Climate4you update July 2009

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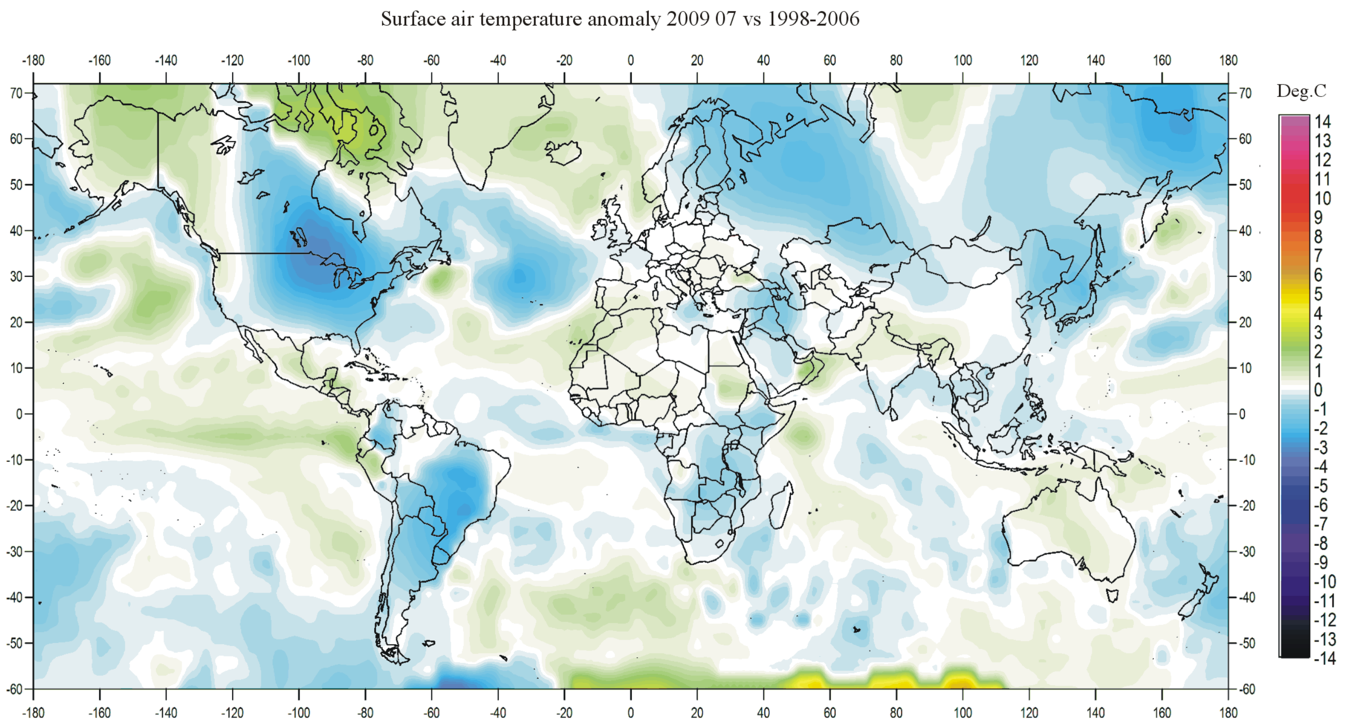
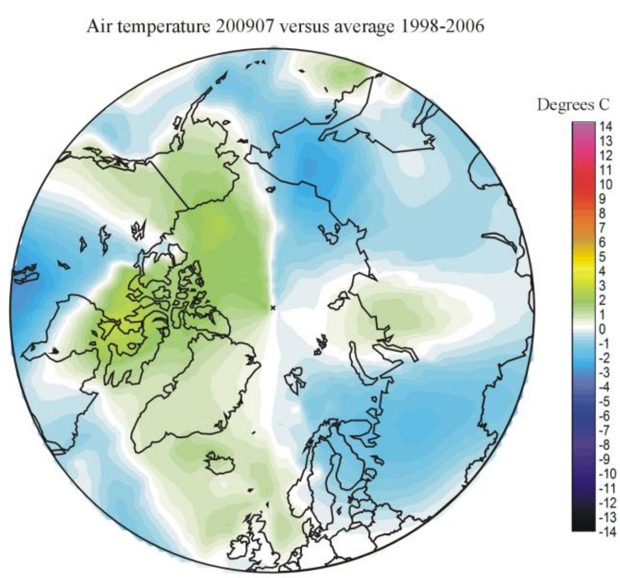
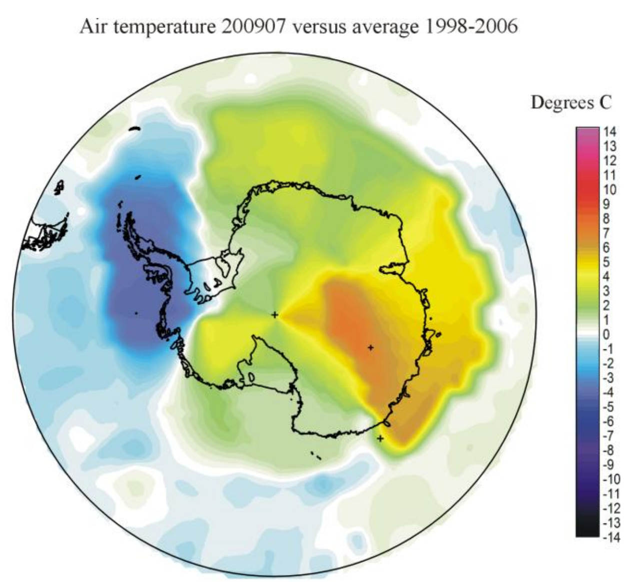
July 2009 global surface air temperature overview

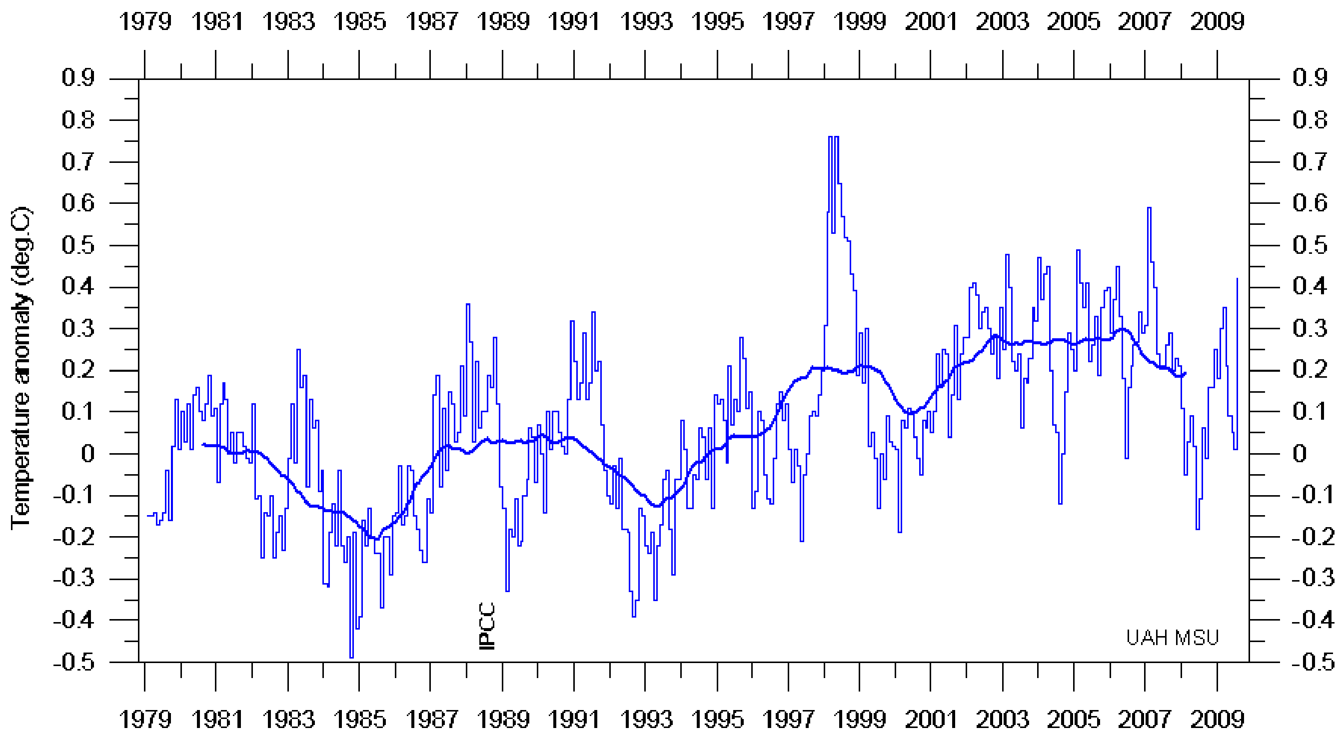




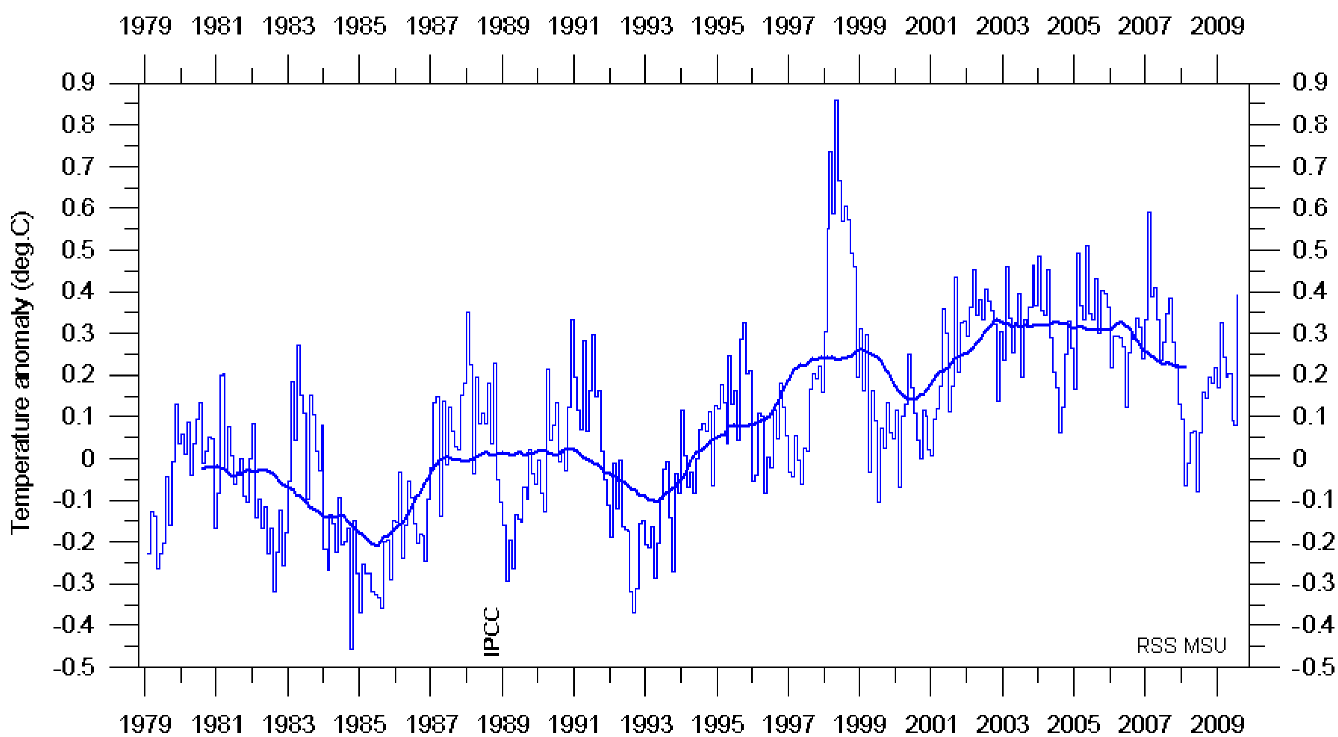


July 2009 surface air temperature compared to the average for July 1998-2006. Green.yellow-red colours indicate areas with higher temperature than the 1998-2006 average, while blue colours indicate lower than average temperatures. Data source: Goddard Institute for Space Studies (GISS)

