Climate4you update July 2010

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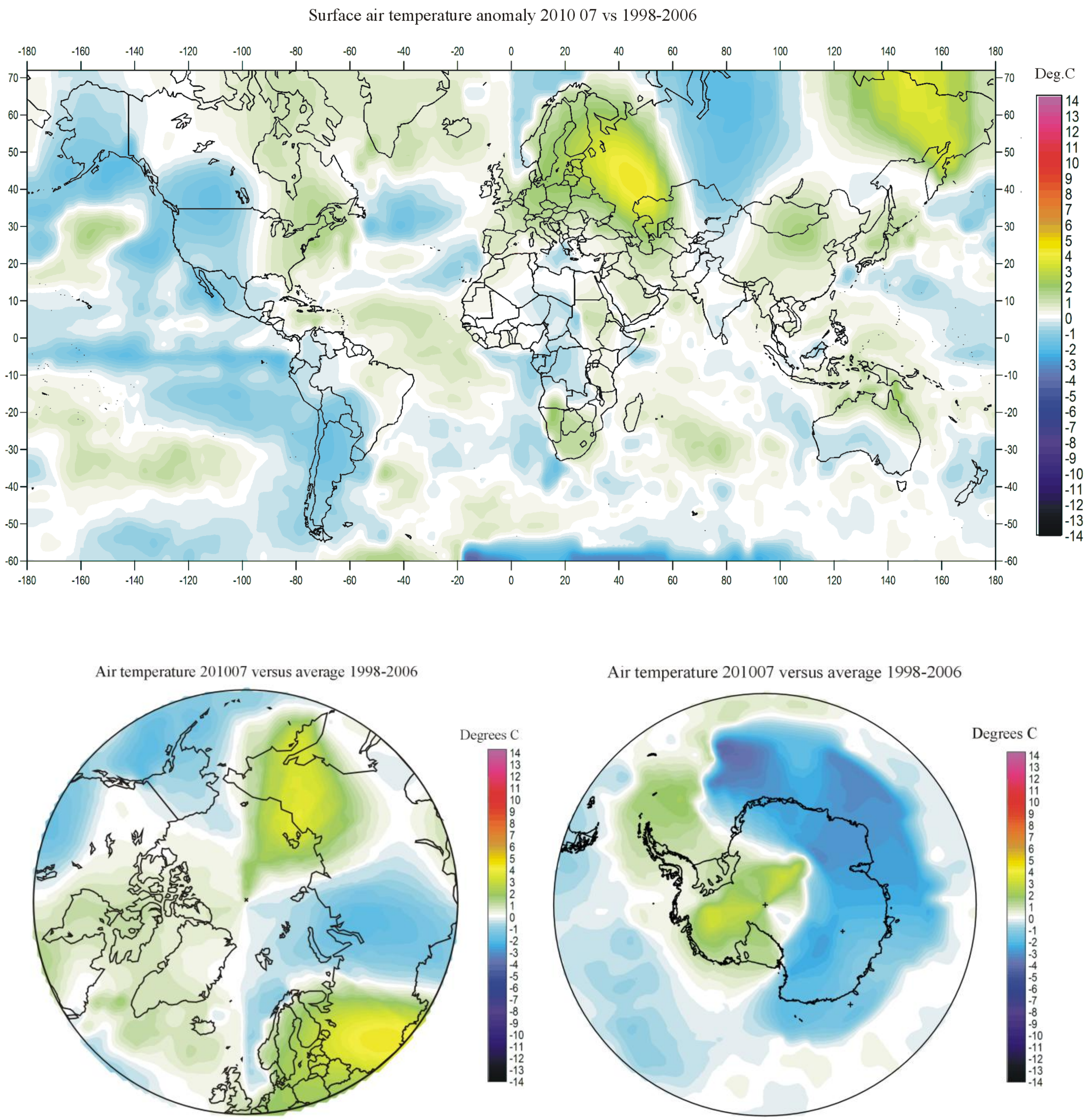
July 2010 global surface air temperature overview



July 2010 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](http://www.giss.nasa.gov/) (GISS)

Comments to the July 2010 global surface air temperature overview

This newsletter contains graphs showing a selection of key meteorological variables for July 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 July 2010 in the Northern Hemisphere was characterised by relatively cold conditions in western North America, eastern Russia and western Siberia.. Eastern North America, Europe and western Russia, and eastern Siberia were relatively warm. The warm region in western Russia gained much media coverage during July. The Southern Hemisphere experienced smaller regional temperature contrasts than the Northern Hemisphere, but was in general relatively cold. Especially South America experienced below average temperatures.

