Climate4you update May 2010

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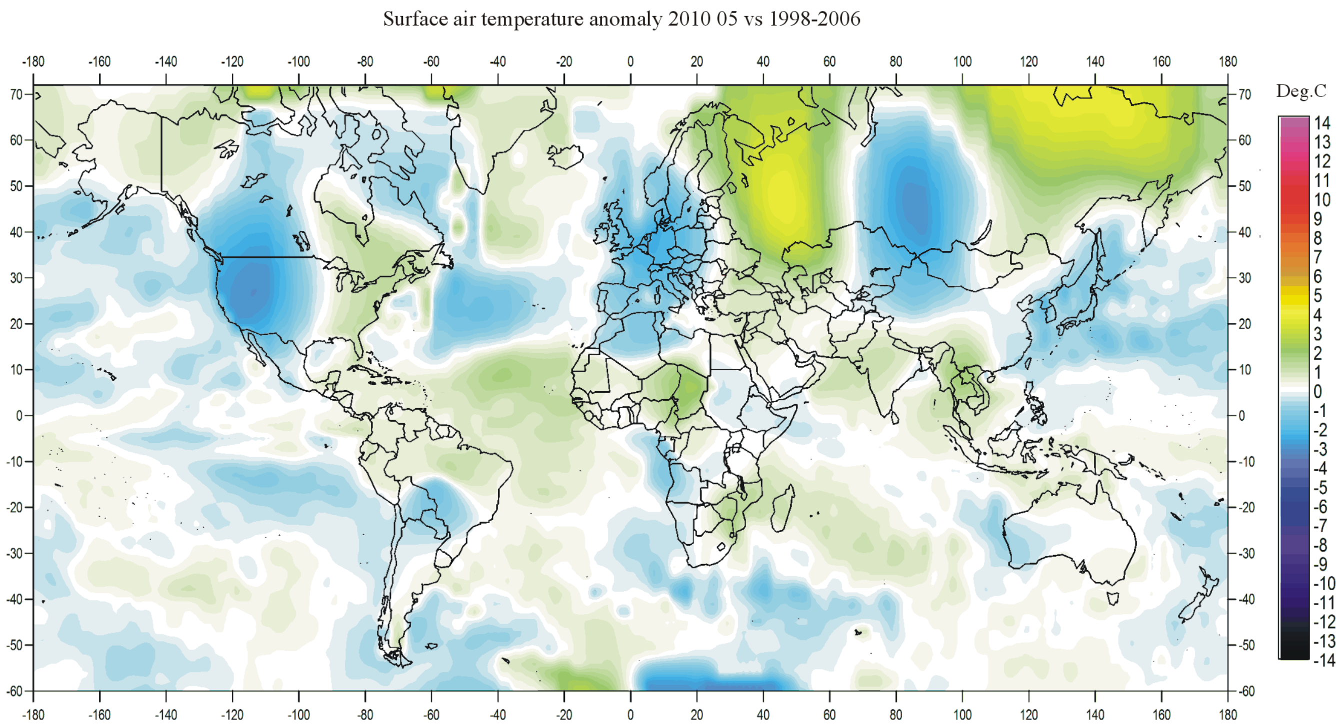
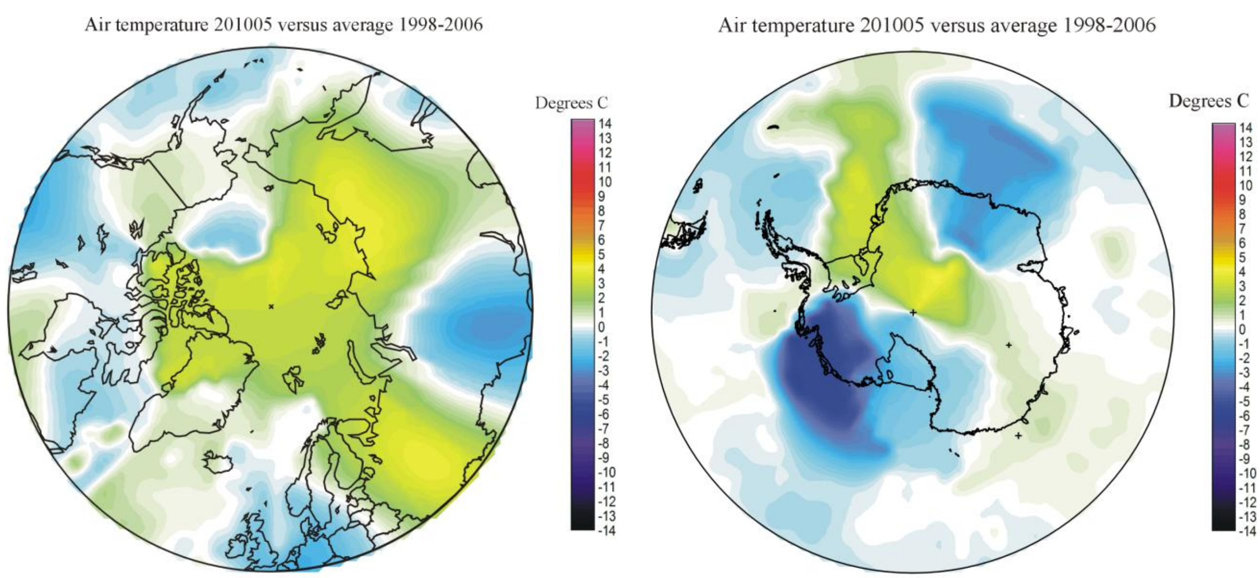
May 2010 global surface air temperature overview





May 2010 surface air temperature compared to the average for May 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)

Comments to the May 2010 global surface air temperature overview

This newsletter contains graphs showing a selection of key meteorological variables for May 2010. All temperatures are given in degrees Celsius.

In the above maps showing the geographical pattern of surface air temperatures, the period 1998-2006 is used as reference period. The reason for comparing with this recent period instead of the official WMO 'normal' period 1961-1990, is that the latter period is affected by the relatively cold period 1945-1980. Almost any comparison with such a low average value will therefore appear as high or warm, and it will be difficult to decide if modern surface air temperatures are increasing or decreasing. Comparing with a more recent period overcomes this problem. In addition to this consideration, the recent temperature development suggests that the time window 1998-2006 may roughly represent a global temperature peak. If so, negative temperature anomalies will gradually become more and more widespread as time goes on. However, if positive anomalies instead gradually become more widespread, this reference period only represented a temperature plateau.

In the other diagrams in this newsletter the thin line represents the monthly global average value, and the thick line indicate a simple running average, in most cases a 37-month average, almost corresponding to three years.

The year 1979 has been chosen as starting point in several of the diagrams, as this roughly corresponds to both the beginning of satellite observations and the onset of the late 20th century warming period.

Global surface air temperatures May 2010 was again characterised by varied conditions in the Northern Hemisphere, ranging from cold to warm conditions. The Southern Hemisphere generally experienced smaller regional temperature contrasts than the Northern Hemisphere. This contrast is not surprising, as the southern hemisphere is dominated by oceans.

In the Northern Hemisphere relative cold areas extended across western USA, much of Canada, most of Europe, eastern Siberia, China and Japan, most of the Pacific Ocean and parts of the North Atlantic. Relatively warm conditions especially characterised western Russia and northern and eastern Siberia.

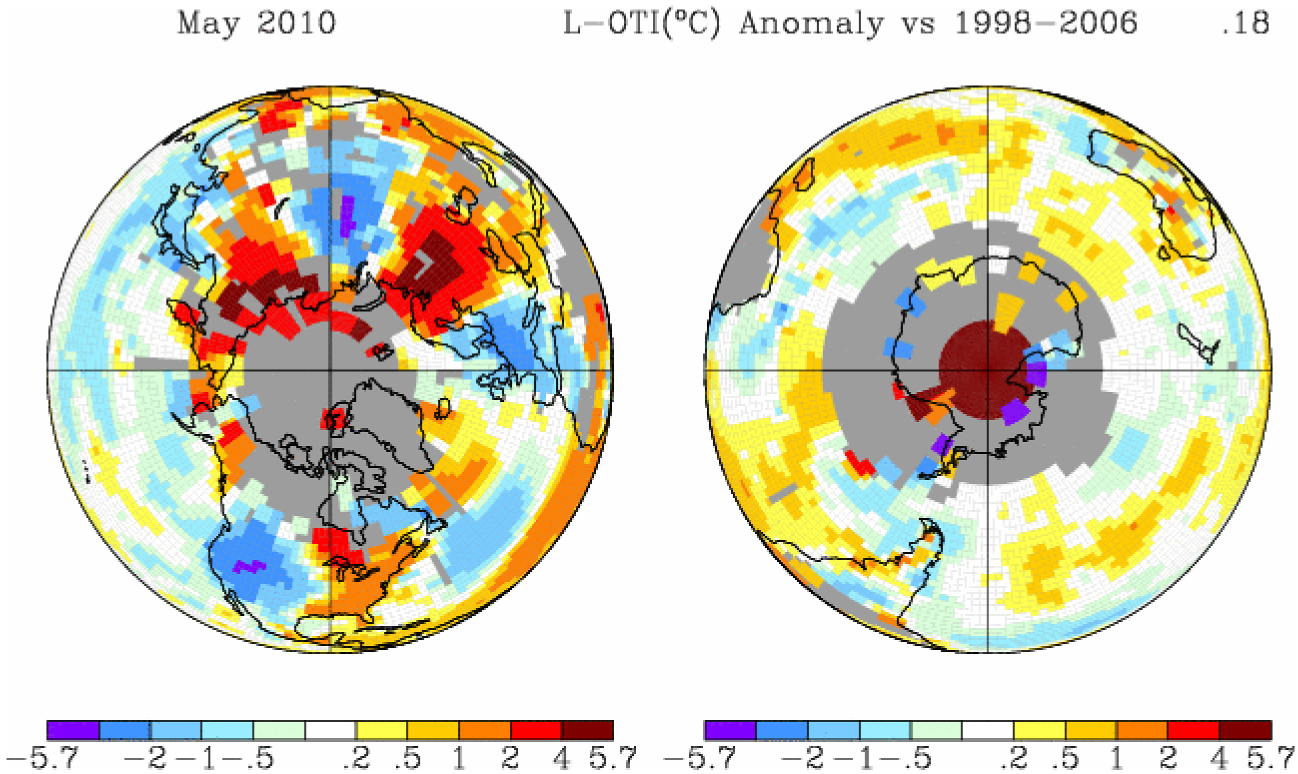
Conditions near Equator were influenced by the now weakening El Niño in the Pacific Ocean. However, relatively high temperatures still characterised a major part of the Equatorial regions, and a warm region extended from northern South America across the Atlantic to Africa and continuing into India and beyond. As these relatively warm regions are located near the Equator, their total surface area is considerable, and the effect on the global average surface temperature therefore important.

In the Southern Hemisphere most areas experienced temperature conditions near the 1998-2006 average, with some regional variations.

In the Arctic, according to the GISS data, a band of relatively high temperatures extended from northern Canada extended over NW Greenland, the central Arctic Ocean, and into northern Russia and Siberia. As there are few observations from the central Arctic, GISS therefore attempts to cover part of the Arctic by interpolating from temperatures recorded at lower latitudes. The result of such interpolation across areas with few observation points always to some degree is problematic, and from a major part of the area indicated as being above average there are few or no observations. The two GISS diagrams on the following page illustrate the interpolation problem for both polar regions. Grey areas are without data.

In the Antarctic relatively cold conditions characterised most of the areas, with the exception of certain parts of East Antarctica and around the Ronne Ice Shelf, which were relatively warm.