Lower troposphere temperature from satellites, updated to July 2009

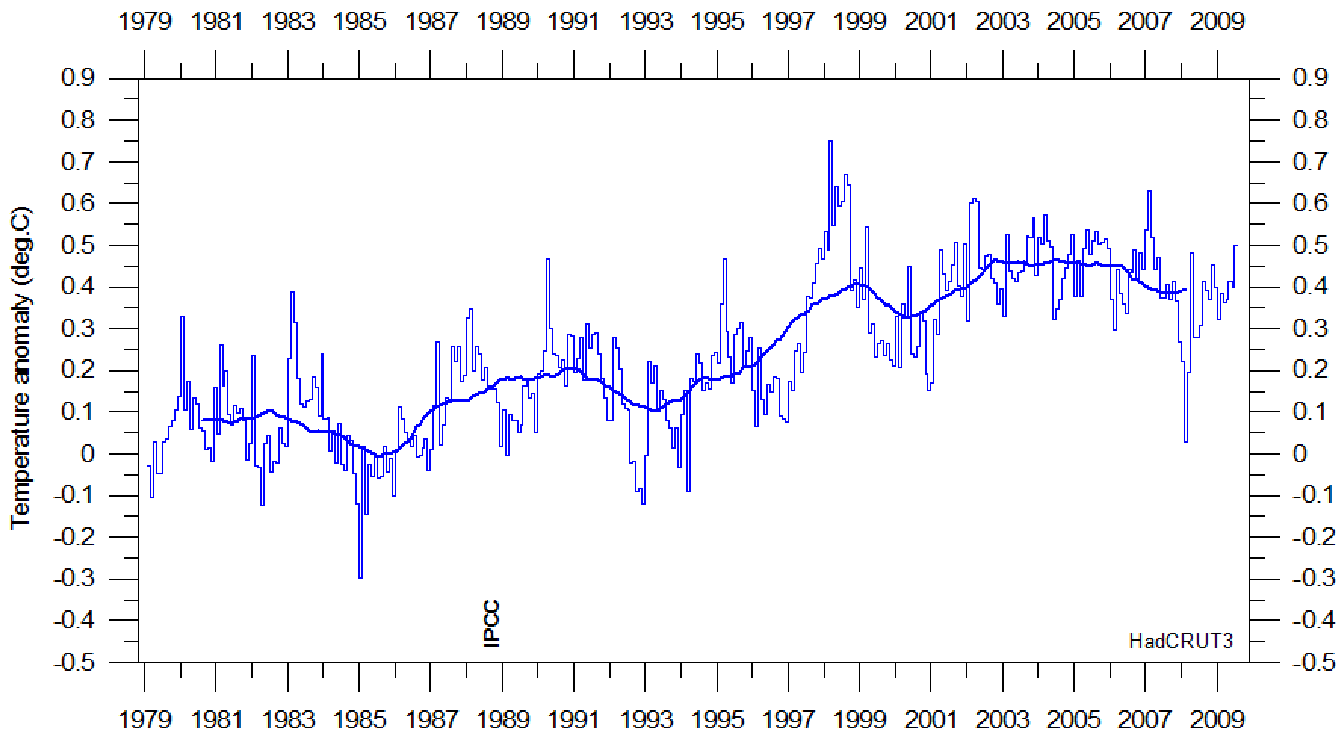


Global monthly average lower troposphere temperature (thin line) since 1979 according to University of Alabama at Huntsville, USA. The thick line is the simple running 37 month average.



Global monthly average lower troposphere temperature (thin line) since 1979 according to according to Remote Sensing Systems (RSS), USA. The thick line is the simple running 37 month average.

Global surface air temperature, updated to July 2009



Global monthly average surface air temperature (thin line) since 1979 according to according to the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK. The thick line is the simple running 37 month average.

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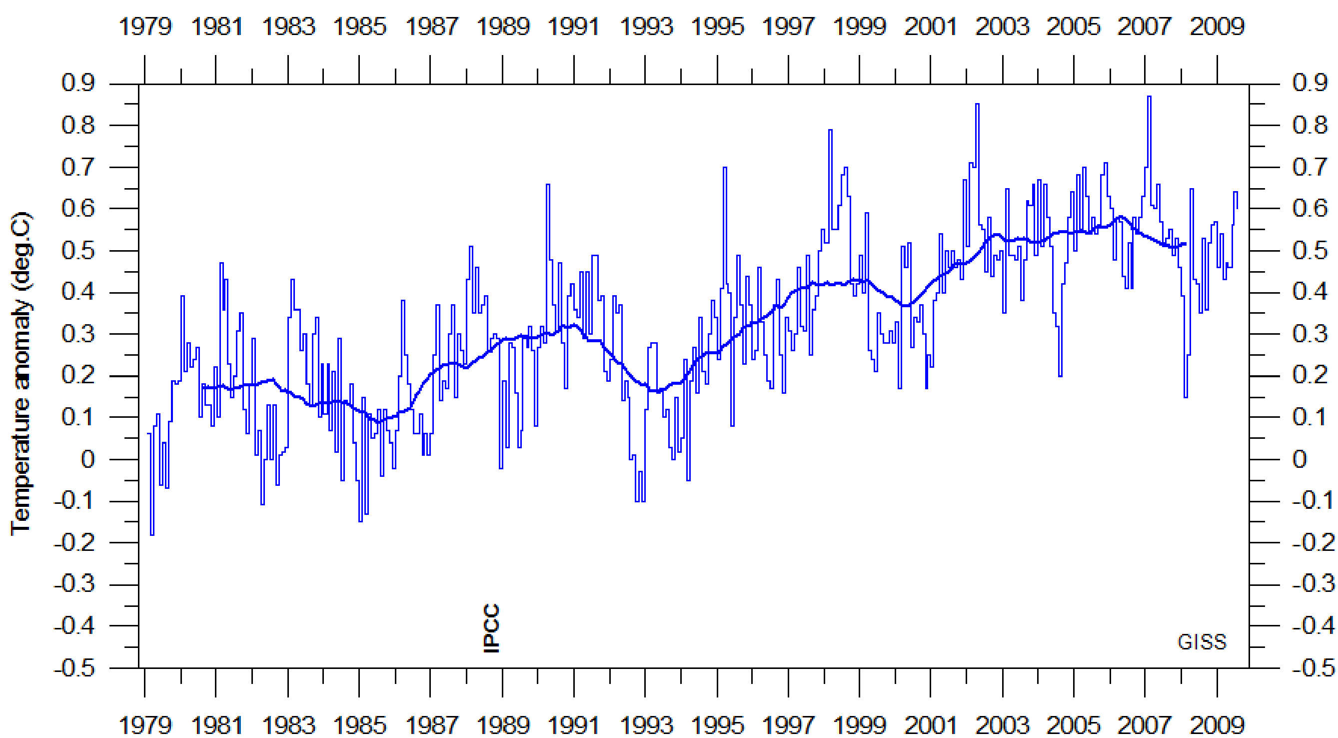
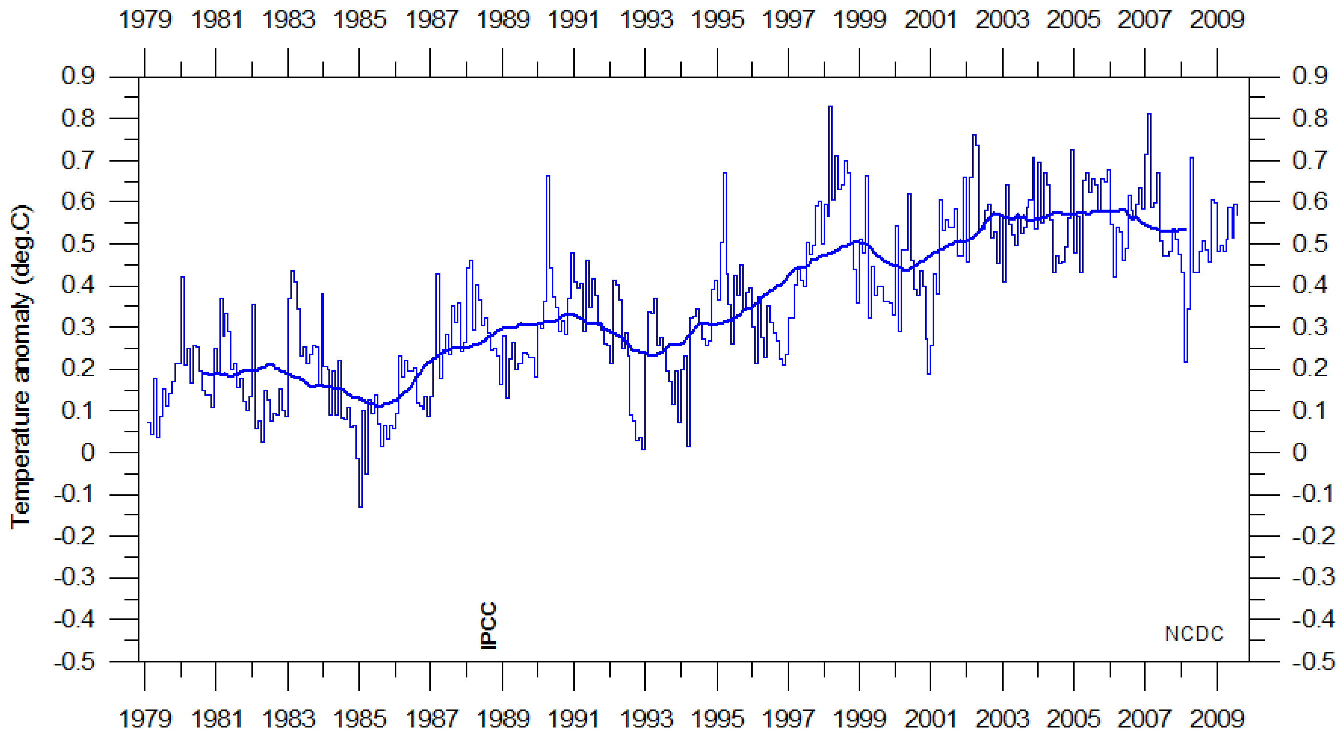
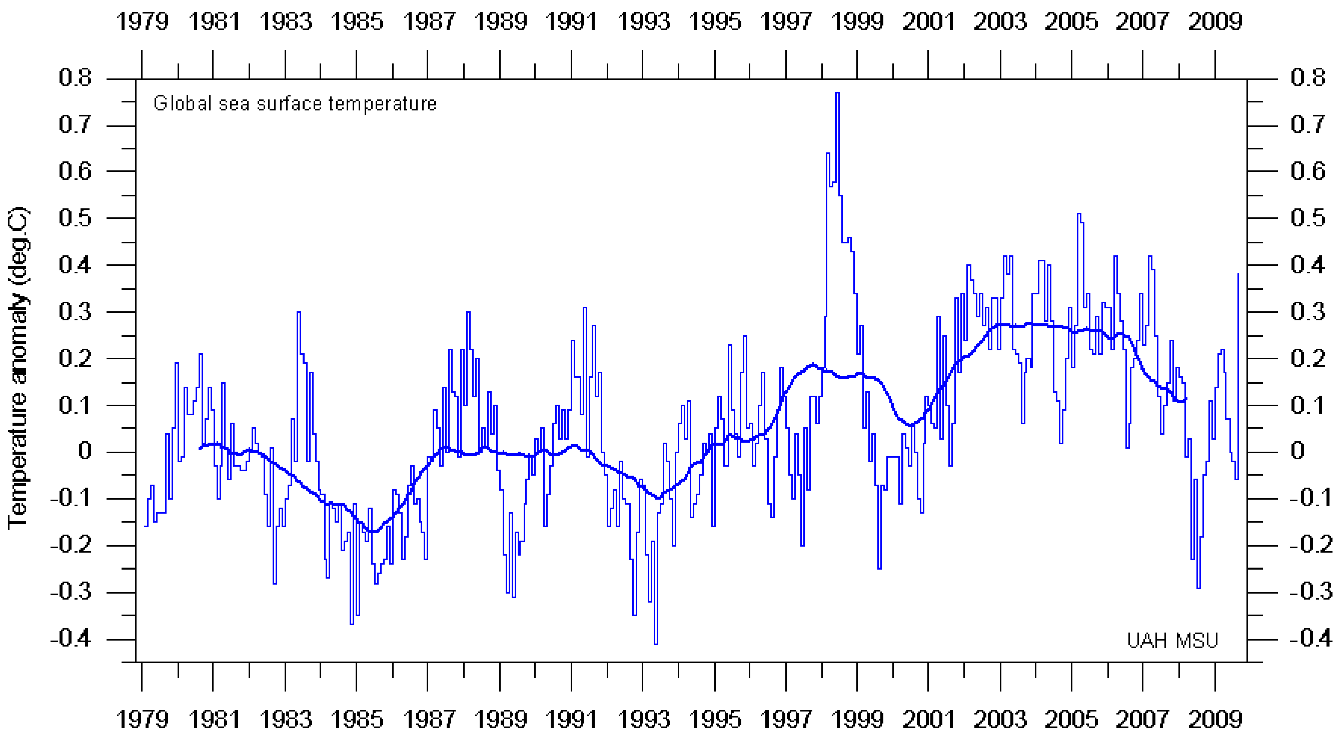