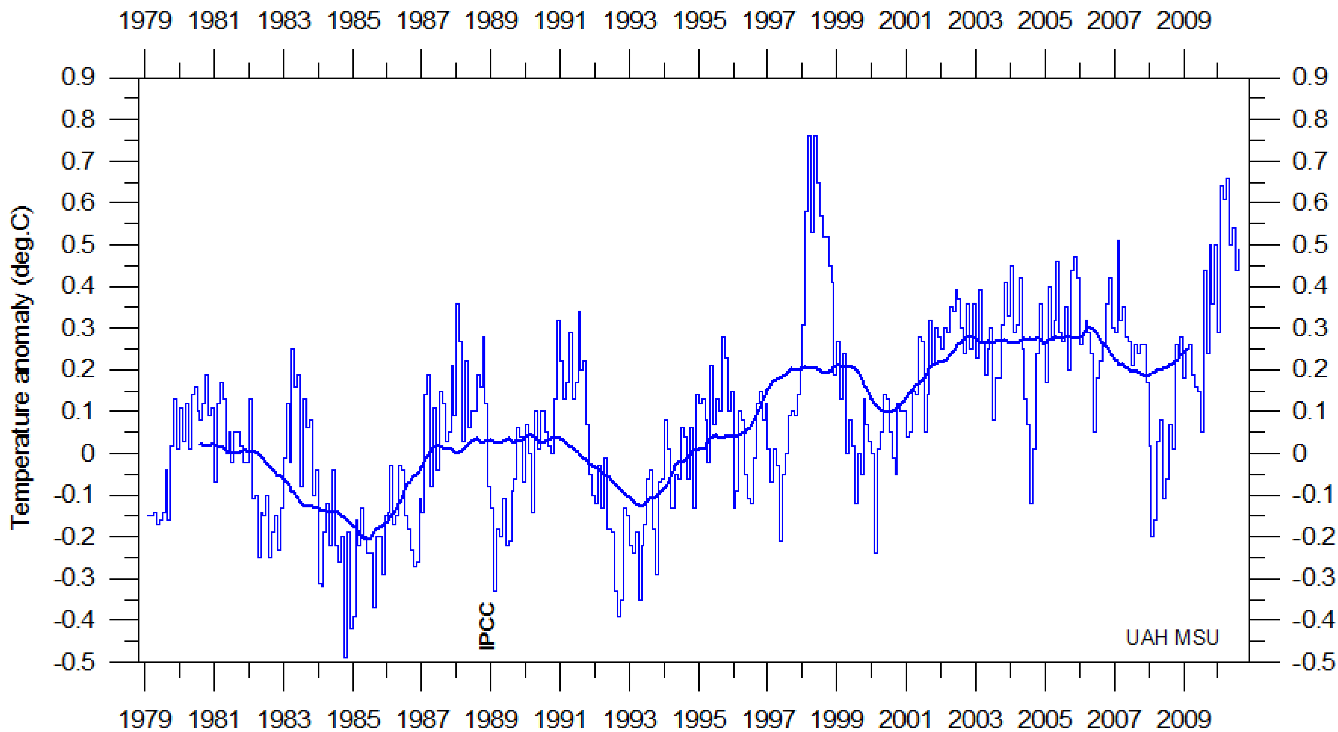
Conditions near Equator were influenced by the end of the previous El Niño in the Pacific Ocean. Relatively low temperatures therefore characterised the Equatorial regions of the Pacific in July 2010. Other Equatorial regions were close to average conditions 1998-2006. Central Africa was relatively cold, but the southern part of Africa was relatively warm. Australia was divided into a relatively warm northern part and a relatively cold southern part. Also New Zealand was relatively cold.