Diagrams shown in this newsletter are available for download on www.climate4you.com



GISS diagram May 2010, using smoothing radius of 250 km. Source: http://data.giss.nasa.gov/gistemp/maps/

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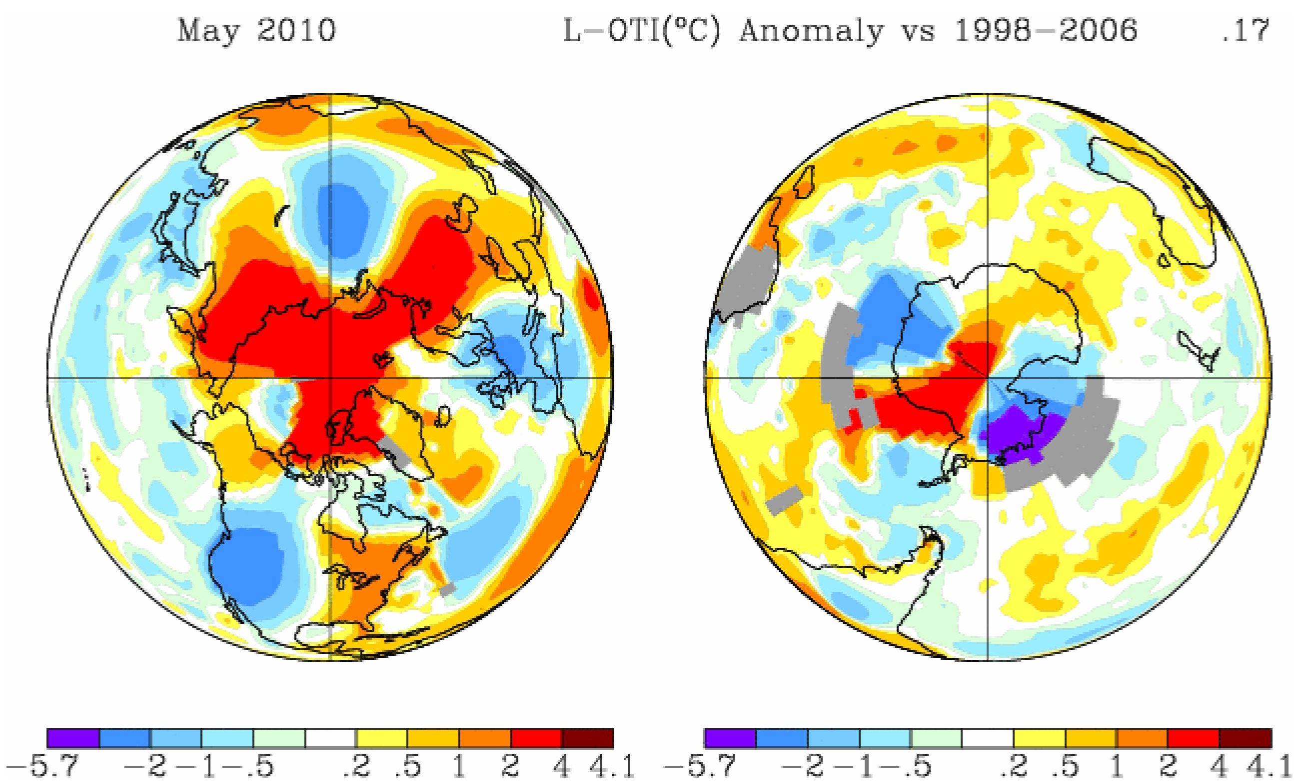
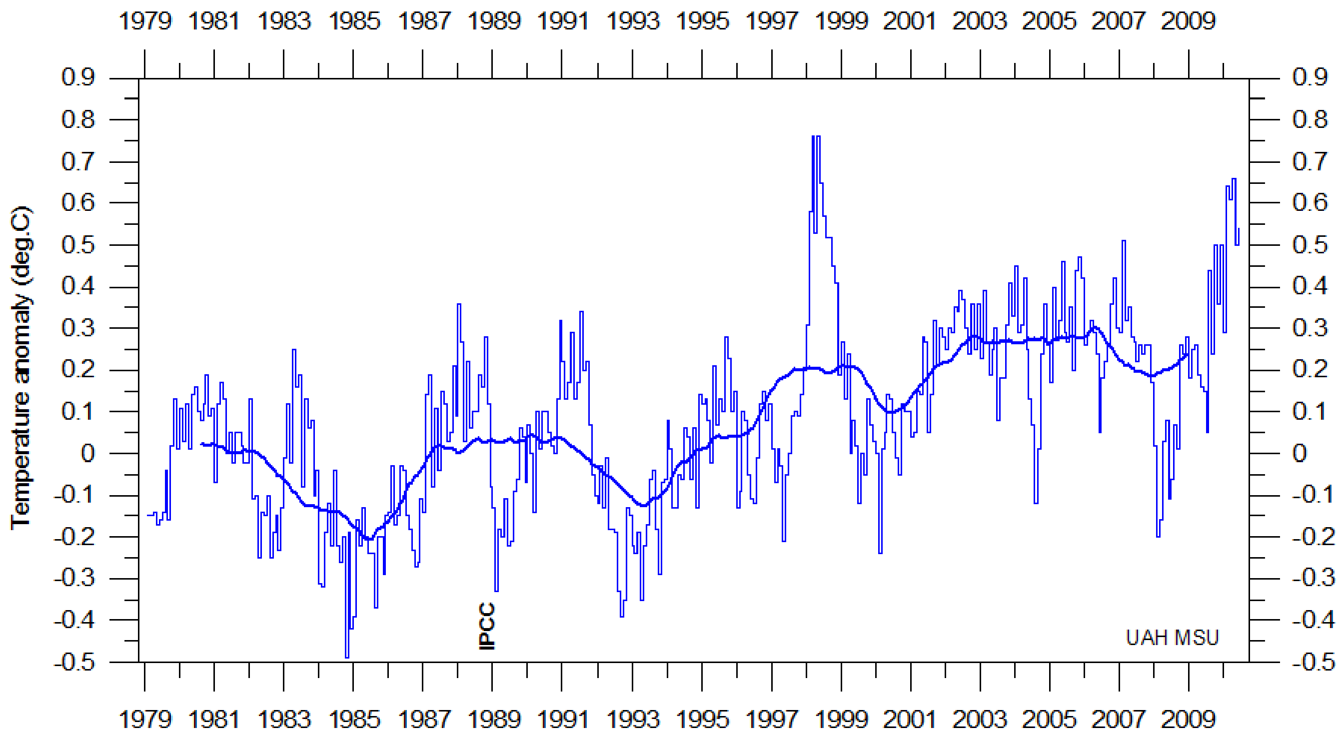
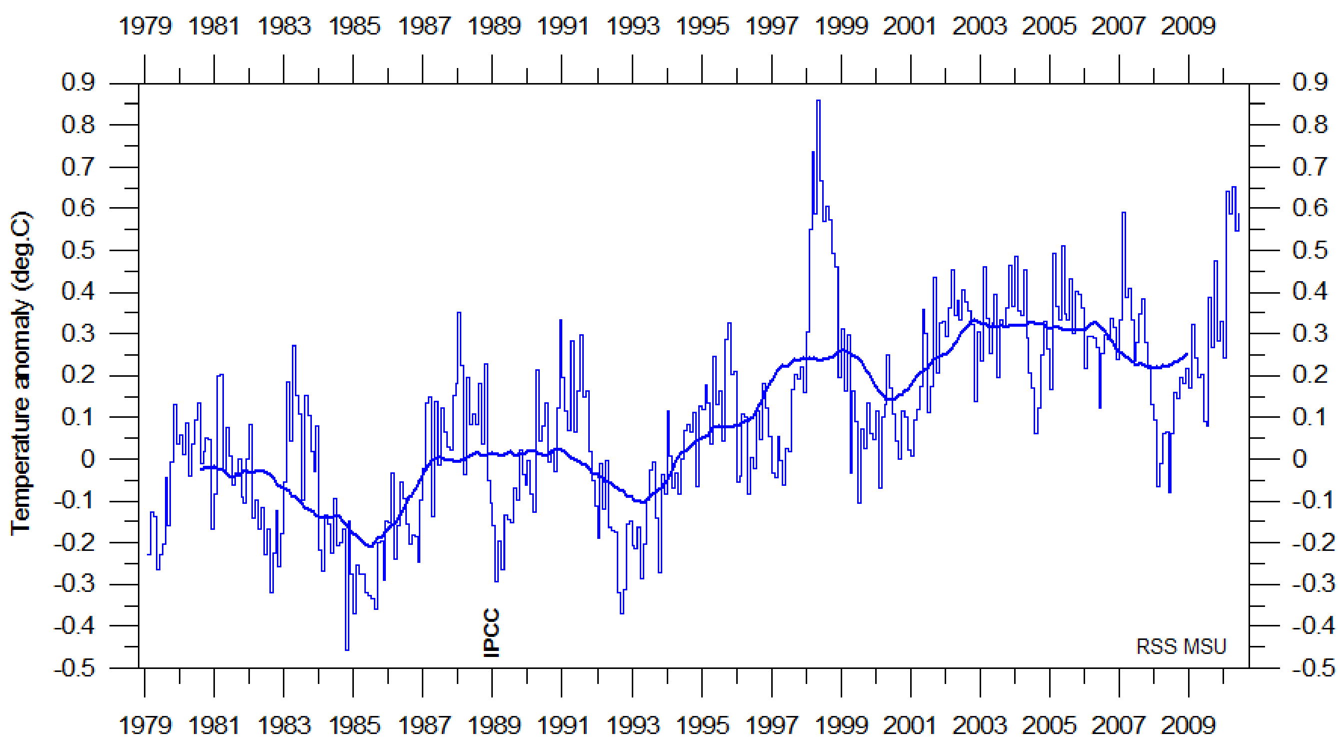


GISS diagram May 2010, using smoothing radius of 1200 km. Source: http://data.giss.nasa.gov/gistemp/maps/

Lower troposphere temperature from satellites, updated to May 2010

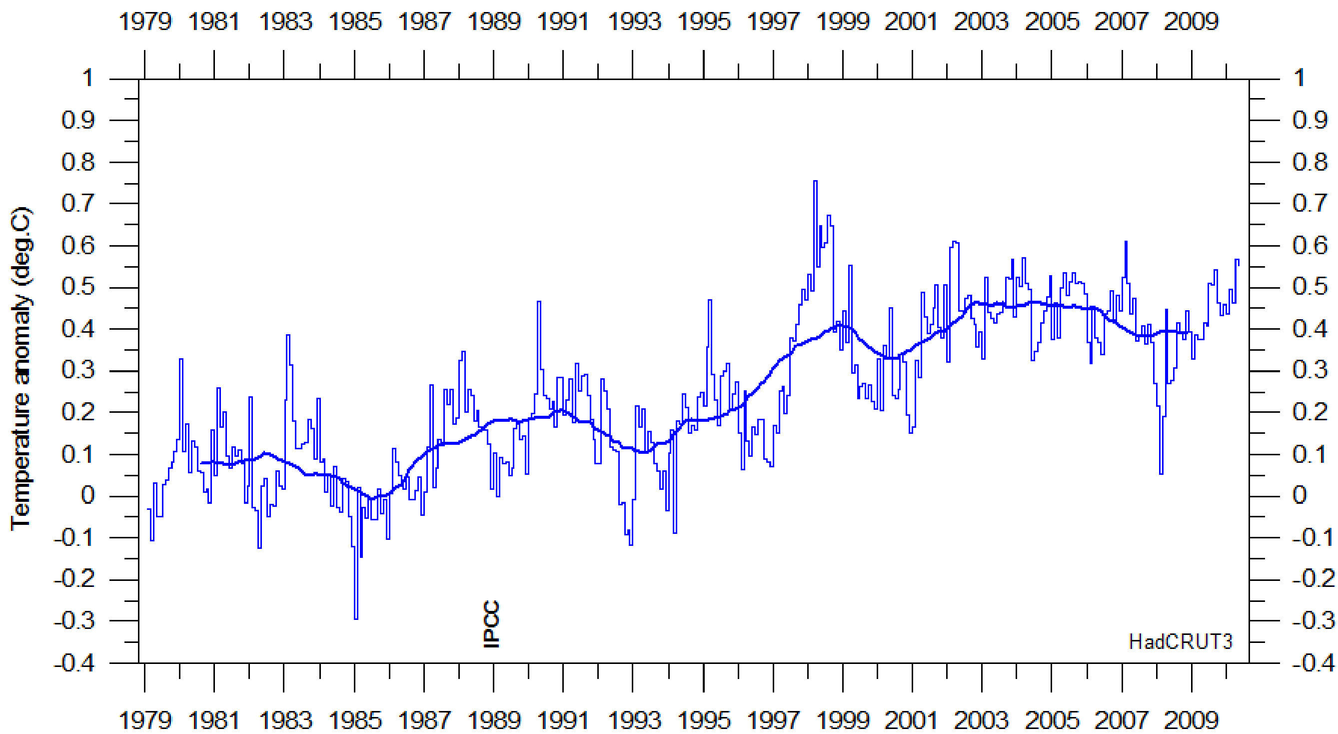


Global monthly average lower troposphere temperature (thin line) since 1979 according to [University of Alabama] at Huntsville, USA. The thick line is the simple running 37 month average.