Global monthly average surface air temperature (thin line) since 1979 according to according to the Goddard Institute for Space Studies (GISS), at Columbia University, New York City, USA. The thick line is the simple running 37 month average.

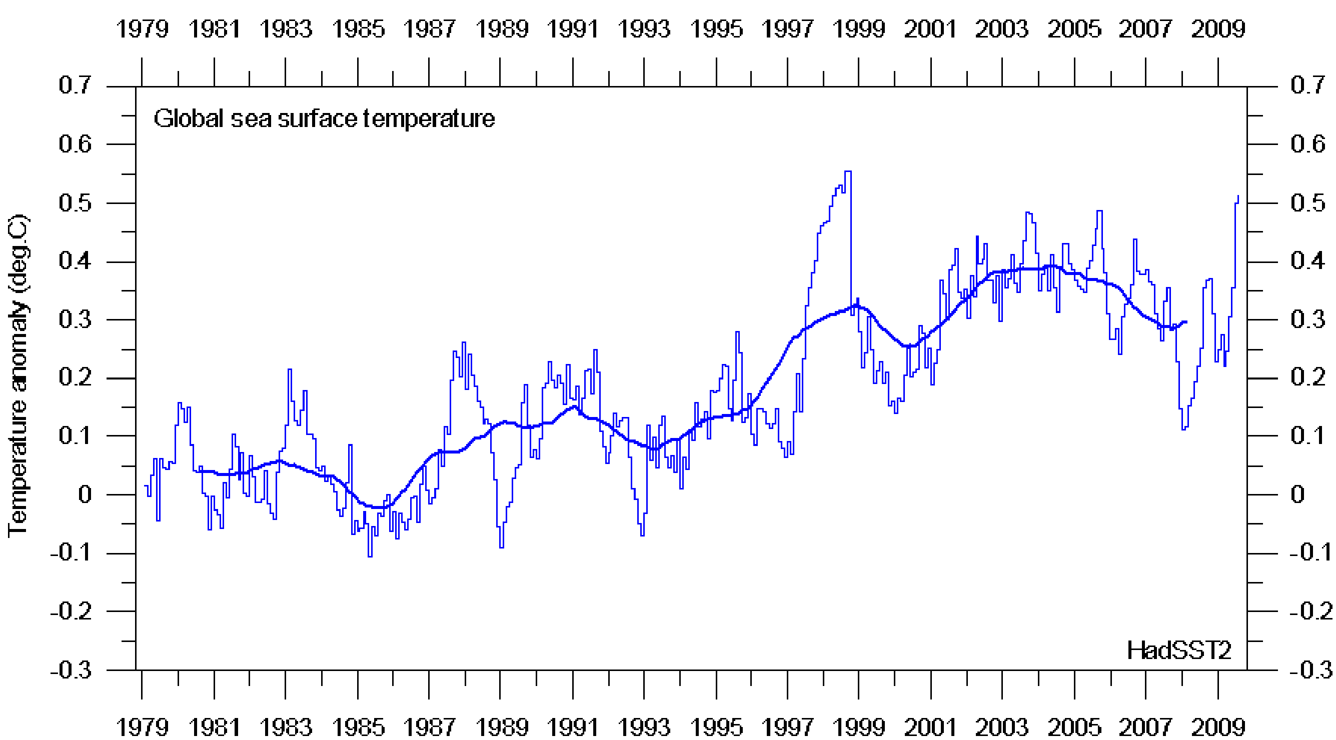


Global monthly average surface air temperature since 1979 according to according to the [National Climatic Data Center](#) (NCDC), USA. The thick line is the simple running 37 month average

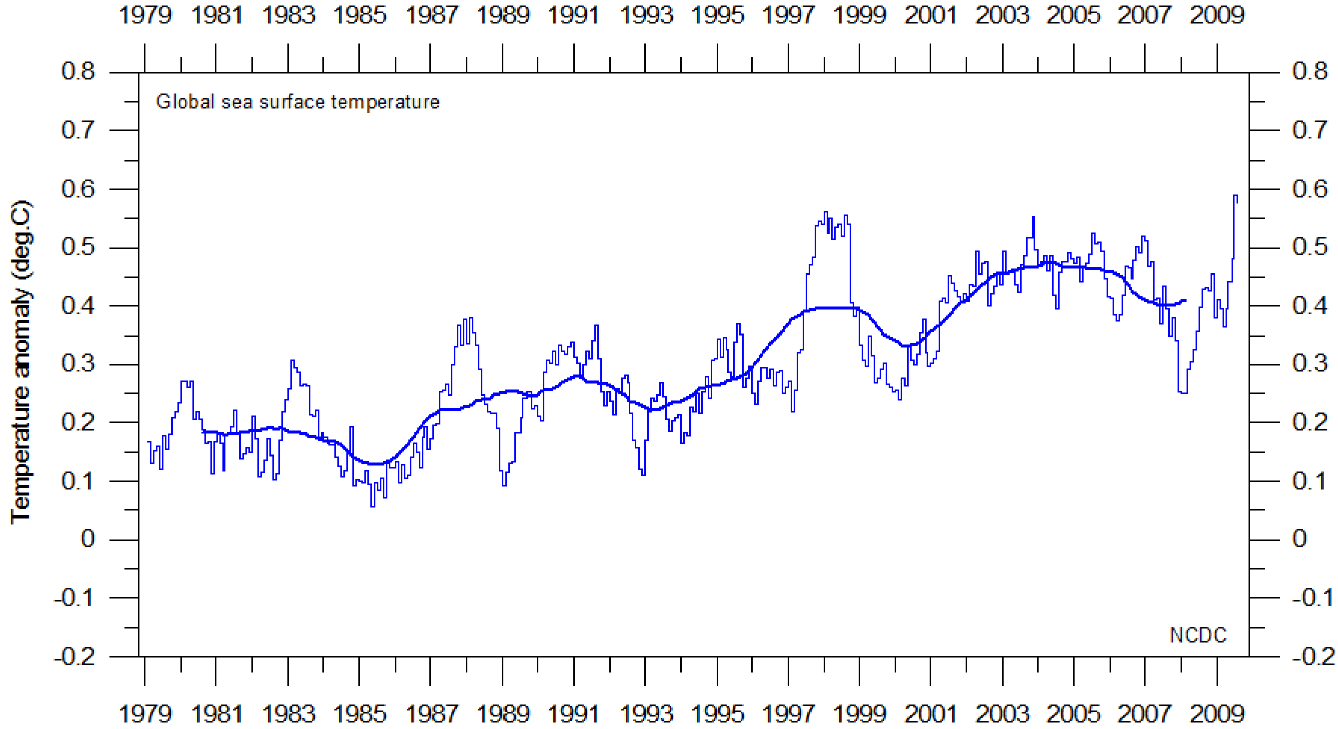
Global sea surface temperature, updated to July 2009



Global monthly average lower troposphere temperature over oceans (thin line) since 1979 according to University of Alabama at Huntsville, USA. The thick line is the simple running 37 month average.

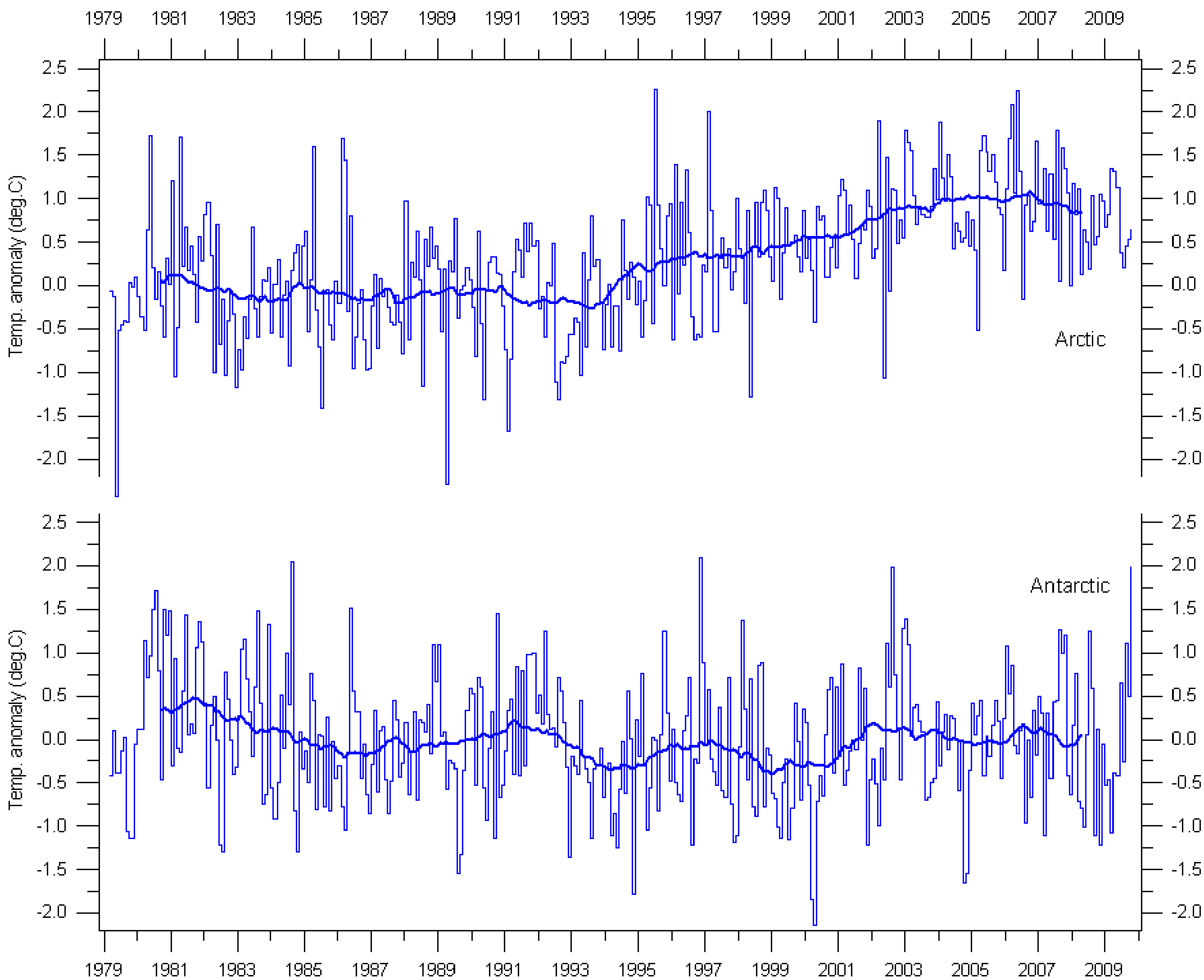


Global monthly average sea surface temperature since 1979 according to University of East Anglia's Climatic Research Unit (CRU), UK. Base period: 1961-1990. The thick line is the simple running 37 month average. Updated to May 2009 only.