In the Arctic relatively low temperatures characterised the Europe-Russia and Alaska sectors, while relatively high temperatures characterised the Canadian-Greenland and eastern Siberia sectors.

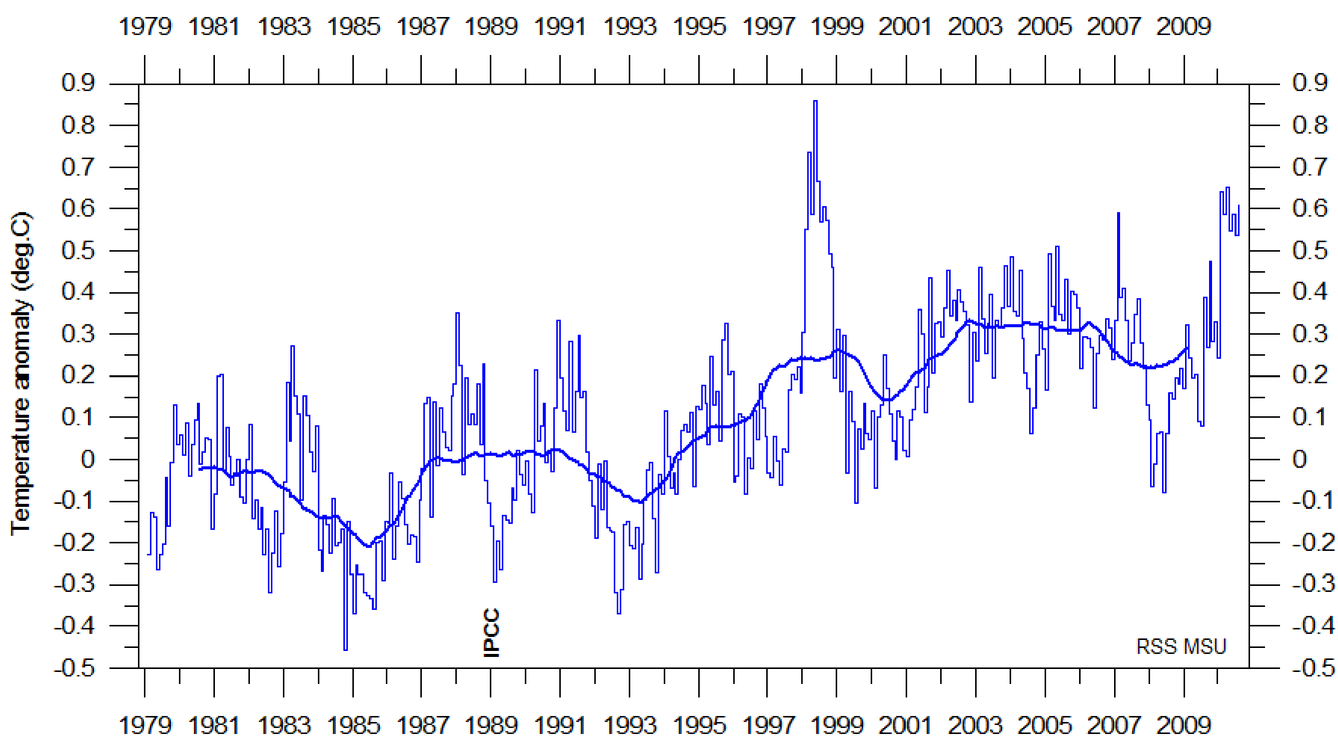
In the Antarctic relatively cold conditions characterised most of the East Antarctic, while West Antarctic and the Peninsula was relatively warm.