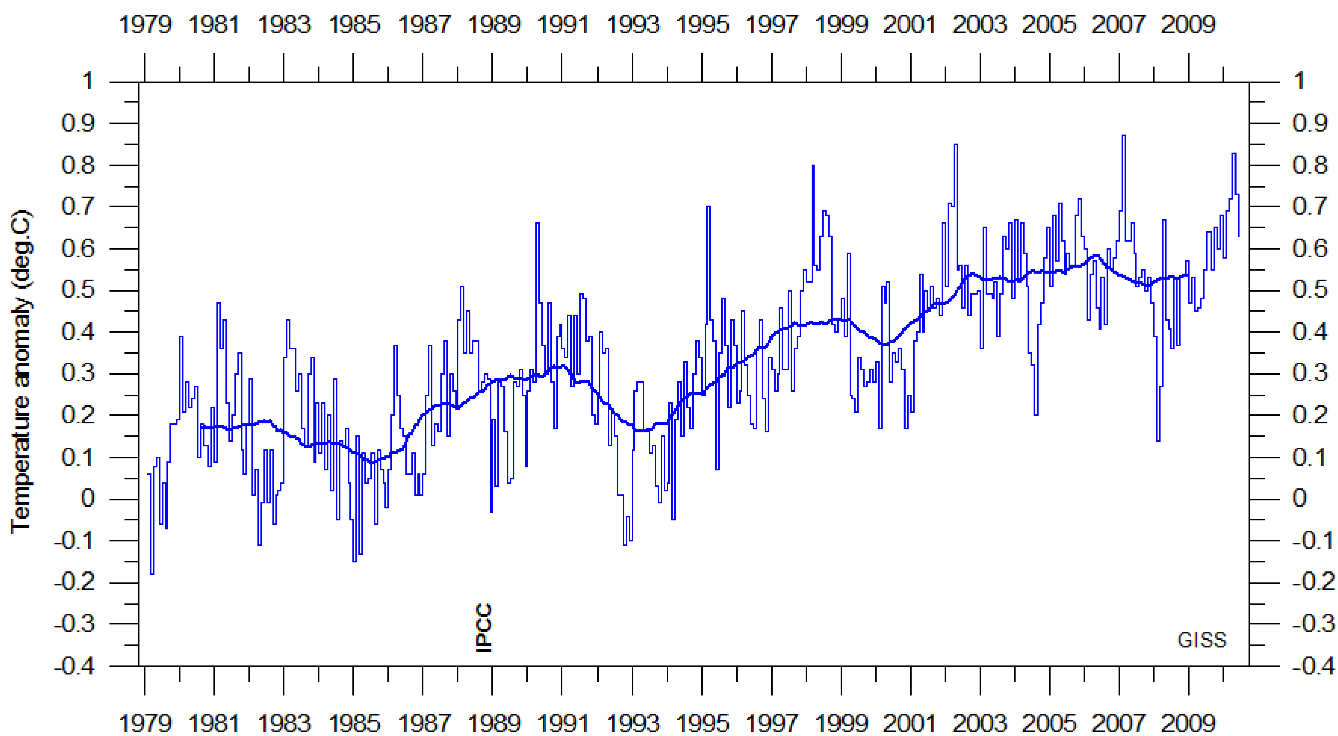


Global monthly average lower troposphere temperature (thin line) since 1979 according to according to [Remote Sensing Systems] (RSS), USA. The thick line is the simple running 37 month average.

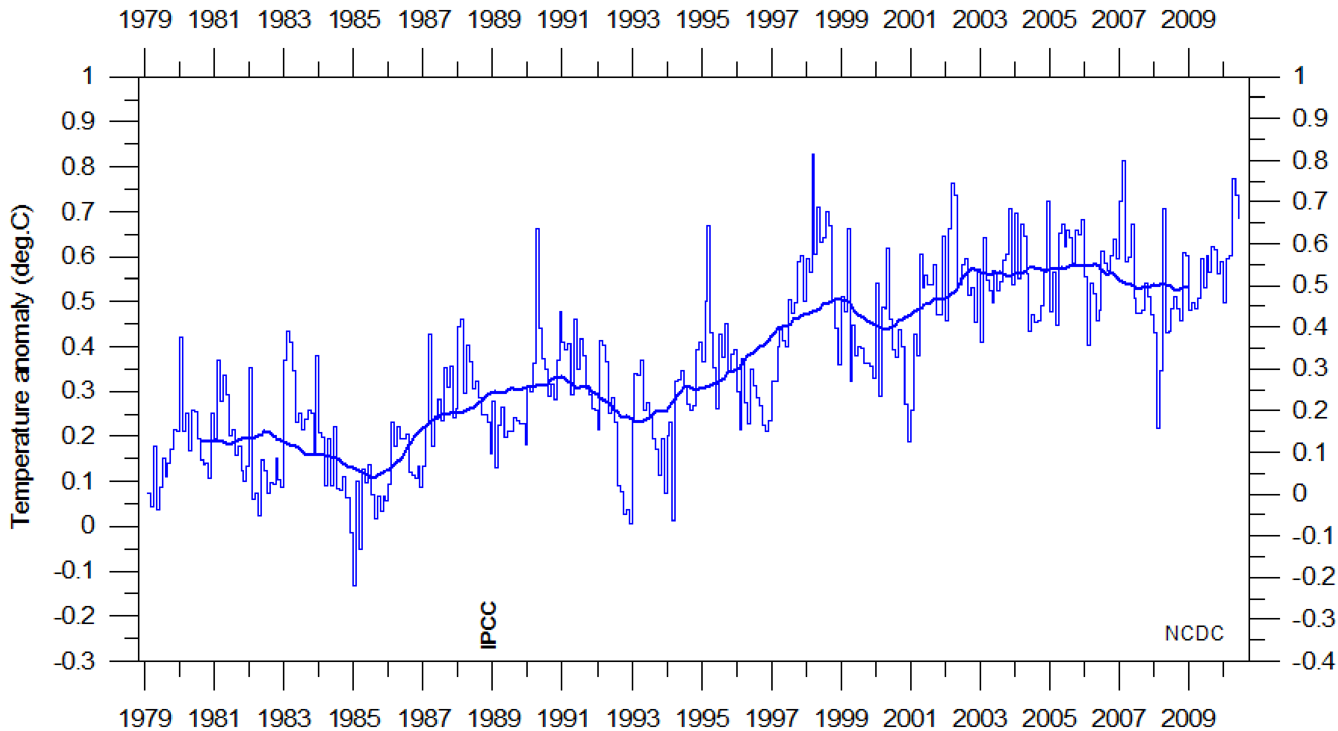
Global surface air temperature, updated to May 2010



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. Please note that this record has not yet been updated beyond April 2010.



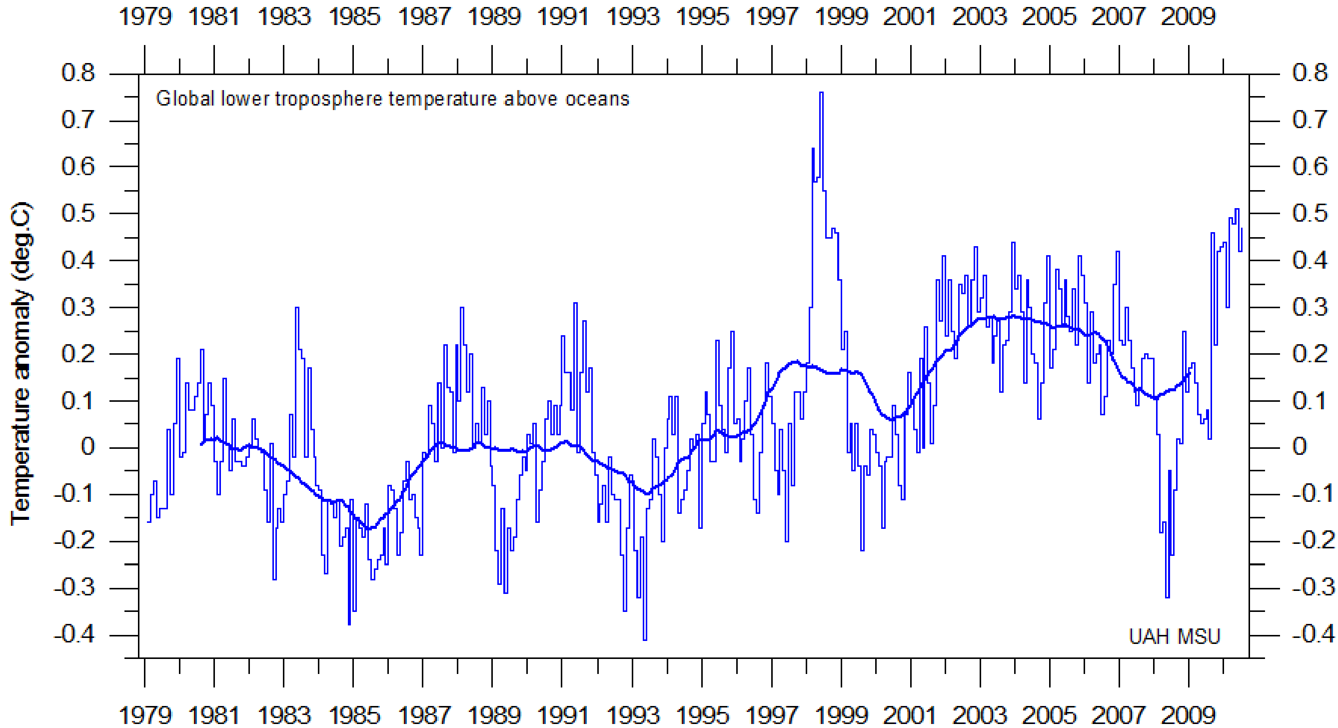
Global monthly average surface air temperature (thin line) since 1979 according to according to the Goddard Institute for Space Studies (GISS), at Columbia University, New York City, USA. The thick line is the simple running 37 month average.



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.

Some readers have noted that several of the above data series display changes when one compare with previous issues of this newsletter, not only for the most recent months, but actually for most of months included in the data series. The interested reader may find more on this lack of temporal stability on [www.climate4you](#) (go to: Global Temperature and then Temporal Stability).

Global sea surface temperature, updated to May 2010



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.