Global monthly average sea surface temperature since 1979 according to the [National Climatic Data Center](#) (NCDC), USA. Base period: 1901-2000. The thick line is the simple running 37 month average.

Arctic and Antarctic lower troposphere temperature, updated to July 2009



Global monthly average lower troposphere temperature since 1979 for the North Pole and South Pole regions, based on satellite observations (University of Alabama at Huntsville, USA). The thick line is the simple running 37 month average, nearly corresponding to a running 3 yr average.

Arctic and Antarctic surface air temperature, updated to July 2009

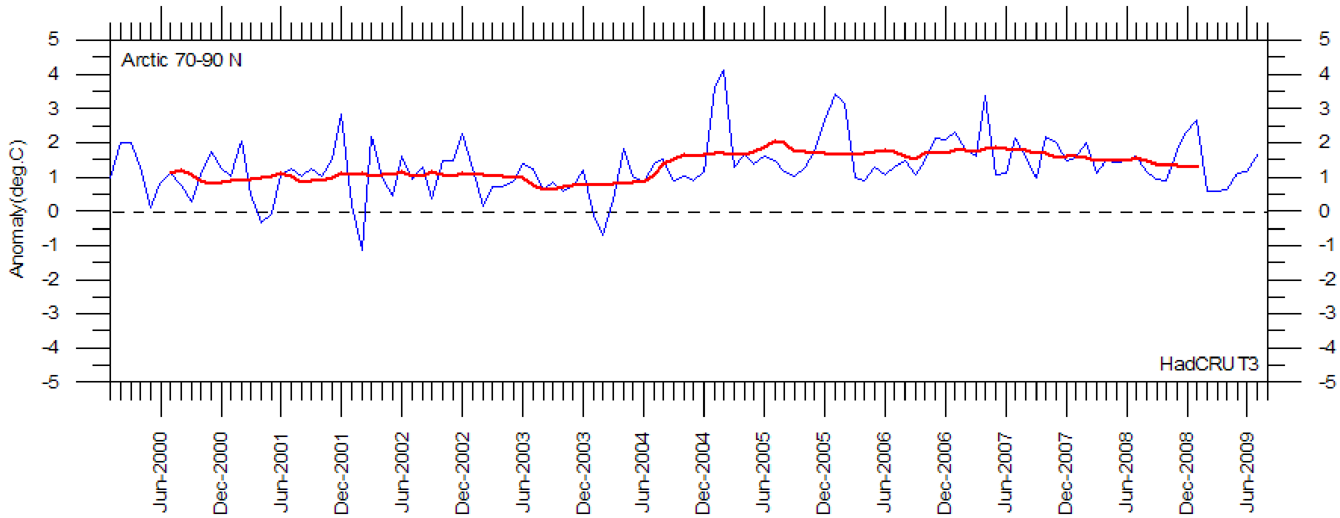


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK.

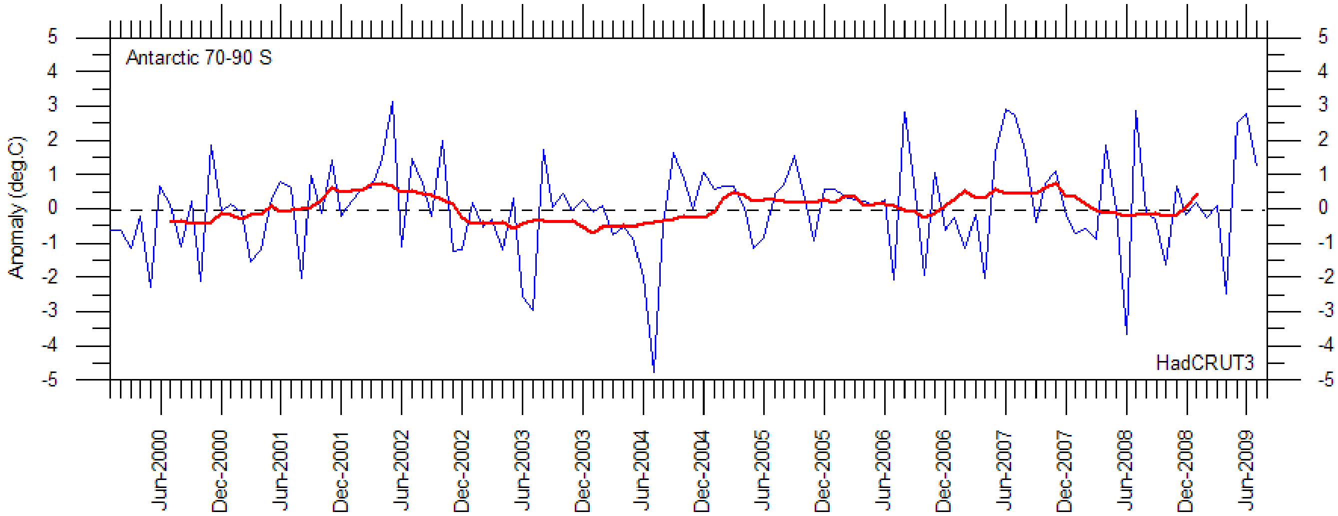


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK.

In general, the Arctic temperature record appears to be less variable than the contemporary Antarctic record, presumably at least partly due to the higher number of meteorological stations north of 70°N, compared to the number of stations south of 70°S.

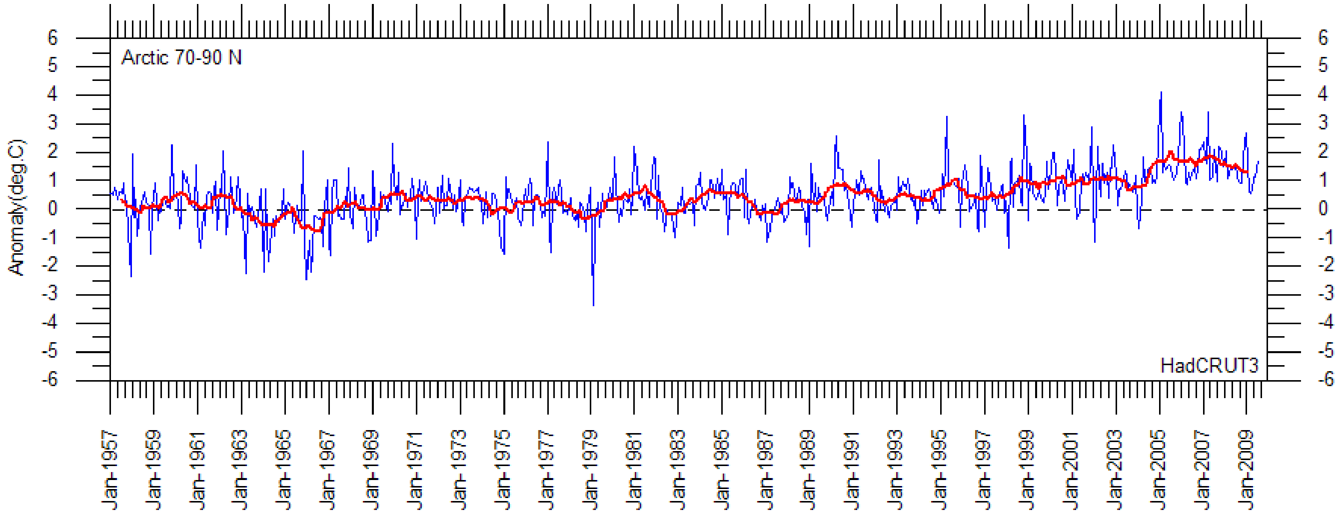


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 has been chosen as starting year, to ensure easy comparison with the maximum length of the realistic Antarctic temperature record shown below. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK.

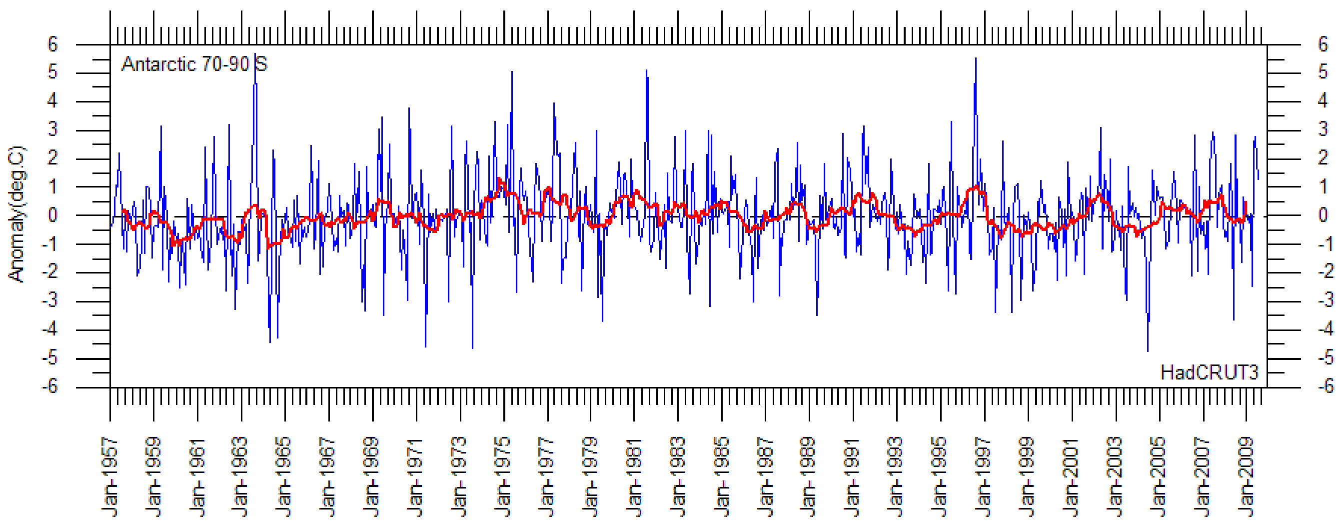


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 was an international geophysical year, and several meteorological stations were established in the Antarctic because of this. Before 1957, the meteorological coverage of the Antarctic continent is poor. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK.

In general, the Arctic temperature record appears to be less variable than the contemporary Antarctic record, presumably at least partly due to the higher number of meteorological stations north of 70°N, compared to the number of stations south of 70°S.