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

[Lower troposphere temperature from satellites, updated to July 2010]

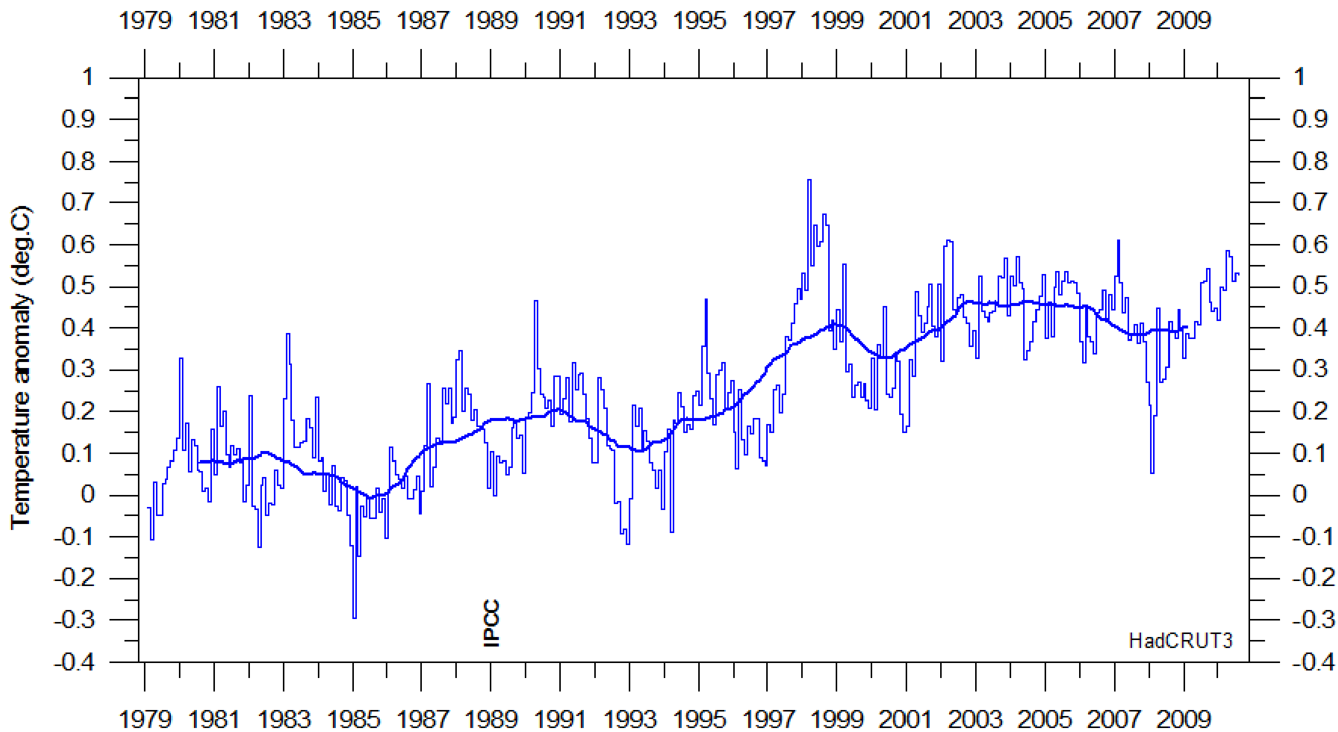


Global monthly average lower troposphere temperature (thin line) since 1979 according to [University of Alabama] at Huntsville, USA. The thick line is the simple running 37 month average.