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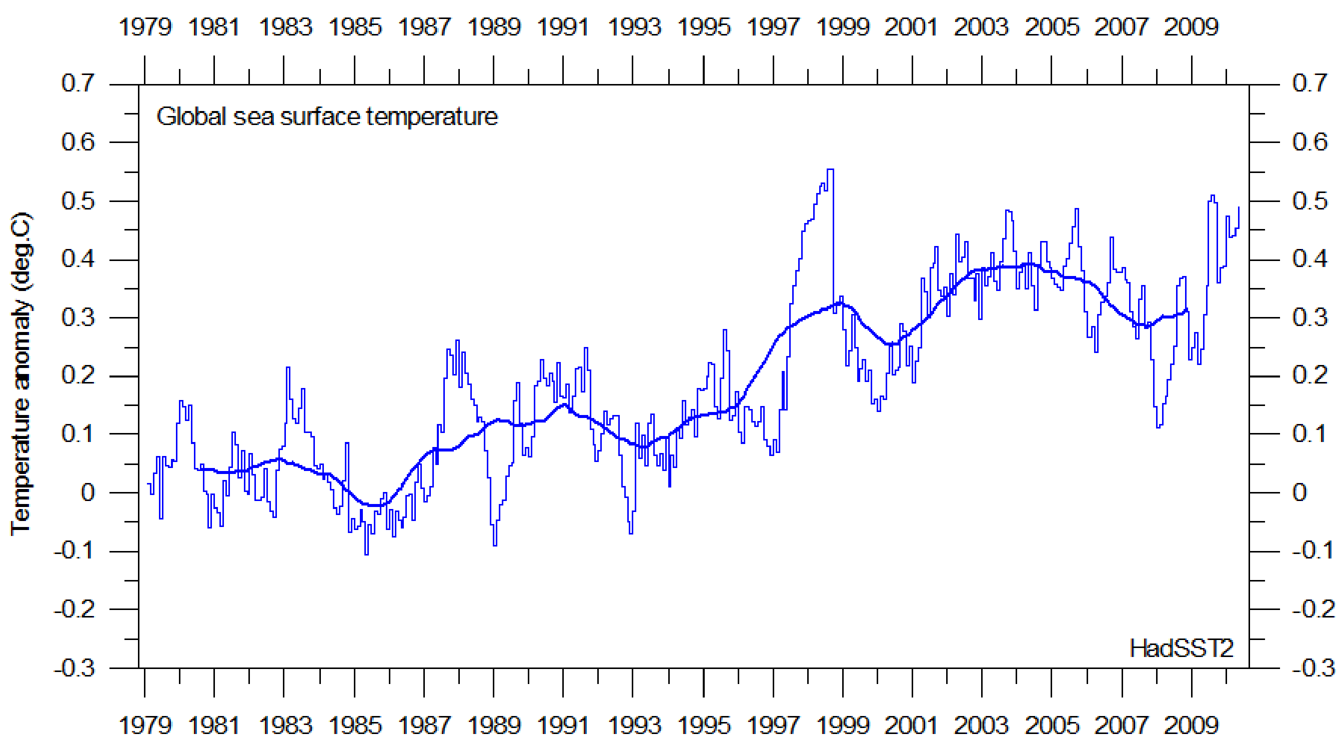
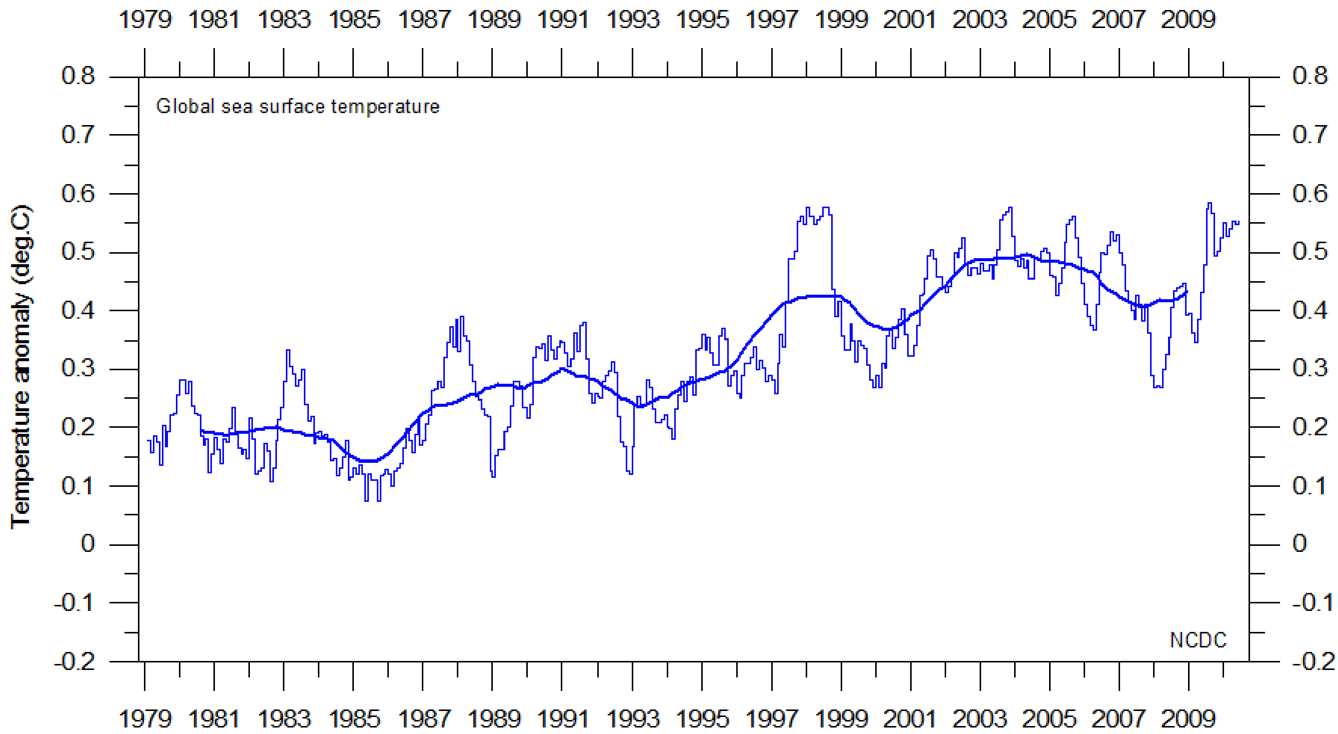
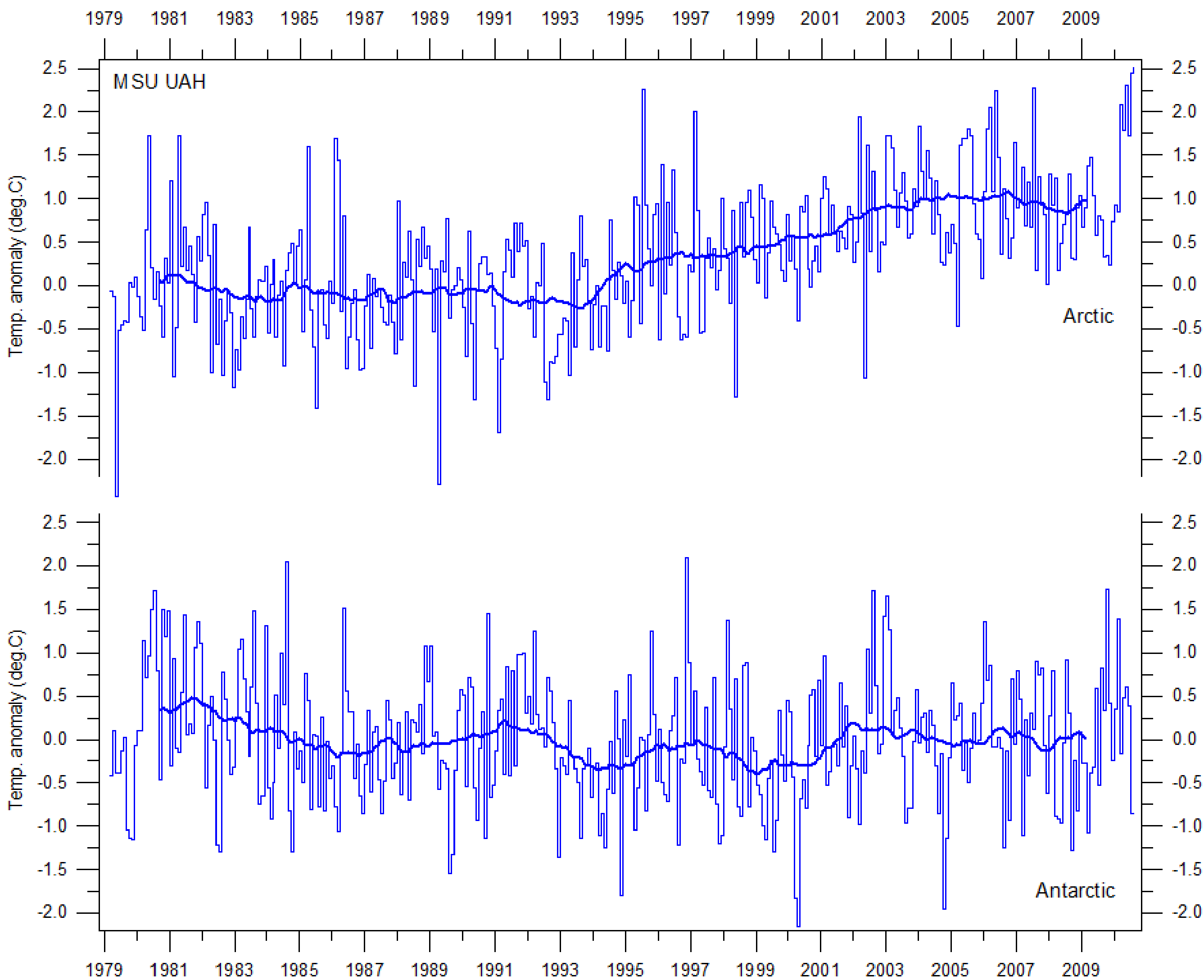


Global monthly average sea surface temperature since 1979 according to University of East Anglia's Climatic Research Unit (CRU), UK. Base period: 1961-1990. The thick line is the simple running 37 month average. Please note that this data series has not yet been updated beyond April 2010.



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 May 2010



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 April 2010

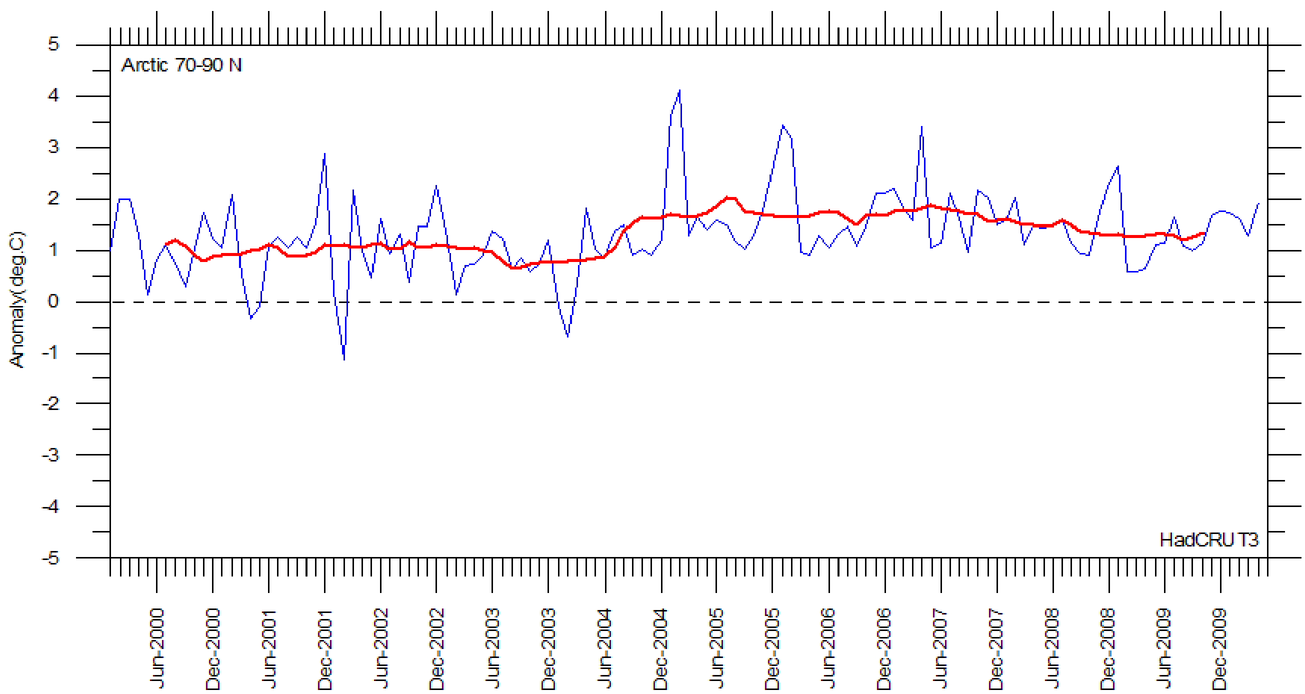


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's [Climatic Research Unit](CRU) ([CRU]), UK. Please note that this data series has not yet been updated beyond April 2010.

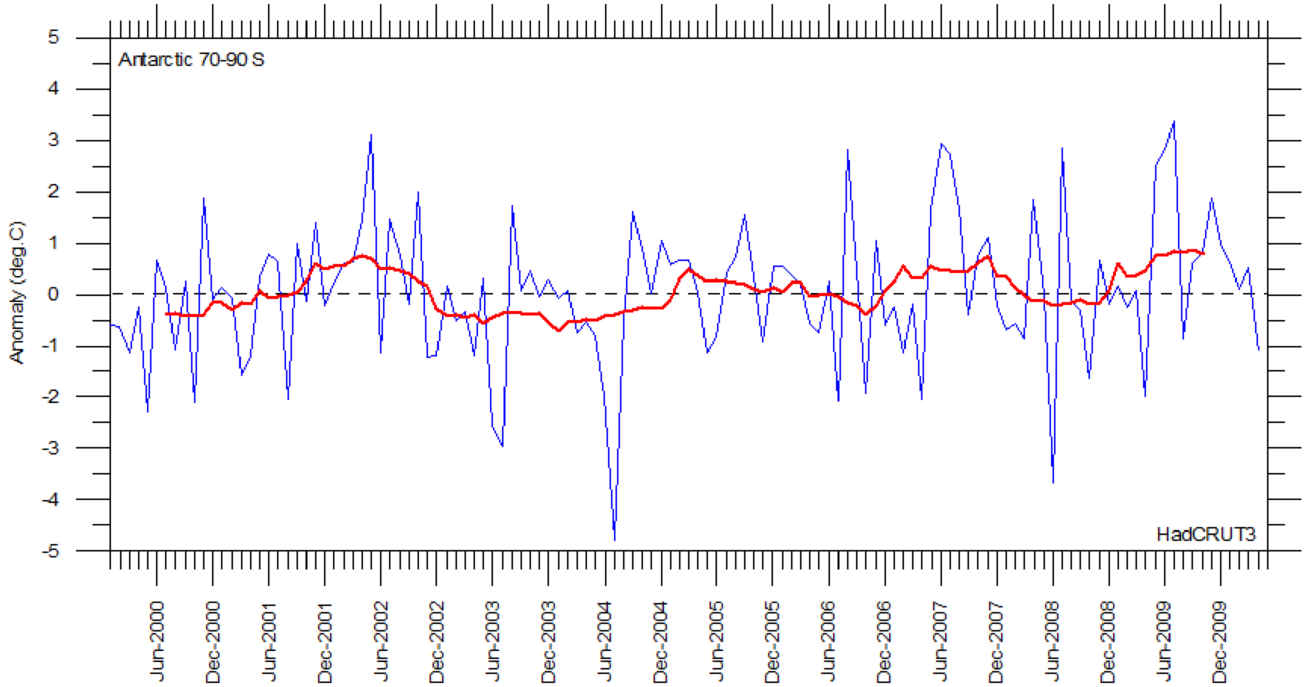


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK. Please note that this data series has not yet been updated beyond April 2010.