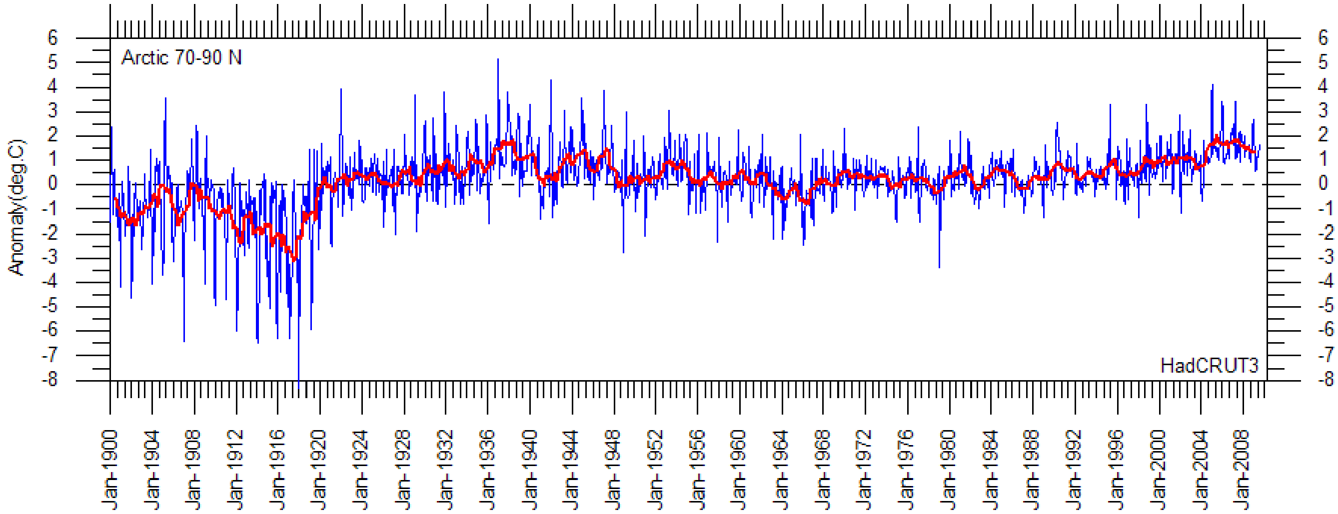
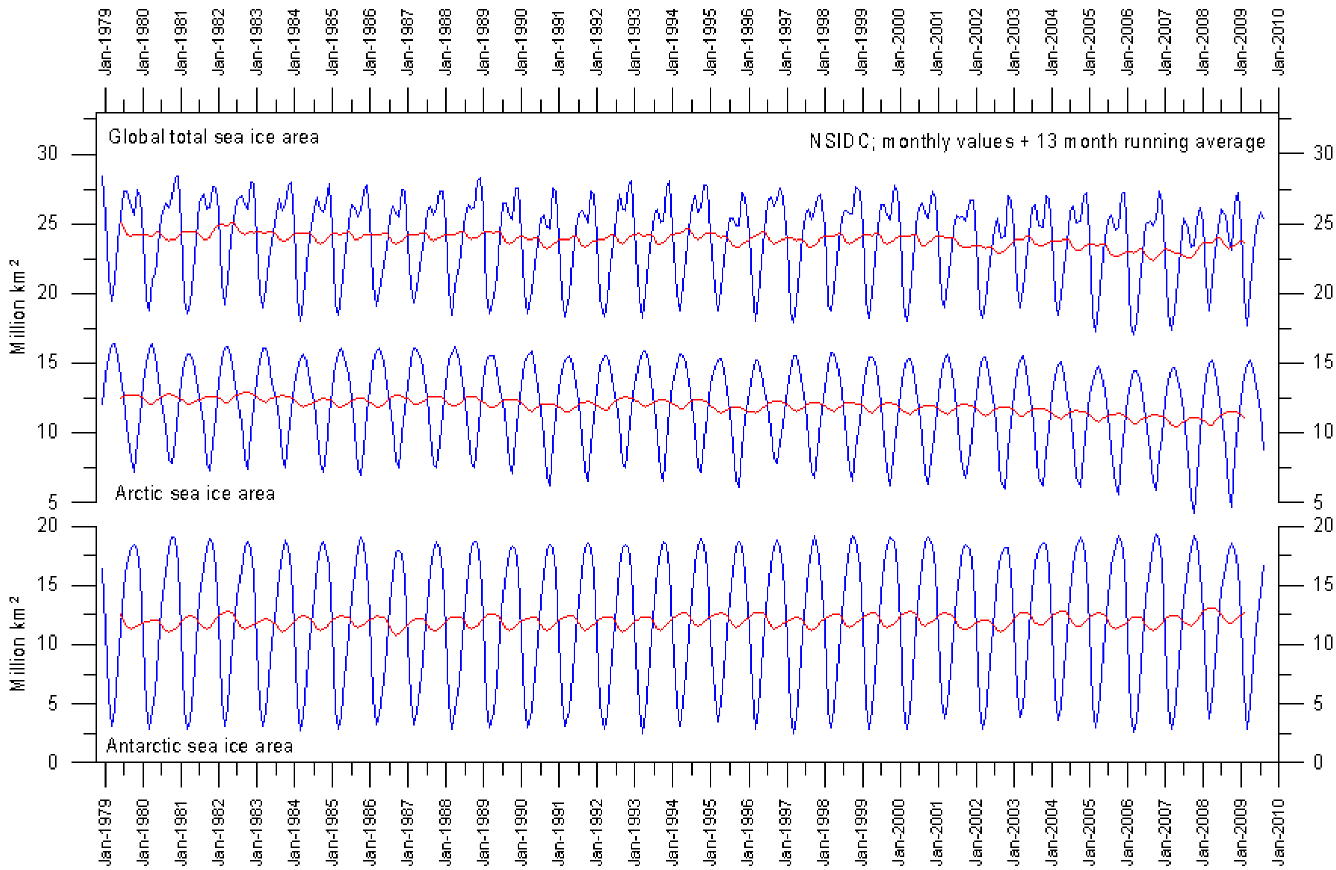
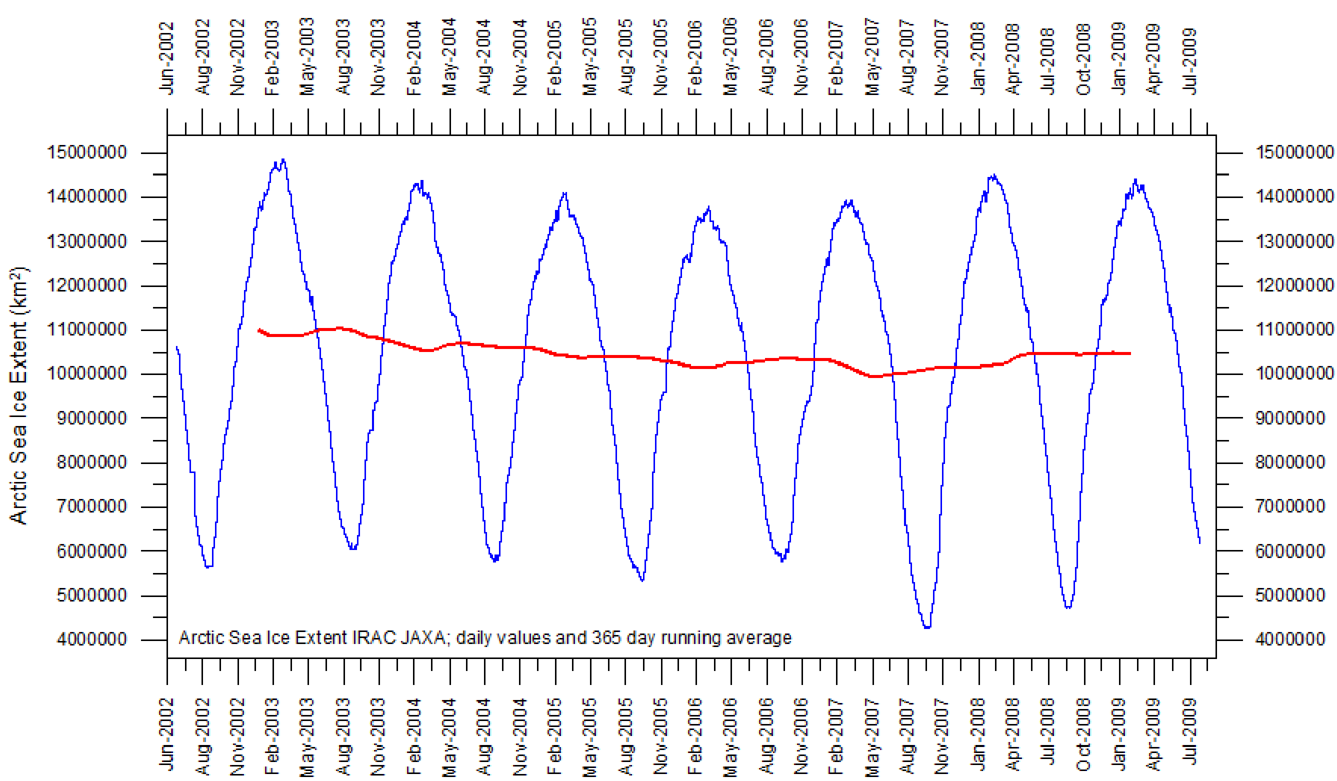


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1900, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. In general, the range of monthly temperature variations decreases throughout the first 30-50 years of the record, reflecting the increasing number of meteorological stations north of 70°N over time. Especially the period from about 1930 saw the establishment of many new Arctic meteorological stations, first in Russia and Siberia, and following the 2nd World War, also in North America. Because of the relatively small number of stations before 1930, details in the early part of the Arctic temperature record should not be over interpreted. The rapid Arctic warming around 1920 is, however, clearly visible, and is also documented by other sources of information. The period since 2000 is warm, about as warm as the period 1930-1940. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK.

Arctic and Antarctic sea ice, updated to July 2009

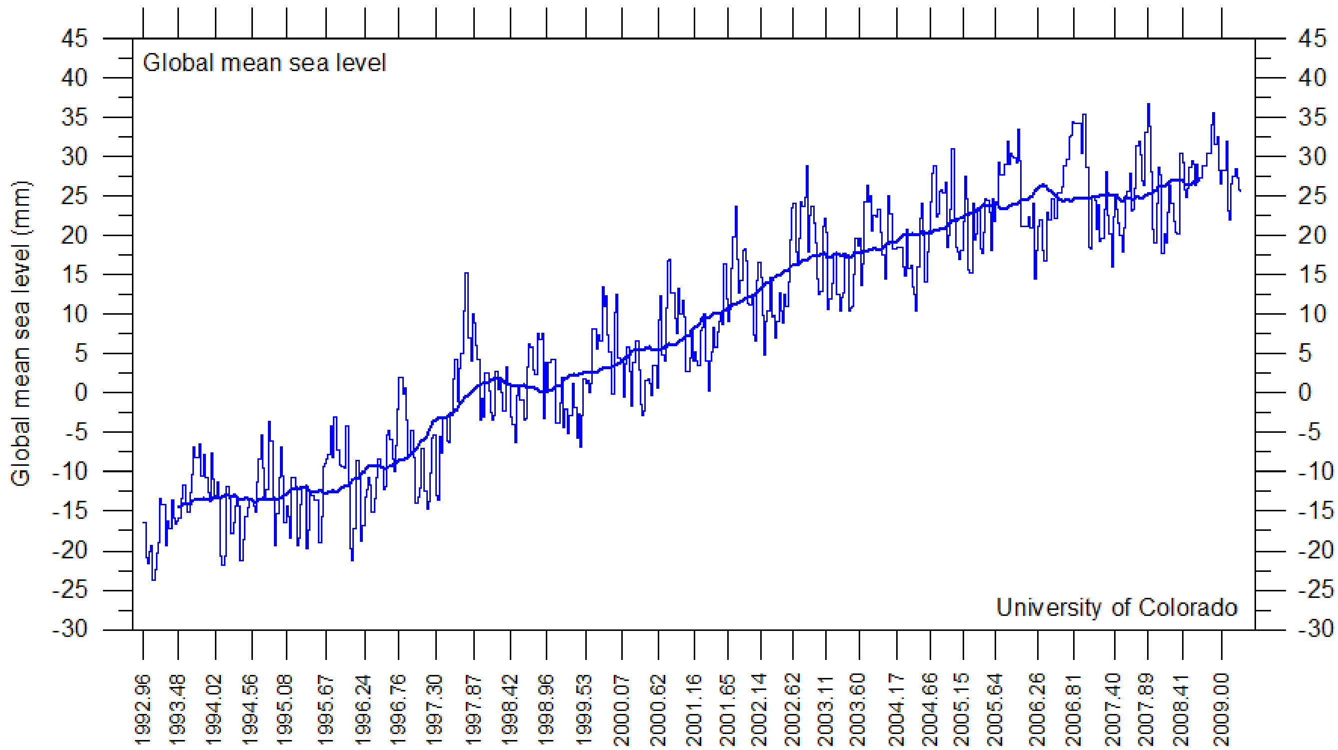


Graphs showing monthly Antarctic, Arctic and global sea ice extent since November 1978, according to the National Snow and Ice data Center (NSIDC).