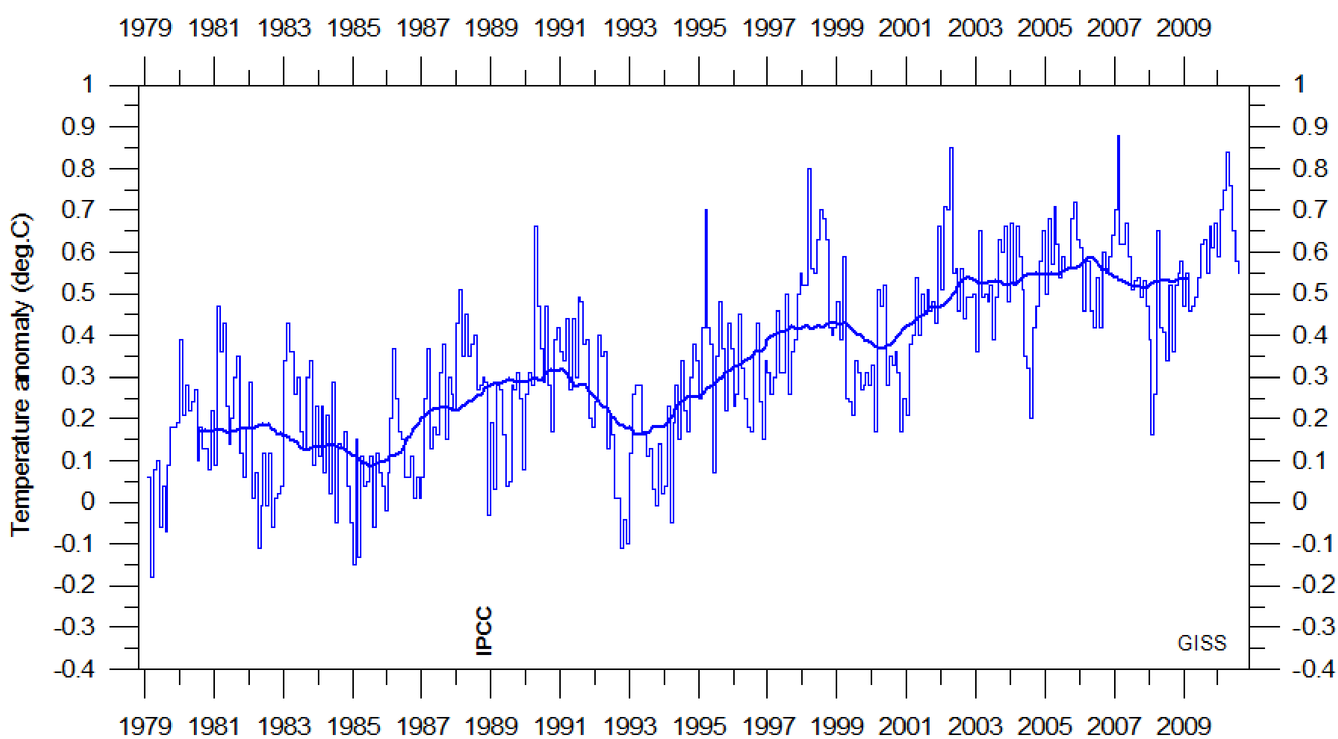


Global monthly average lower troposphere temperature (thin line) since 1979 according to according to [Remote Sensing Systems](#) (RSS), USA. The thick line is the simple running 37 month average.

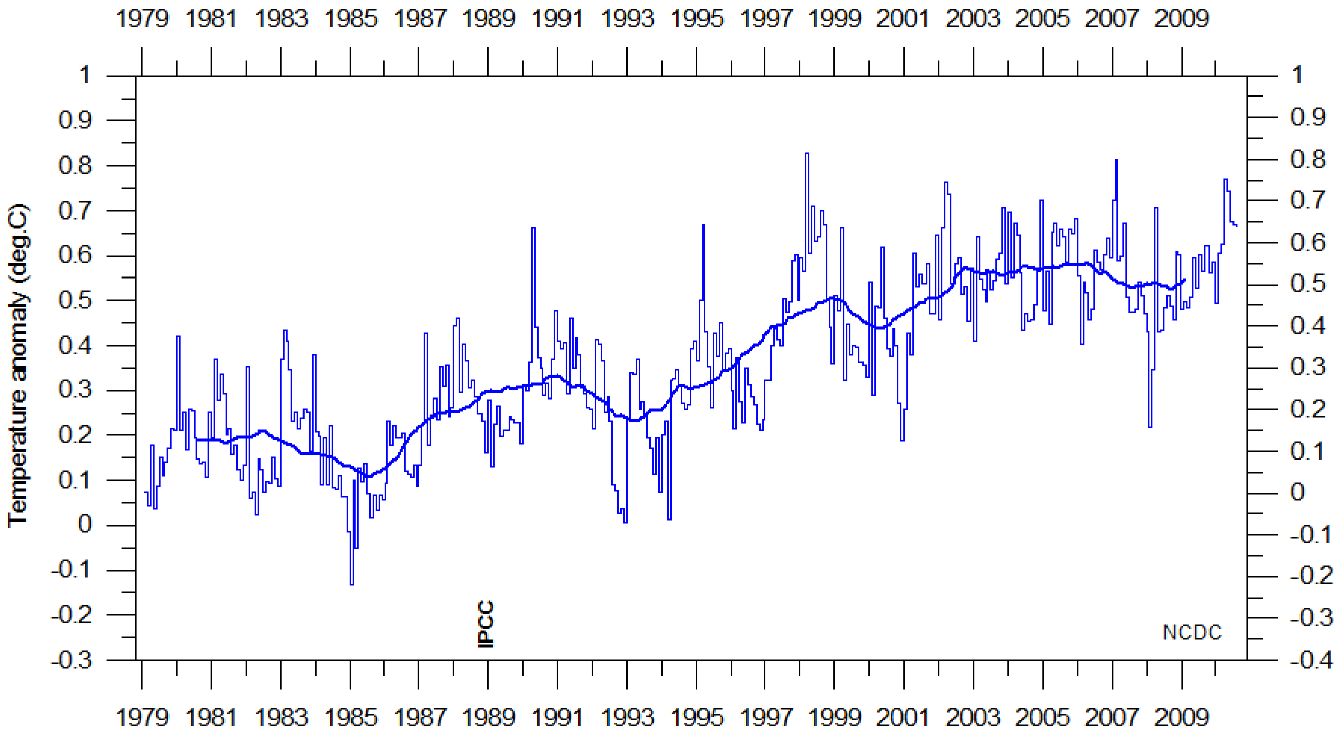
[Global surface air temperature, updated to July 2010](#)