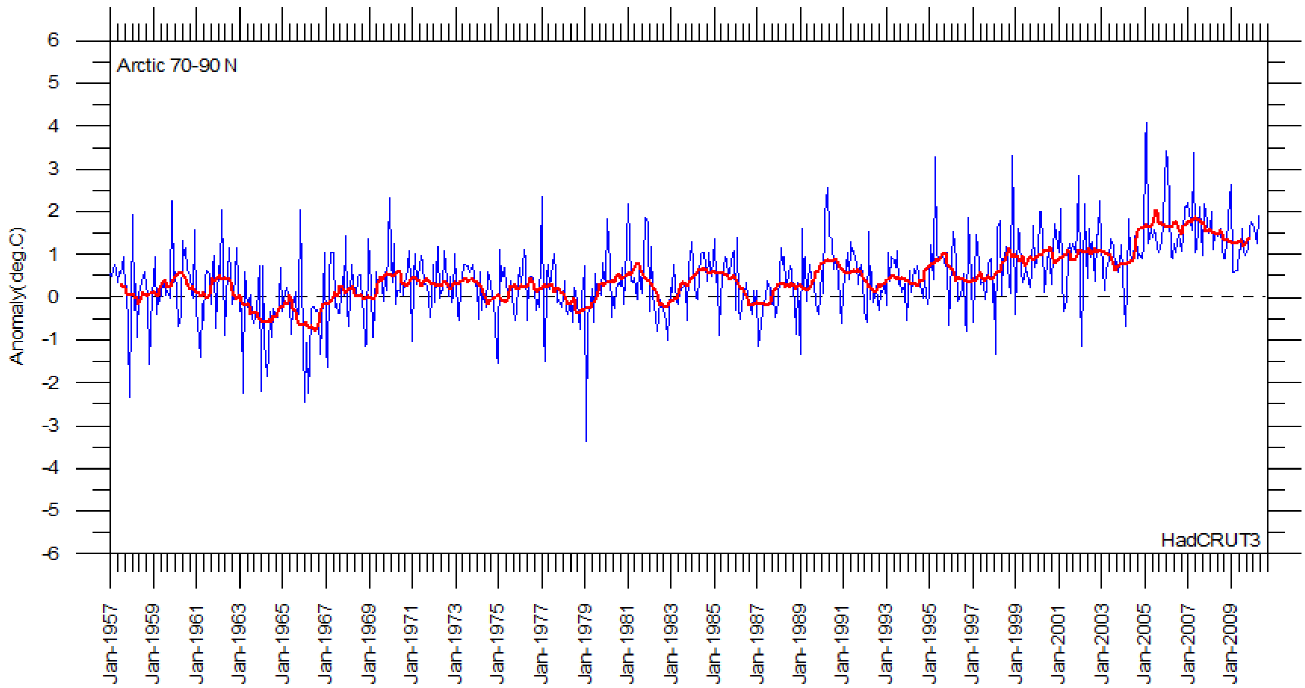


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 has been chosen as starting year, to ensure easy comparison with the maximum length of the realistic Antarctic temperature record shown 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. Please note that this data series has not yet been updated beyond April 2010.

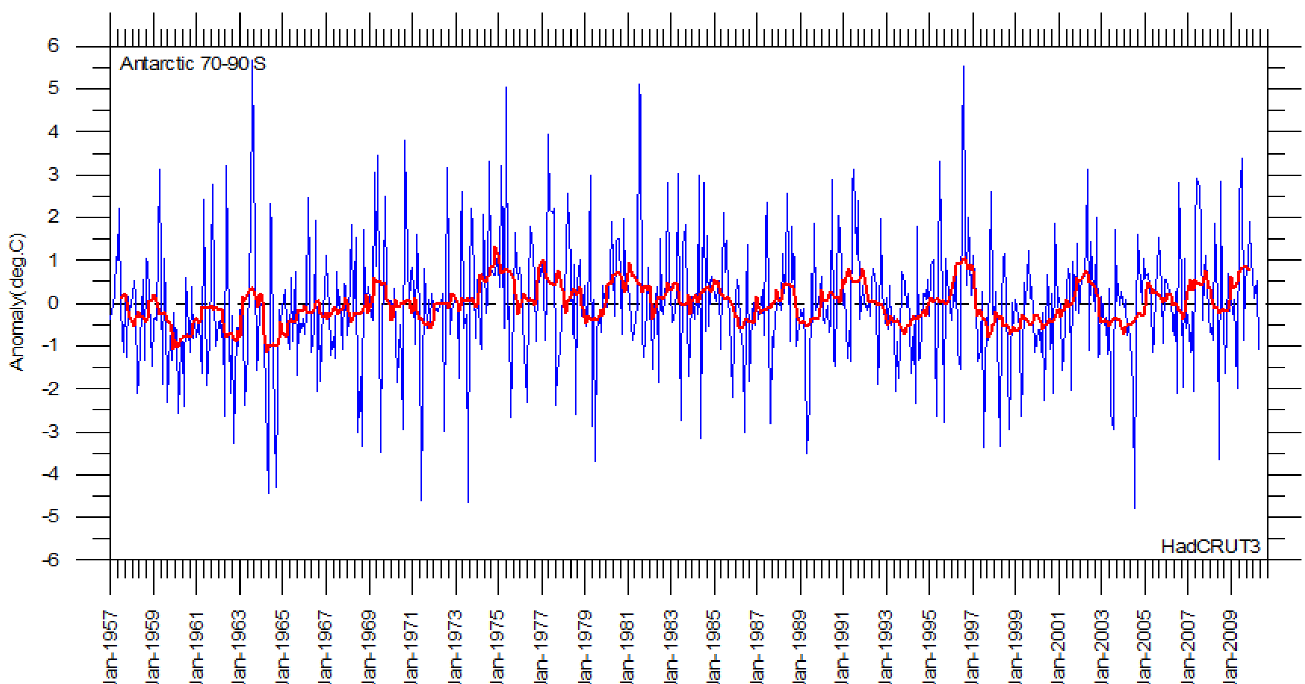


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 was an international geophysical year, and several meteorological stations were established in the Antarctic because of this. Before 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. Please note that this data series has not yet been updated beyond April 2010.

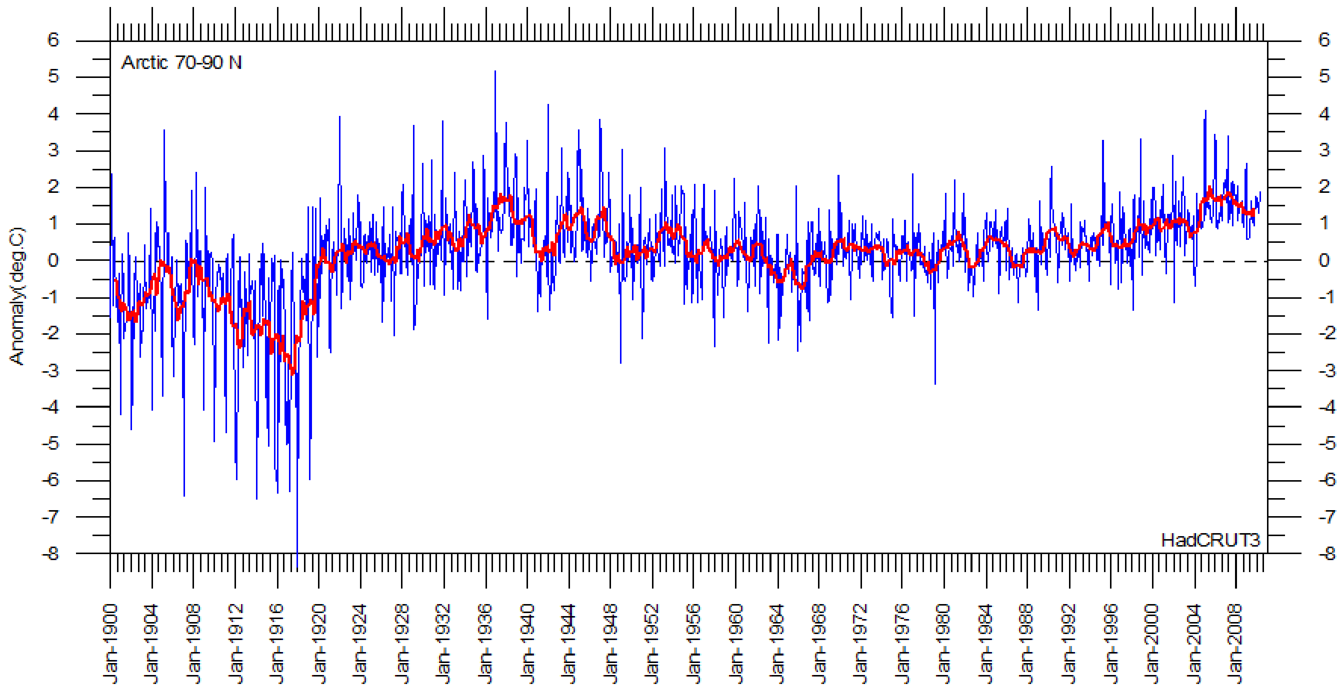


Diagram showing Arctic monthly surface air temperature anomaly 70-90^{o}N since January 1900, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. In general, the range of monthly temperature variations decreases throughout the first 30-50 years of the record, reflecting the increasing number of meteorological stations north of 70^{o}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. Please note that this data series has not yet been updated beyond April 2010.

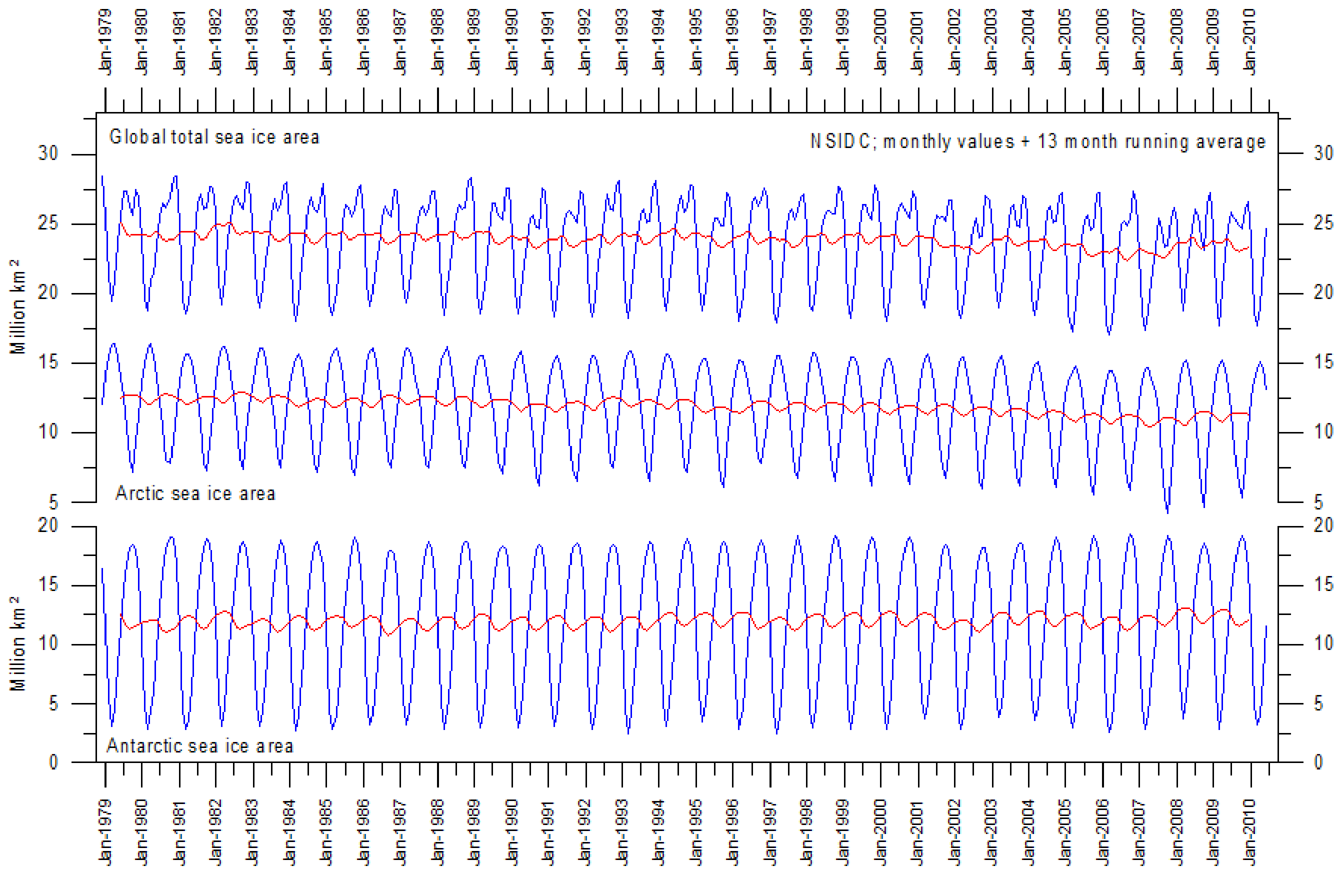
In general, the Arctic temperature record appears to be less variable than the contemporary Antarctic record, presumably at least partly due to the higher number of meteorological stations north of 70^{o}N, compared to the number of stations south of 70^{o}S.

As data coverage is sparse in the polar regions, the procedure of Gillet et al. 2008 has been followed, giving equal weight to data in each 5^{o}x5^o grid cell when calculating means, with no weighting by the areas of the grid dells.