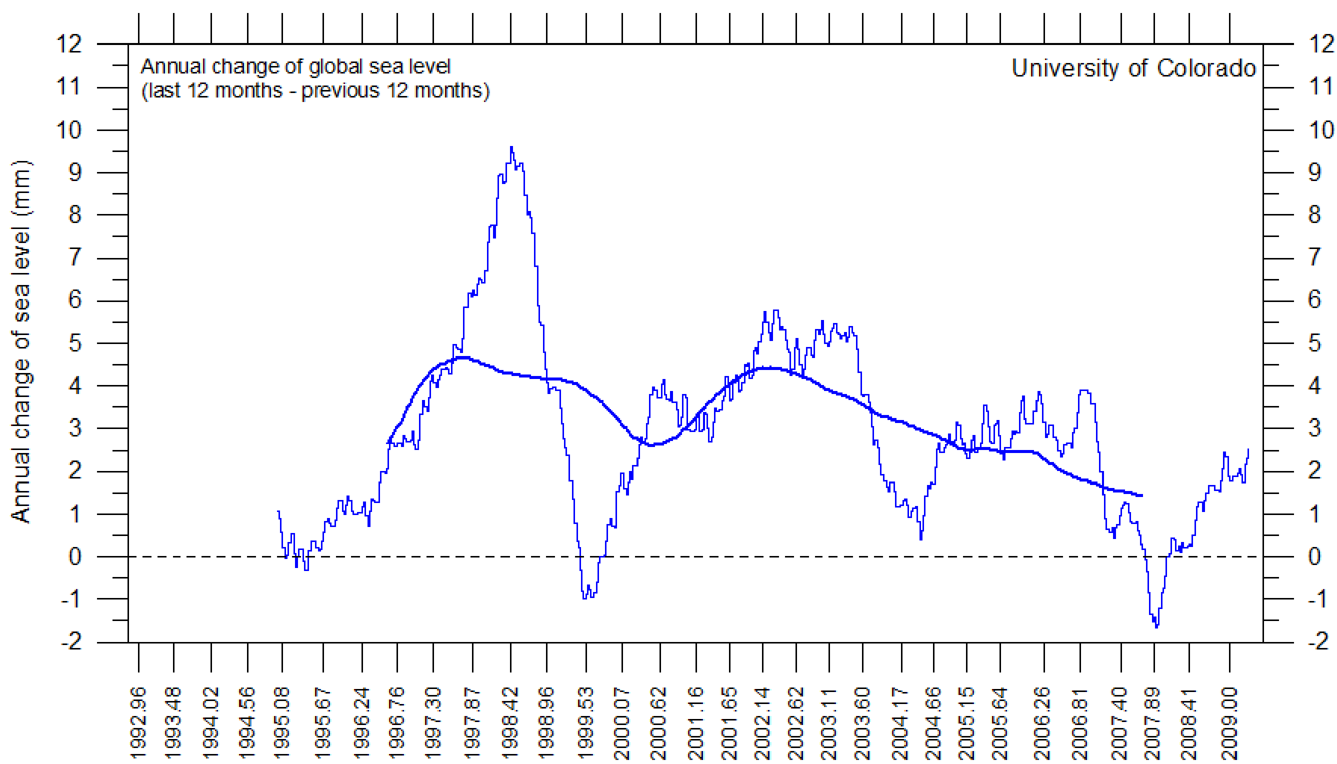


Graph showing daily Arctic sea ice extent since June 2002, by courtesy of Japan Aerospace Exploration Agency (JAXA).

Global sea level, updated July 2009

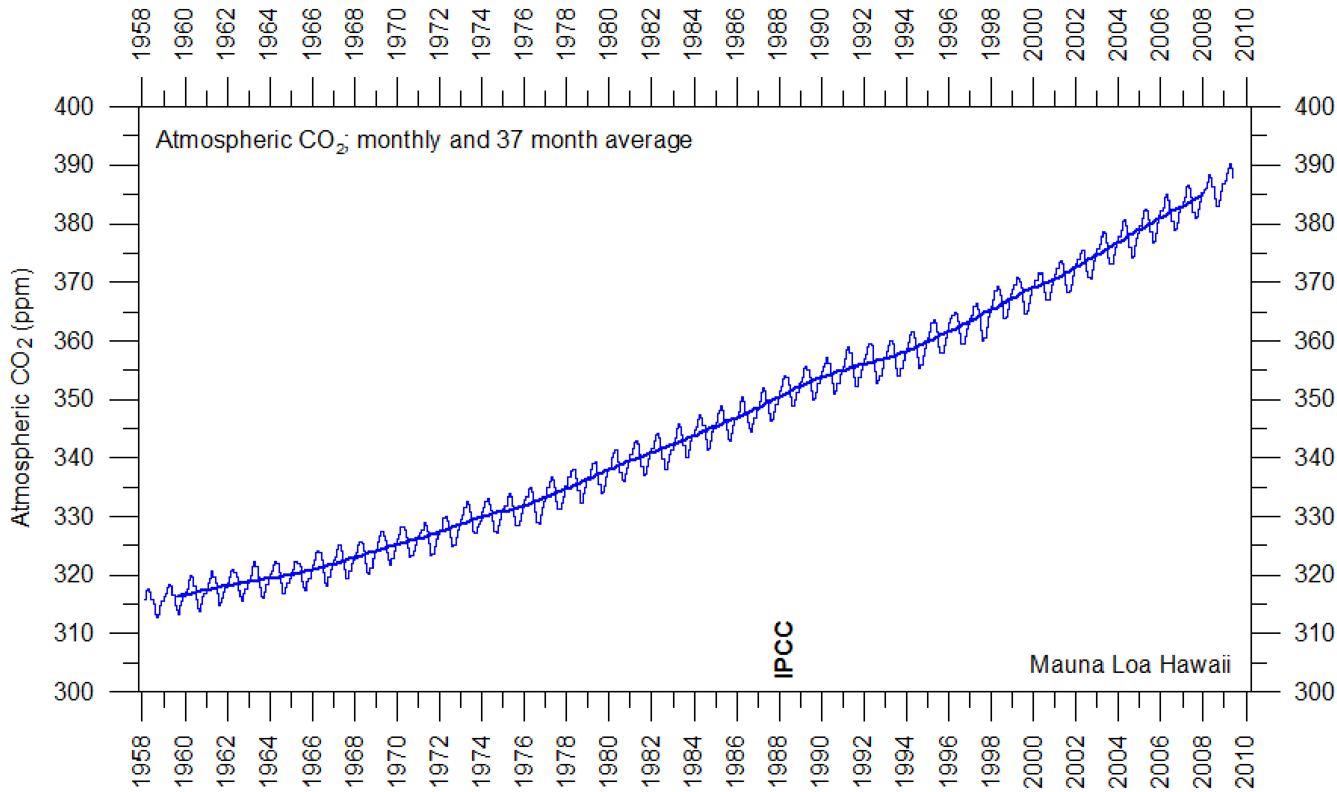


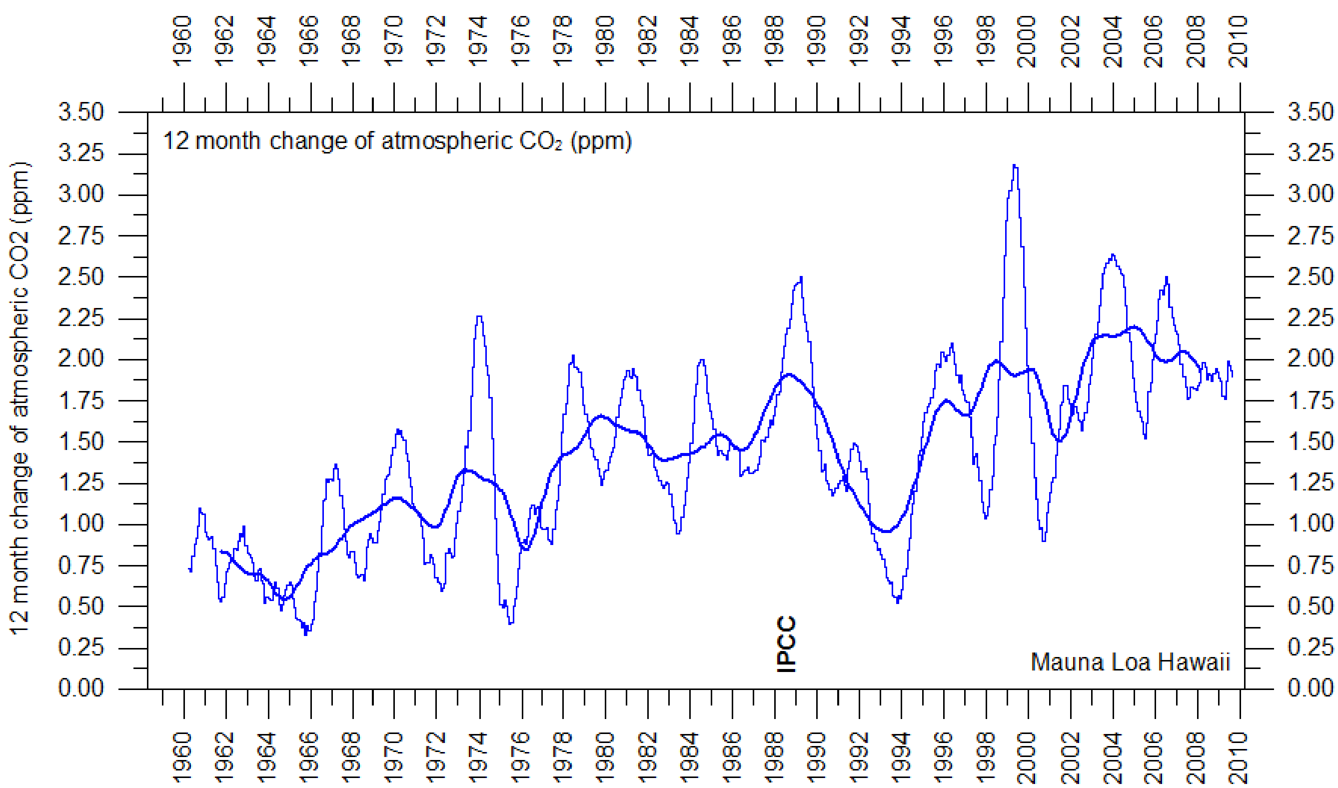
Globa lmonthly sea level since late 1992 according to the Colorado Center for Astrodynamics Research at [*University of Colorado at Boulder*]*, USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.*



