public that a new Ice Age was just around the corner. Apparently, we have not learned the lesson of the "new Ice Age mistake": short-period data do not tell the whole story.

In conclusion, the nature of the climate change after 1970 should be a matter of great debate. It should not be assumed that this short period of warming is entirely due to the greenhouse effect caused by the actions of man. The prediction of future trends depends greatly on the understanding of the nature of the rise after 1970.

Thank you again for the opportunity to present this testimony today, and thank you for your interest in this important issue. Please feel free to contact me if you have any additional questions.

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