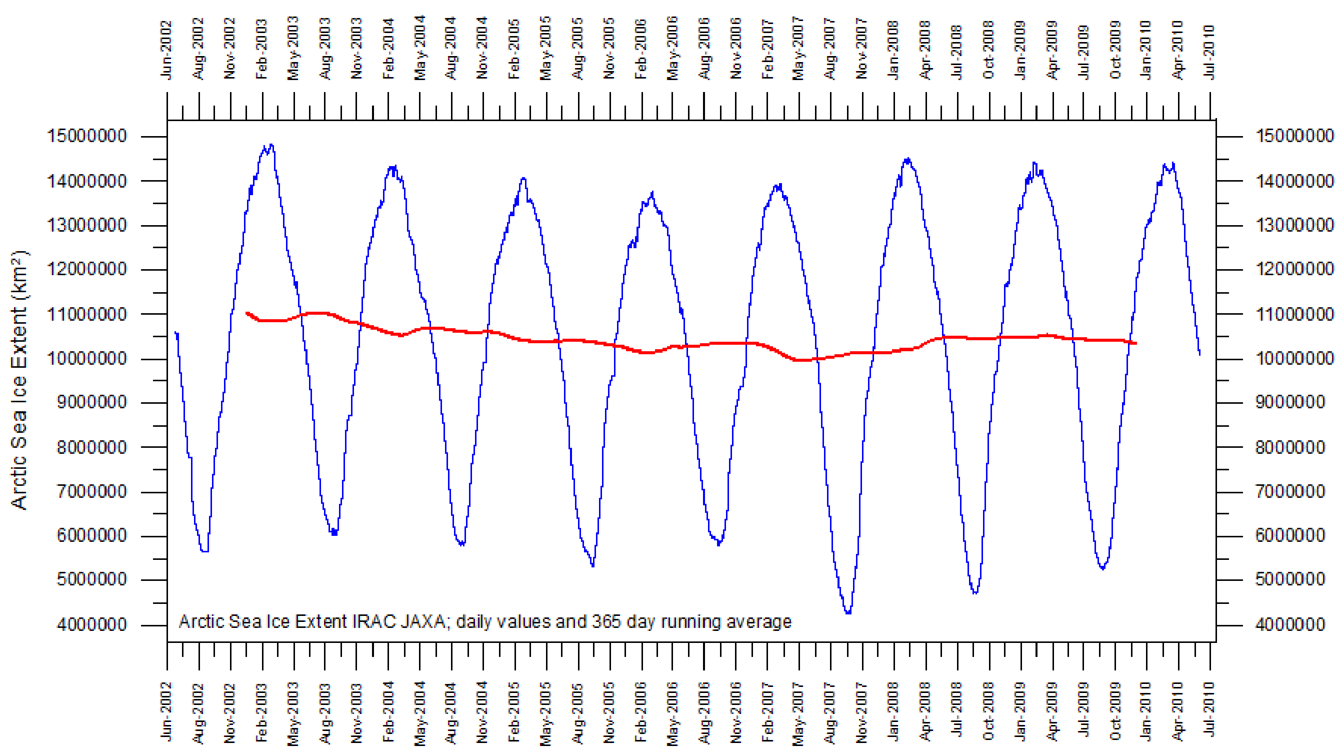
Litterature:

Gillett, N.P., Stone, D.A., Stott, P.A., Nozawa, T., Karpechko, A.Y.U., Hegerl, G.C., Wehner, M.F. and Jones, P.D. 2008. Attribution of polar warming to human influence. *Nature Geoscience* 1, 750-754.

[Arctic and Antarctic sea ice, updated to May 2010]

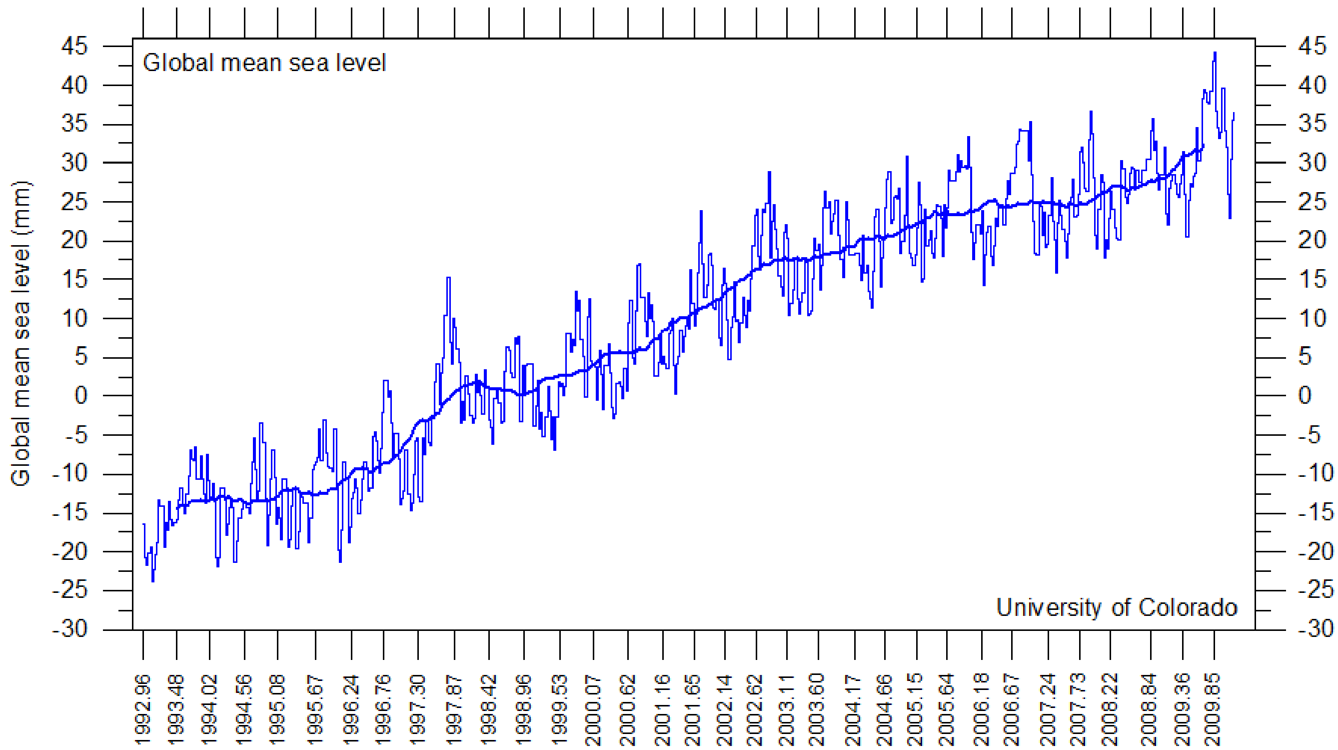


Graphs showing monthly Antarctic, Arctic and global sea ice extent since November 1978, according to the [National Snow and Ice data Center] (NSIDC).

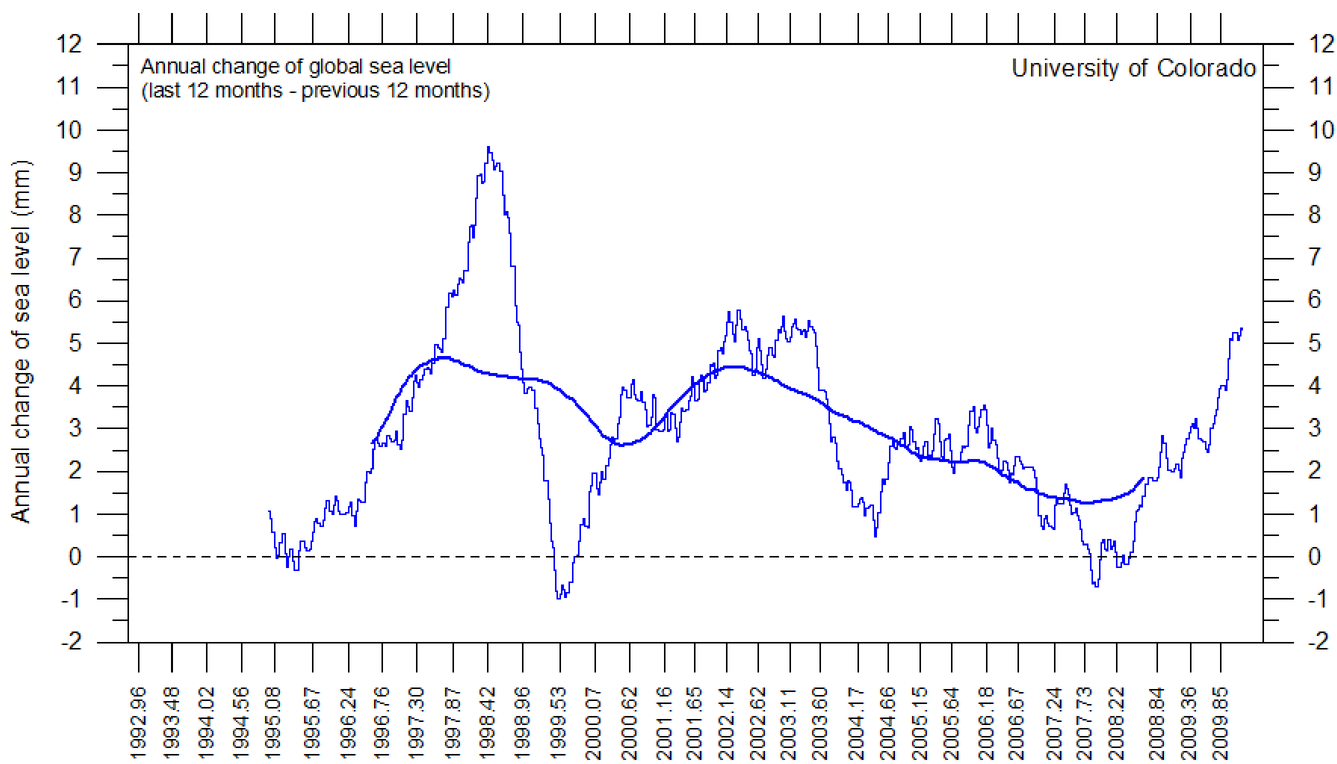


Graph showing daily Arctic sea ice extent since June 2002, to 16/06 2010, by courtesy of [Japan Aerospace Exploration Agency] (JAXA).