Annual change of global sea level since late 1992 according to the Colorado Center for Astrodynamics Research at [*University of Colorado at Boulder*]*, USA. The thick line is the simple running 3 yr average.*

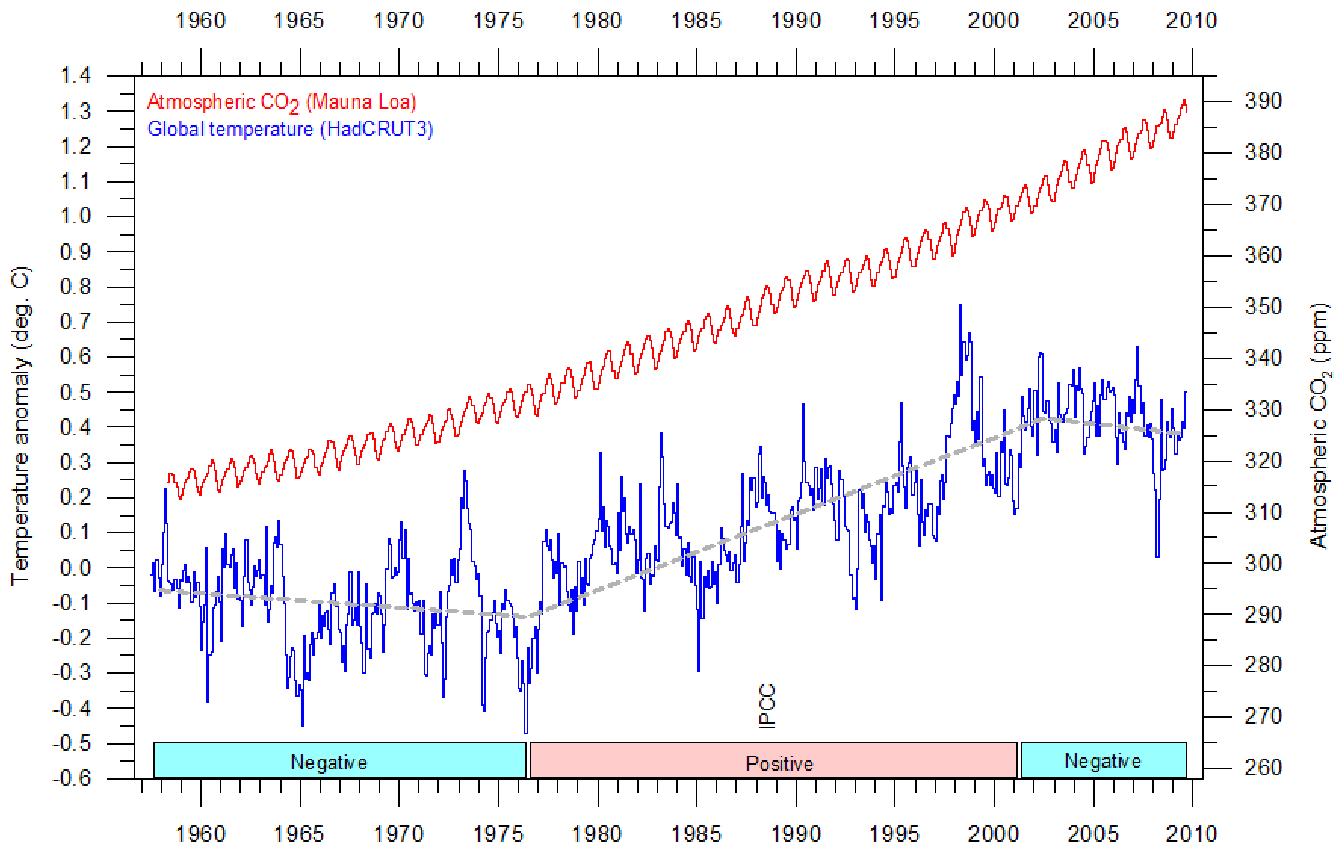
Atmospheric CO_2, updated to July 2009

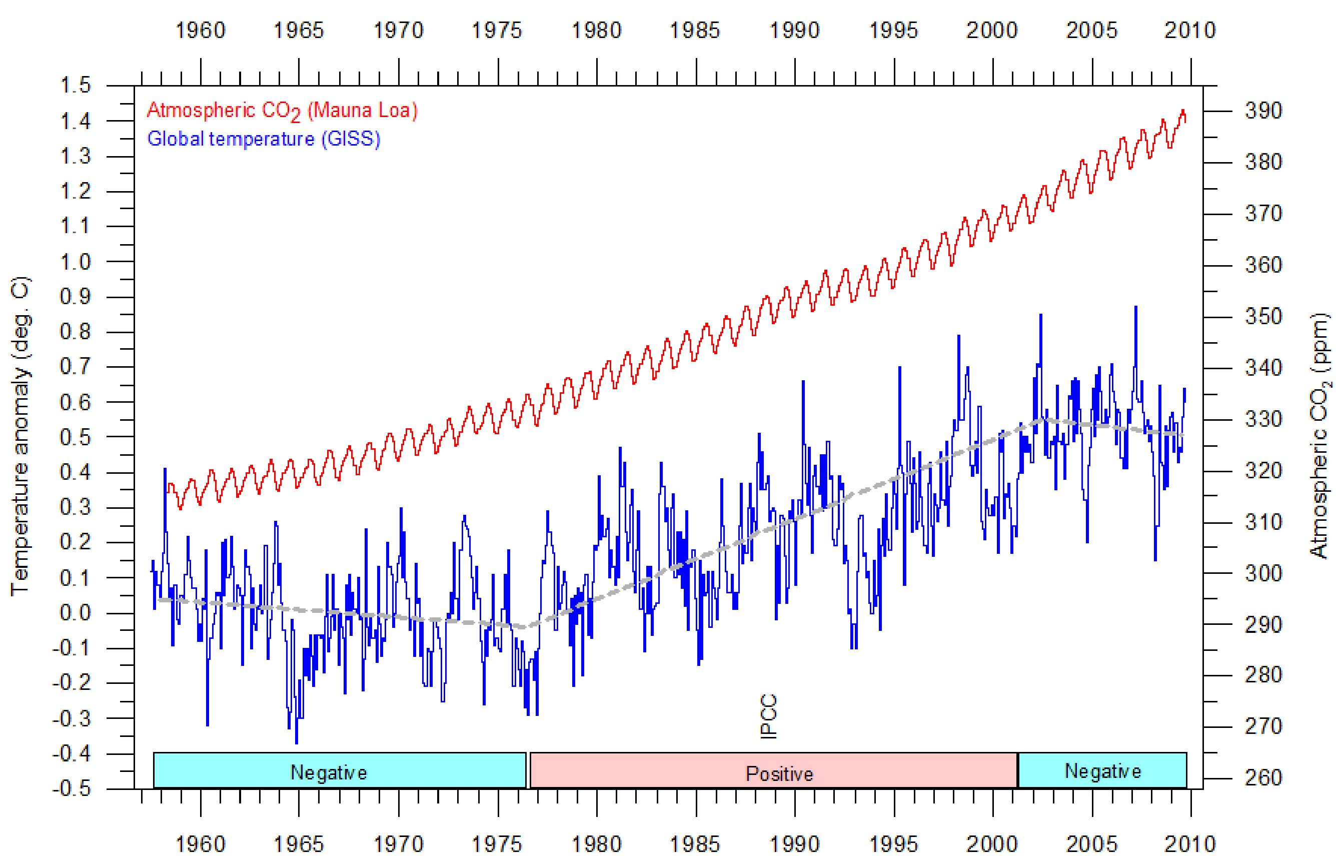


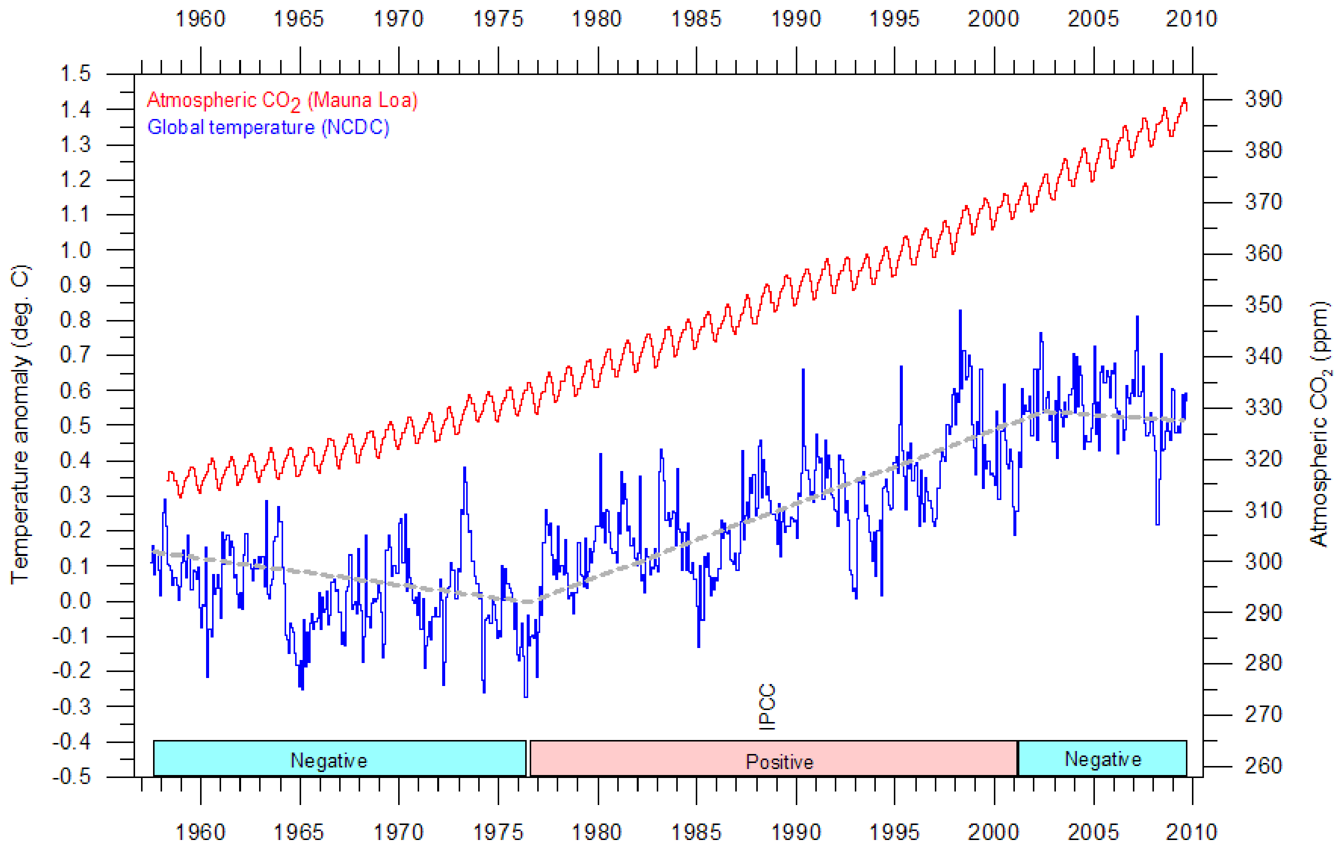


Monthly amount of atmospheric CO_2 (above) and annual growth rate (below; average last 12 months minus average preceding 12 months) of atmospheric CO_2 since 1959, according to data provided by the [Mauna Loa Observatory](), Hawaii, USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.