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.



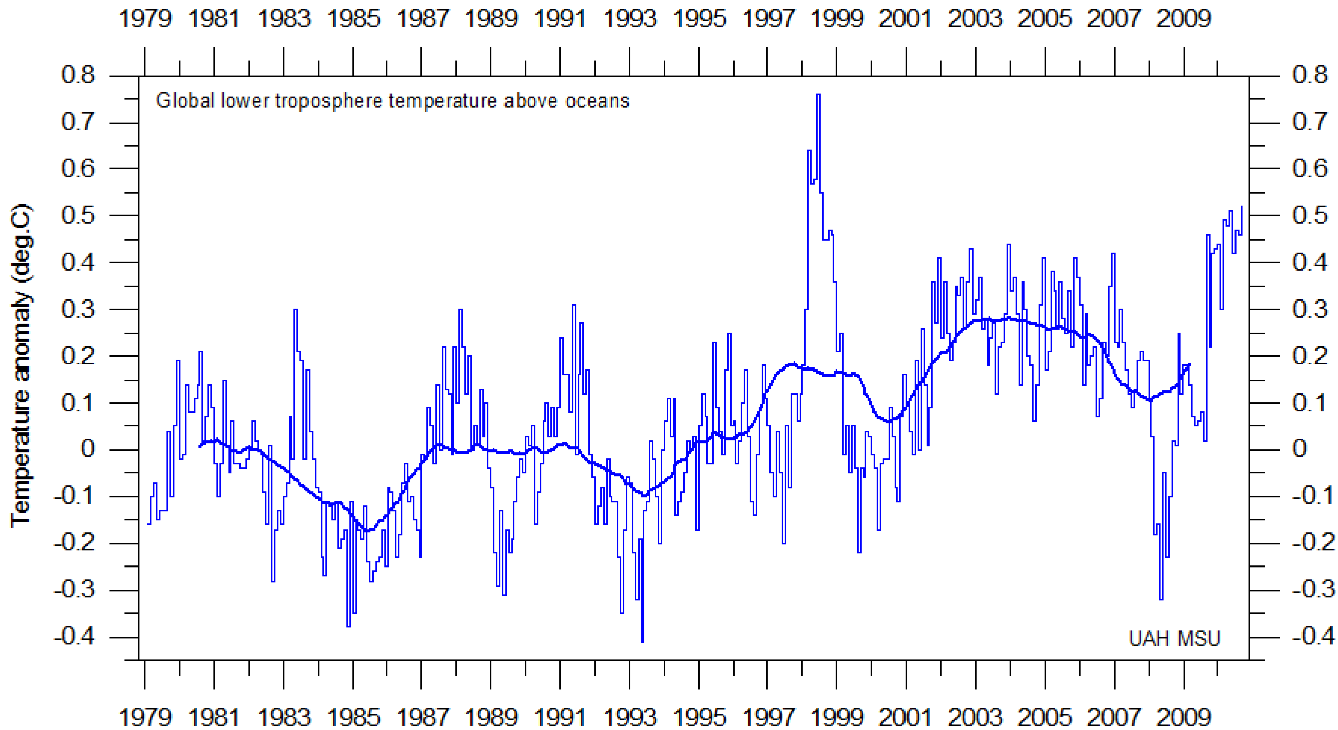
Global monthly average surface air temperature (thin line) since 1979 according to according to the [Goddard Institute for Space Studies](#) (GISS), at Columbia University, New York City, USA. The thick line is the simple running 37 month average.