Global sea level, updated to April 2010

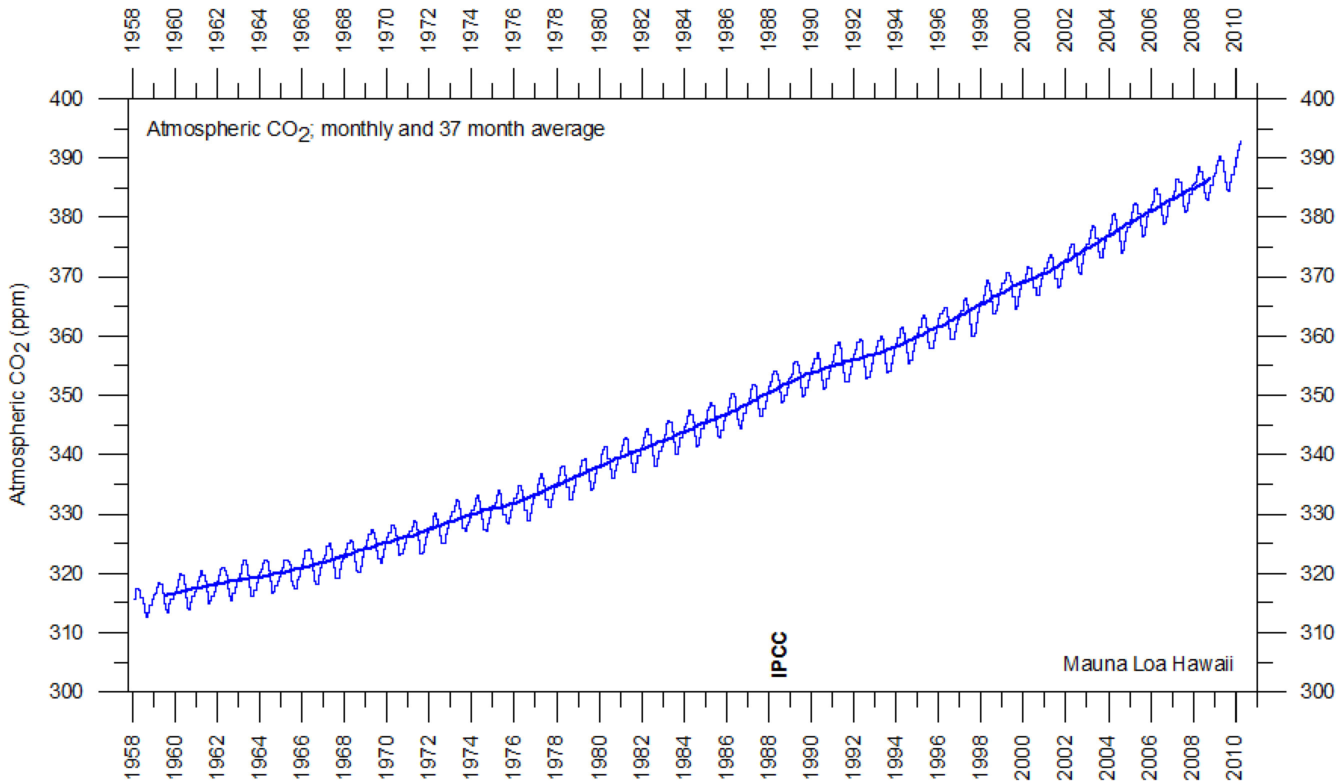


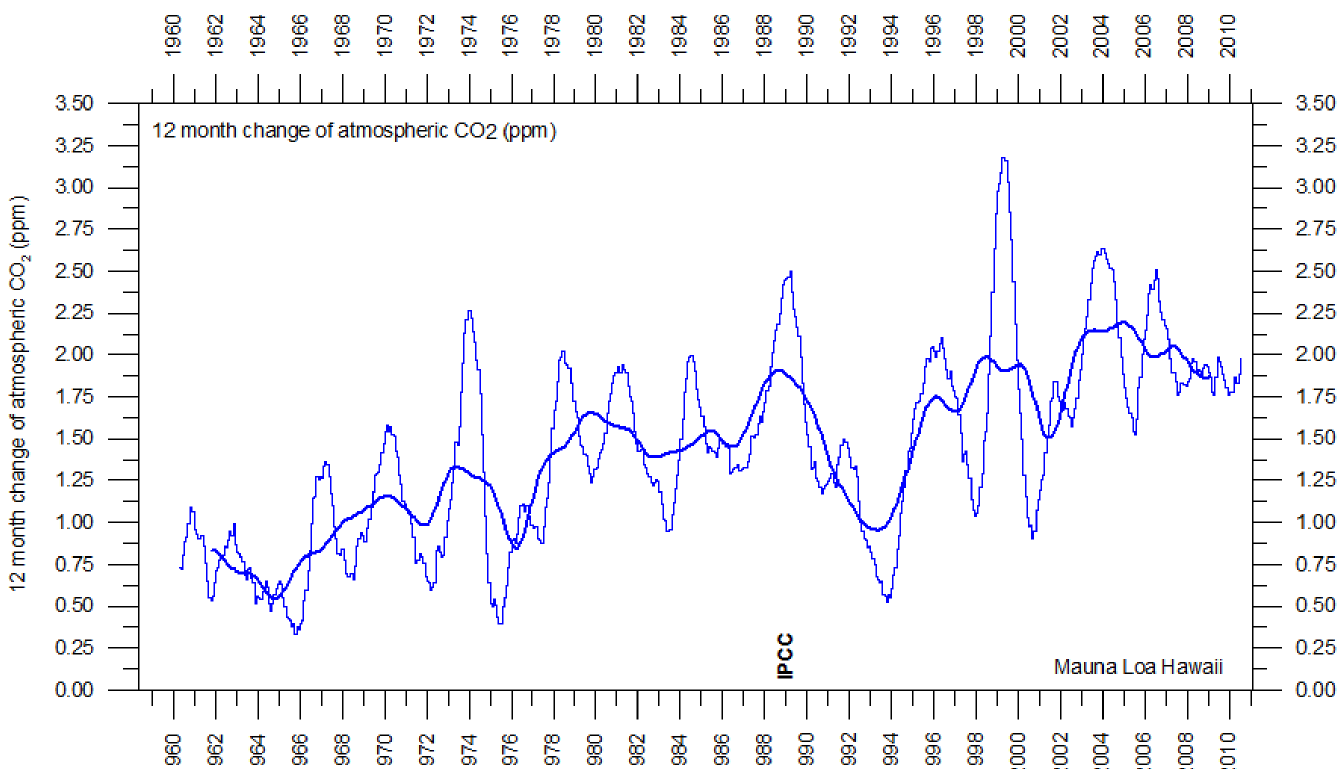
Globa lmonthly sea level since late 1992 according to the Colorado Center for Astrodynamics Research at University of Colorado at Boulder, USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.



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.

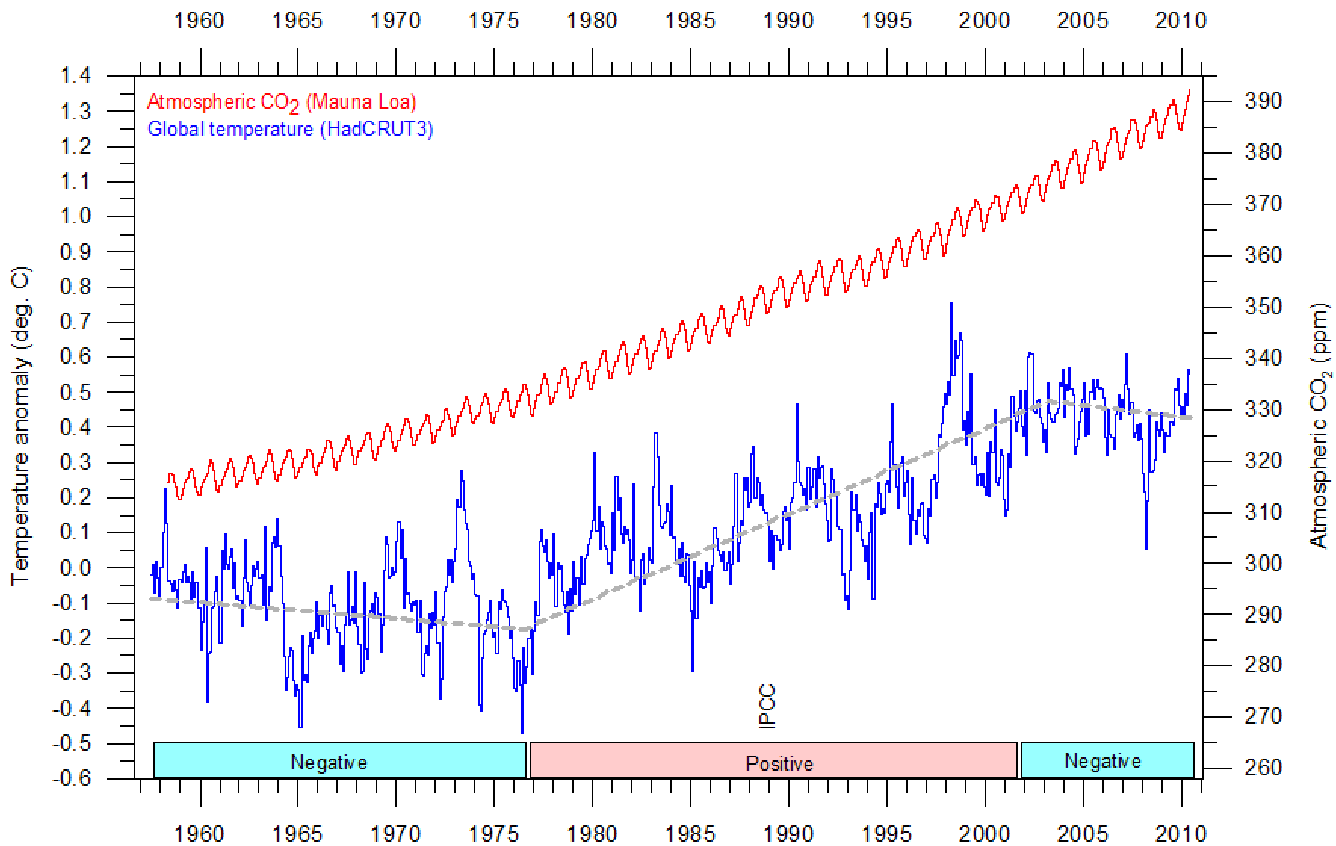
Atmospheric CO_2, updated to May 2010

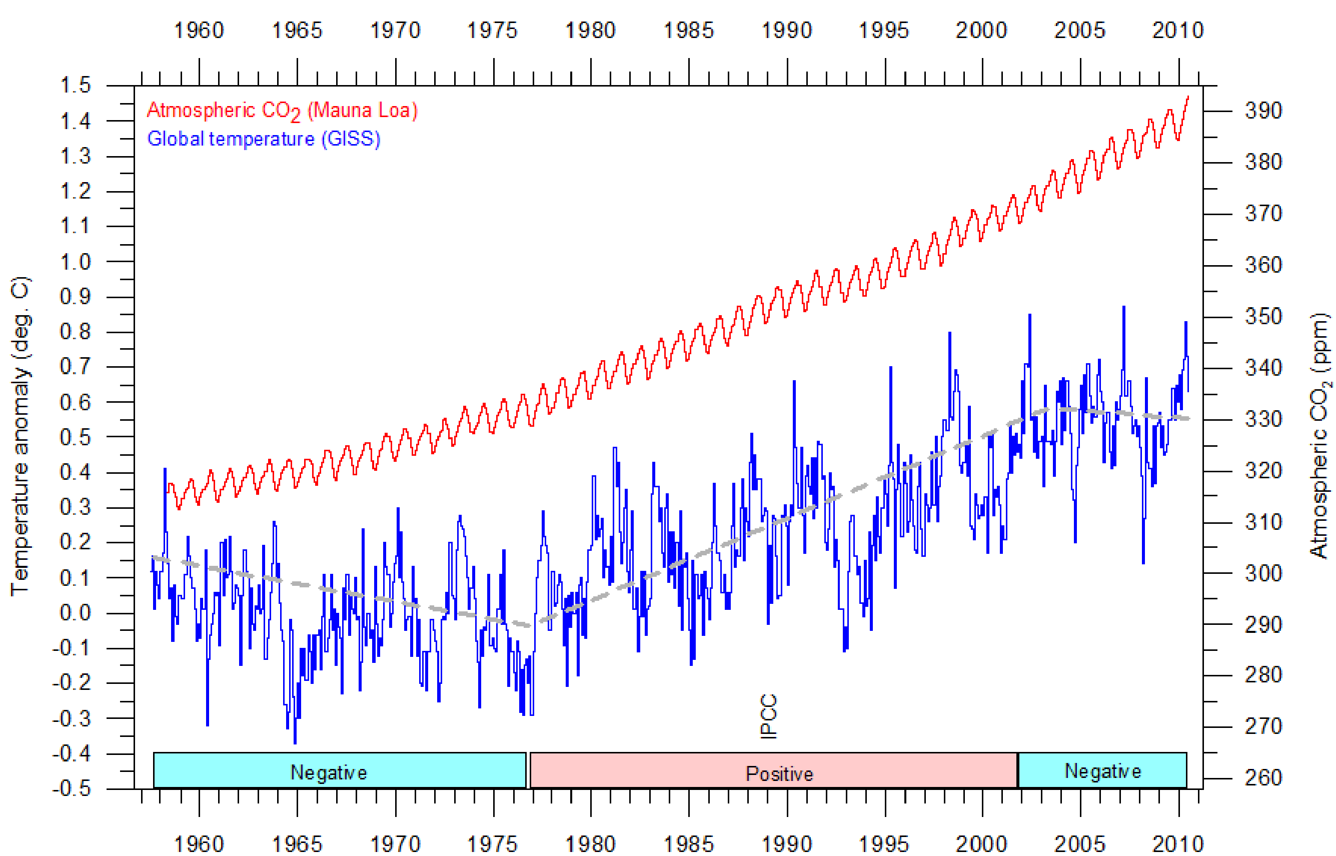


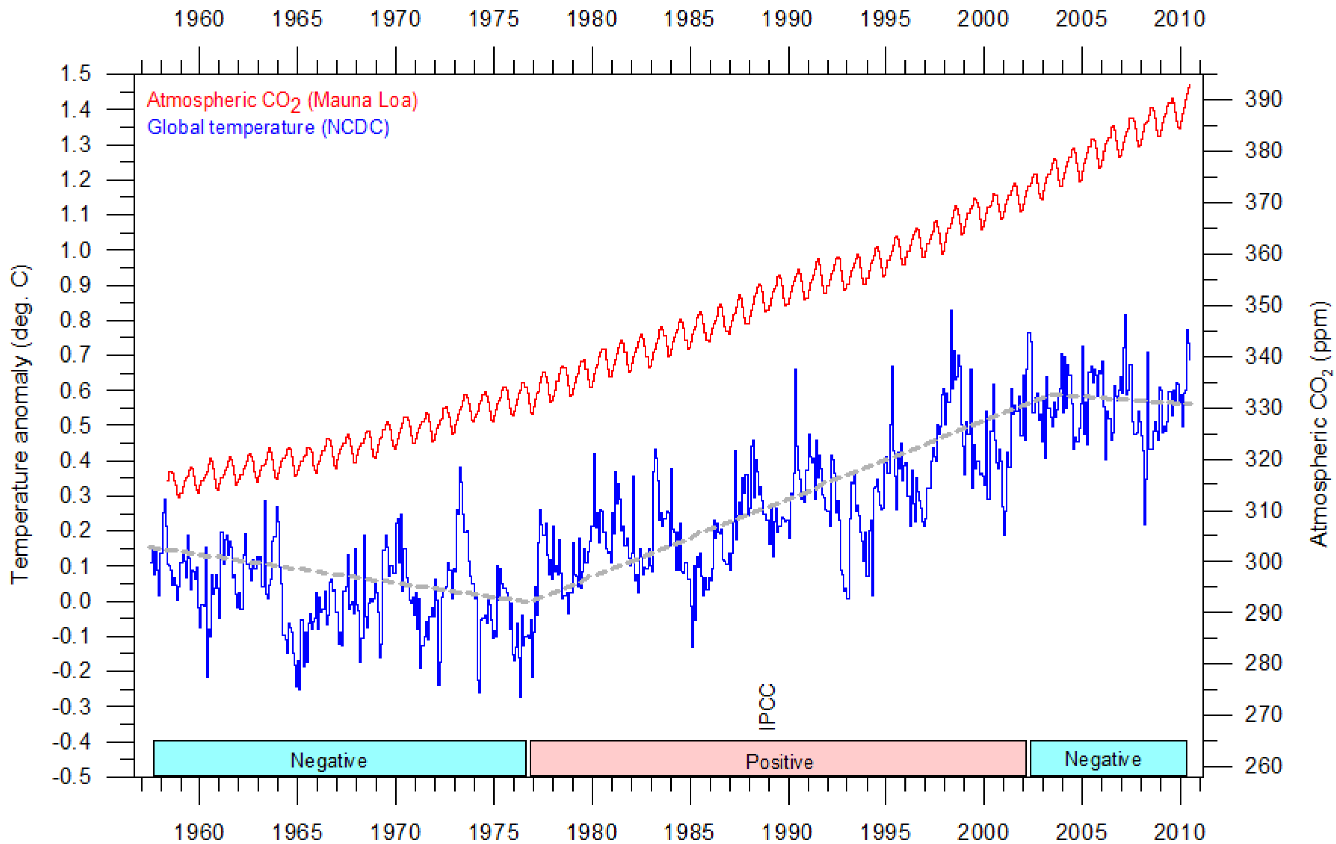


Monthly amount of atmospheric CO_2 (above) and annual growth rate (below; average last 12 months minus average preceding 12 months) of atmospheric CO_2 since 1959, according to data provided by the [Mauna Loa Observatory](), Hawaii, USA. The thick line is the simple running 37 observation average, nearly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

Global surface air temperature and atmospheric CO_2, updated to May 2010







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. Please note that the HadCRUT3 record has not been updated beyond April 2010.