Global surface air temperature and atmospheric CO_2, updated to July 2009







Diagrams showing HadCRUT3, GISS, and NCDC monthly global surface air temperature estimates (blue) and the monthly atmospheric CO_2 content (red) according to the Mauna Loa Observatory, Hawaii. The Mauna Loa data series begins in March 1958, and 1958 has therefore been chosen as starting year for the diagrams. Reconstructions of past atmospheric CO_2 concentrations (before 1958) are not incorporated in this diagram, as such past CO_2 values are derived by other means (ice cores, stomata, or older measurements using different methodology, and therefore are not directly comparable with modern atmospheric measurements. The dotted grey line indicates the approximate linear temperature trend, and the boxes in the lower part of the diagram indicate the relation between atmospheric CO_2 and global surface air temperature, negative or positive

Most climate models assume the greenhouse gas carbon dioxide CO_2 to influence significantly upon global temperature. Thus, it is relevant to compare the different global temperature records with measurements of atmospheric CO_2, as shown in the diagrams above. Any comparison, however, should not be made on a monthly or annual basis, but for a longer time period, as other effects (oceanographic, clouds, etc.) may well override the potential influence of CO_2 on short time scales such as just a few years.

It is of cause equally inappropriate to present new meteorological record values, whether daily, monthly or annual, as support for the hypothesis ascribing high importance of atmospheric CO_2 for global temperatures. Any such short-period meteorological record value may well be the result of other phenomena than atmospheric CO_2.

What exactly defines the critical length of a relevant time period to consider for evaluating the alleged high importance of CO_2 remains elusive, and is still a topic for debate. The critical period length must, however, be inversely proportional to the importance of CO_2 on the global temperature, including feedback effects, such as assumed by most climate models.

After about 10 years of global temperature increase, IPCC was established in 1988. Presumably, several scientists interested in climate then felt intuitively that their empirical and theoretical understanding of climate dynamics was sufficient to conclude about the importance of CO2 for global temperature. However, for obtaining public and political support for the CO_2-hyphotesis the 10 year warming period leading up to 1988 in all likelihood was important. Had the global temperature instead been decreasing, public support for the hypothesis would have been difficult to obtain. Adopting this approach as to critical time length, the varying relation (positive or negative) between global temperature and atmospheric CO_2 has been indicated in the lower panels of the three diagrams above.

Climate and history; one example among many

1967: Cod fishing at Greenland begins to decline in concert with sea temperatures

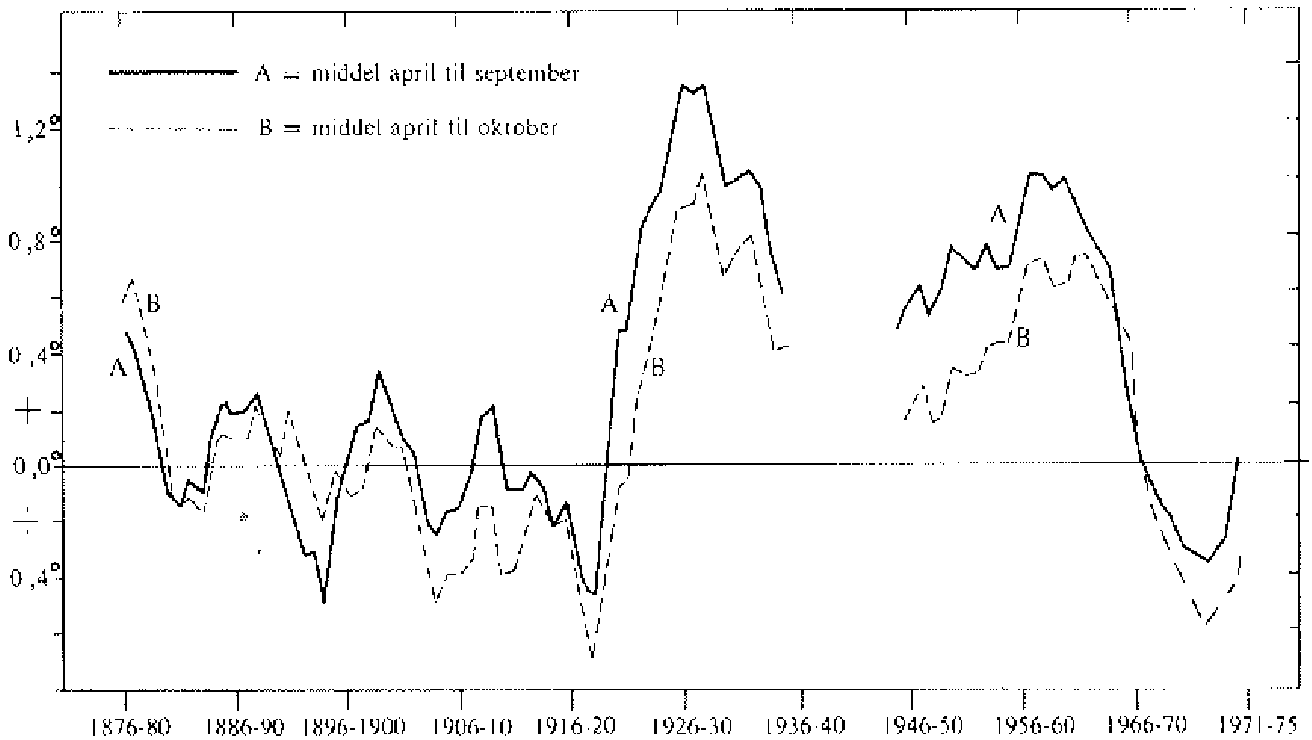


Diagram showing sea surface temperatures (degrees Centigrade) along the west coast of southern Greenland (Figure 6 A in Balslev Smidt, 1989). The simple 5-yr average is plotted. The solid line shows the average temperature April – September, while the dotted line shows the average temperature April – October. Temperatures are shown as deviations (anomalies) from the average temperature during the relatively cold reference period 1876-1915.

Balslev Smidt (1989) discusses the development of fishing in the Greenlandic waters. He especially addresses the fishing for cods, which began shortly after 1920, following the early 20th century increase of both air- and sea temperatures around 1920 in the Arctic. Previously, cod only was caught in Greenlandic waters in two short periods, around 1820 and 1845-1850. Since 1920, the total annual fishing for cod in Greenland varied in concert with sea surface temperatures, with high temperatures being associated with high numbers for the total catch.

Balslev Smidt (1989) especially draws attention to the period 1920-1968, where sea temperatures beyond southern West Greenland were relatively high (see diagram above), and the simultaneous increase of cod fishing in the same region (diagram below), as well as retreating glaciers. In 1962 a total of about 450,000 tonnes of cod were caught in the sea west of southern Greenland . Of this, only between20,000 and 30,000 tonnes were taken by Greenland vessels, and subsequently landed in Greenland (Balslev Smidt, 1989).

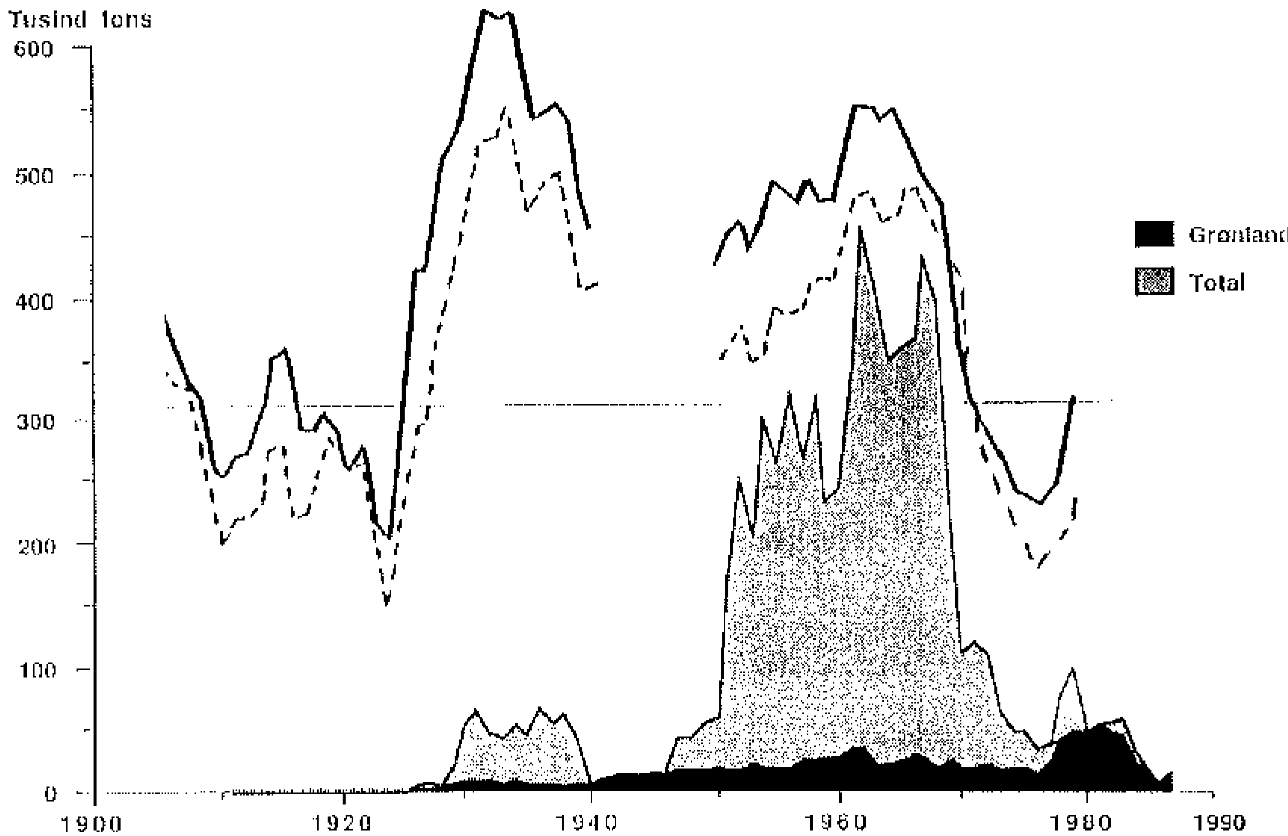


Diagram showing sea surface temperatures (degrees Centigrade) and tonnes of cod caught along the west coast of southern Greenland (Figure 6 B in Balslev Smidt, 1989). The simple 5-yr average is plotted for temperatures (see diagram above). The shaded part of the diagram show the total (grey) and the Greenlandic (black) catch, respectively. The left scale show the catch in 1000 tonnes. During the 2nd World war no international fishing took place along West Greenland , and all cods caught was landed by Greenland vessels.

The thorough modernisation of the Greenlandic society, which took place between 1970 and 1985 (Balslev Smidt, 1989), included the building of several large trawlers designed for cod fishing. Based upon the development since 1930, and especially since 1950 (see diagram above), cod fishing was assumed to represent a major source of income for the Greenlandic society in the years to come. Decreasing sea temperatures from about 1967, however, contributed to the following collapse of this industry in Greenland, and a major and costly change towards fishing for shrimps instead had to be introduced.

References

Balslev Smidt, E.L. 1989. Min tid i Grønland – Grønland i min tid. Fiskeri Biologi Samfund 1948-1985. Nyt Nordisk Forlag Arnold Busck, Copenhagen, 214 pp.

All above diagrams with supplementary information (including links to data sources) are available on www.climate4you.com

Yours sincerely, Ole Humlum (Ole.Humlum@geo.uio.no)

23 August 2009.