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.

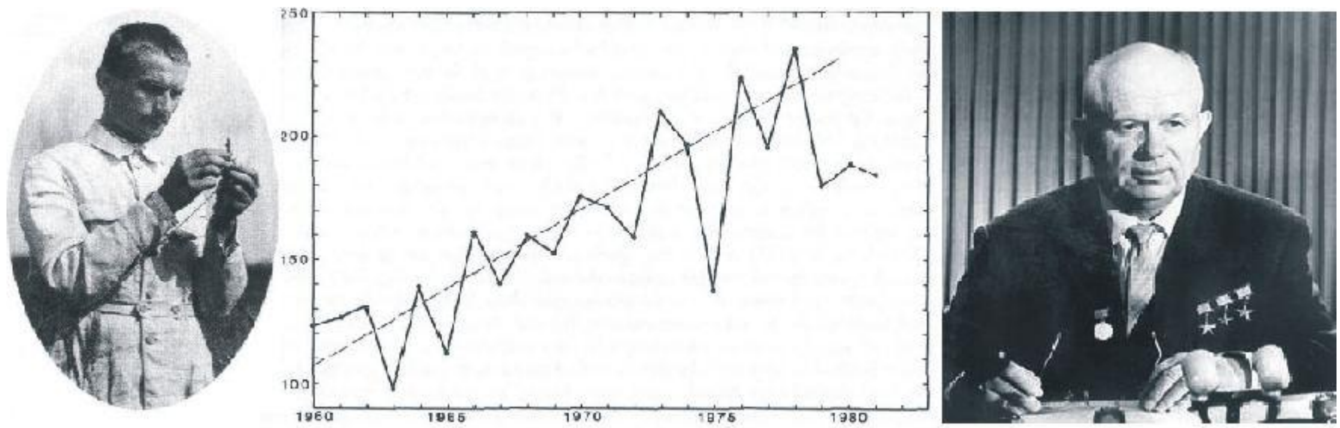
It is of cause equally inappropriate to present new meteorological record values, whether daily, monthly or annual, as support for the hypothesis ascribing high importance of atmospheric CO_2 for global temperatures. Any such short-period meteorological record value may well be the result of other phenomena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

After about 10 years of global temperature increase following global cooling 1940-1978, 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 high importance of CO_2 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]

1963-1980: Failures of USSR grain harvest

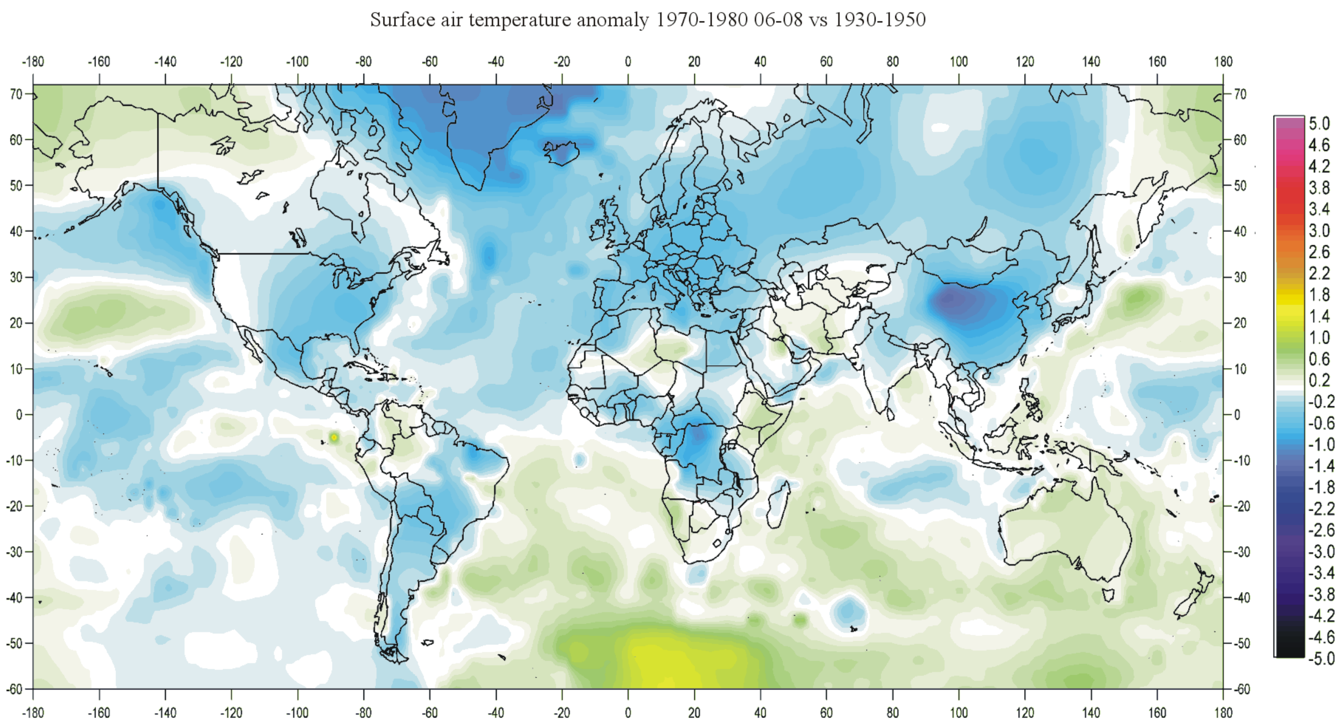


Trofim Lysenko (1898-1976), agronomist and director of Soviet biology under Joseph Stalin (left). Graph showing the total grain production in USSR 1960-1980 (left axis showing millions of tonnes). The broken line indicates the rising production expected from increasing acreage sown and increasing technological development and input (Diagram from Lamb 1995; data provided by United States Department of Agriculture). Nikita Khrushchev (1894-1971), First Secretary of the Communist Party of the Soviet Union 1953-1964 (right).

In 1913 Imperial Russia was still the main producer and exporter of surplus grain, especially wheat. Up to the 1930s many other countries, including USA, produced surpluses for export. Since 1960, however, the world's total production of grains was barely able to keep pace with the growth of the world population. From 1960 the end of season world stocks of grains was declining. In 1960 the stock was estimated at 222 million tonnes, about 26% of the annual requirement). In 1975 the total stock was down to about 135 million tonnes, representing 11% of the annual requirement (Lamb 1995).

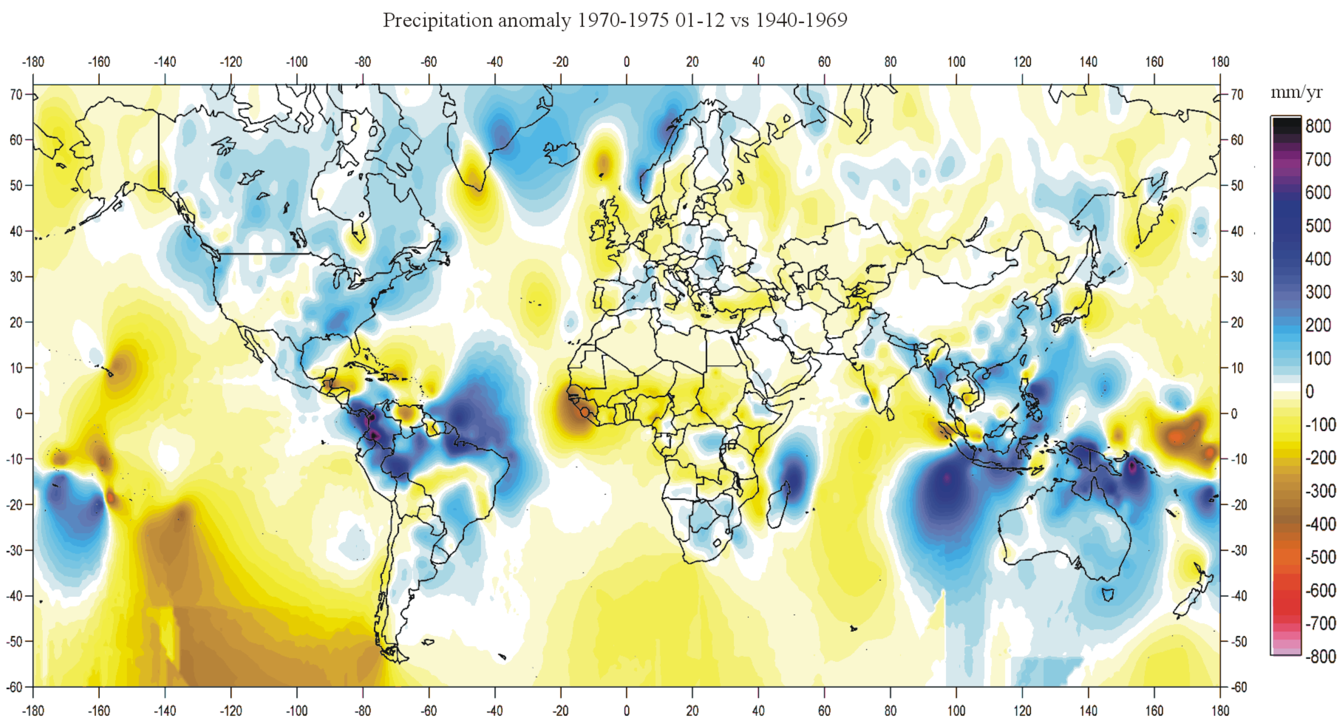
One reason for this unfortunate development was a recurrent failure of grain harvest in the Soviet Union (USSR). In the 1970s the USSR, although still the world's second biggest grain producer, had become a net importer of grain. The overall driver for this development was the temperature decline since about 1940. Trofin Lysenko, however, must carry some of the responsibility for the severe harvest failure in 1963. Lysenko was an agronomist who rejected Mendelian genetics in favour of hybridization hypotheses. With considerable success he adopted these unproven ideas into a powerful political scientific movement termed Lysenkoism. His unorthodox experimental research in improved crop yields earned the support of Soviet leadership, and in 1940 he became director of the Institute of

Genetics within the USSR’s Academy of Sciences. Sceptics of Lysenko’s agricultural hypotheses were formally outlawed in 1948, and many imprisoned. Following the disastrous 1963 harvest Lysenko's work was officially discredited in the Soviet Union in 1964. Along with other factors, the 1963 harvest failure contributed towards weakening the position of the First Secretary of the Communist Party of the Soviet Union, Nikita Khrushchev, who was forced to resign in 1964.



Map showing the deviation of the average surface air temperature during the main growing season June-August 1970-1980, compared to average conditions 1930-1950. Much of the northern hemisphere, and around 1975 the end of season world stocks of grains were dangerous low. Europe and USSR was among the world’s main grain growing areas hardest hit by this climatic development, compared to the previous 21 year period 1930-1950. Temperature scale in degrees Celsius. Data source: NASA Goddard Institute for Space Studies (GISS).

Global cooling, however, prevailed until around 1980. As a result of this, a number of subsequent disastrous harvests in the 1970's (see figure above) forced the Soviet Union to go onto the world market to buy additional wheat. In 1975 USSR was able to buy 25% of the total US wheat crop production, as well as buying elsewhere on the global market (Lamb 1995). This had the result that the world price of wheat doubled within a few months and the difficulties increased for not only USSR, but also for many poor countries suffering food shortage in 1975 because of the global cooling prevailing at that time (see temperature map above). Temperature was not the only factor, but drought in western USSR also had its effects (see precipitation map below).



Map showing the deviation of the average precipitation 1970-1975, compared to average conditions 1940-1969. With the exception of North America, many areas shortly north of Equator received less precipitation than during the previous 30 years. Among the regions worst hit by drought was the Sahel region in North Africa. Also USSR was seriously affected. Precipitation scale in mm w.e. per year. Data source: NASA Goddard Institute for Space Studies (GISS).

More disappointing USSR harvests in the late 1970's and in the early 1980's added to this negative economic development, and left the USSR in a weakened state. The war in Afghanistan and the contemporary arms race with USA made a bad situation even worse, despite first secretary Michail Gorbatjov's impressive attempts of restructuring (perestroika). Eventually USSR collapsed in 1991.

References:

Lamb, H.H. 1995. *Climate, History and the Modern World*. Routledge, London, 2nd edition, 433 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)

21 June 2010.