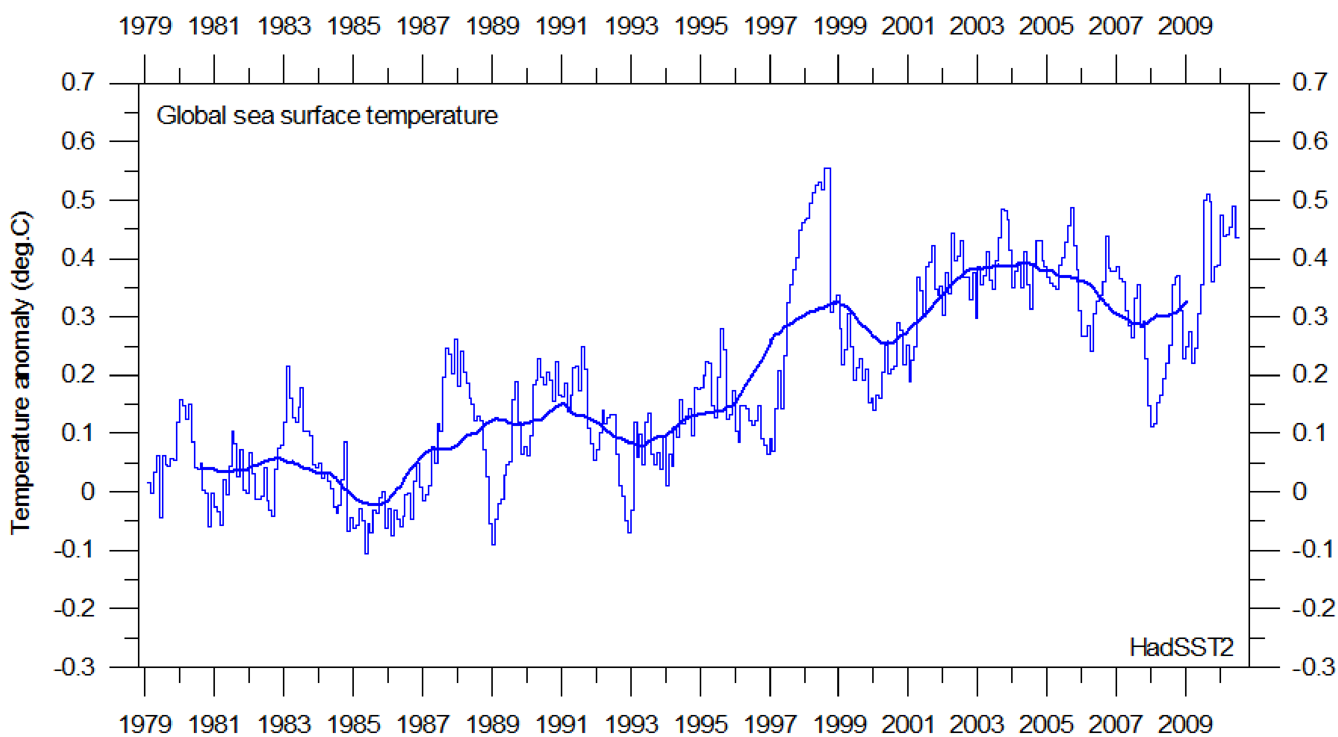
Global monthly average surface air temperature since 1979 according to according to the [National Climatic Data Center](#) (NCDC), USA. The thick line is the simple running 37 month average.

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).

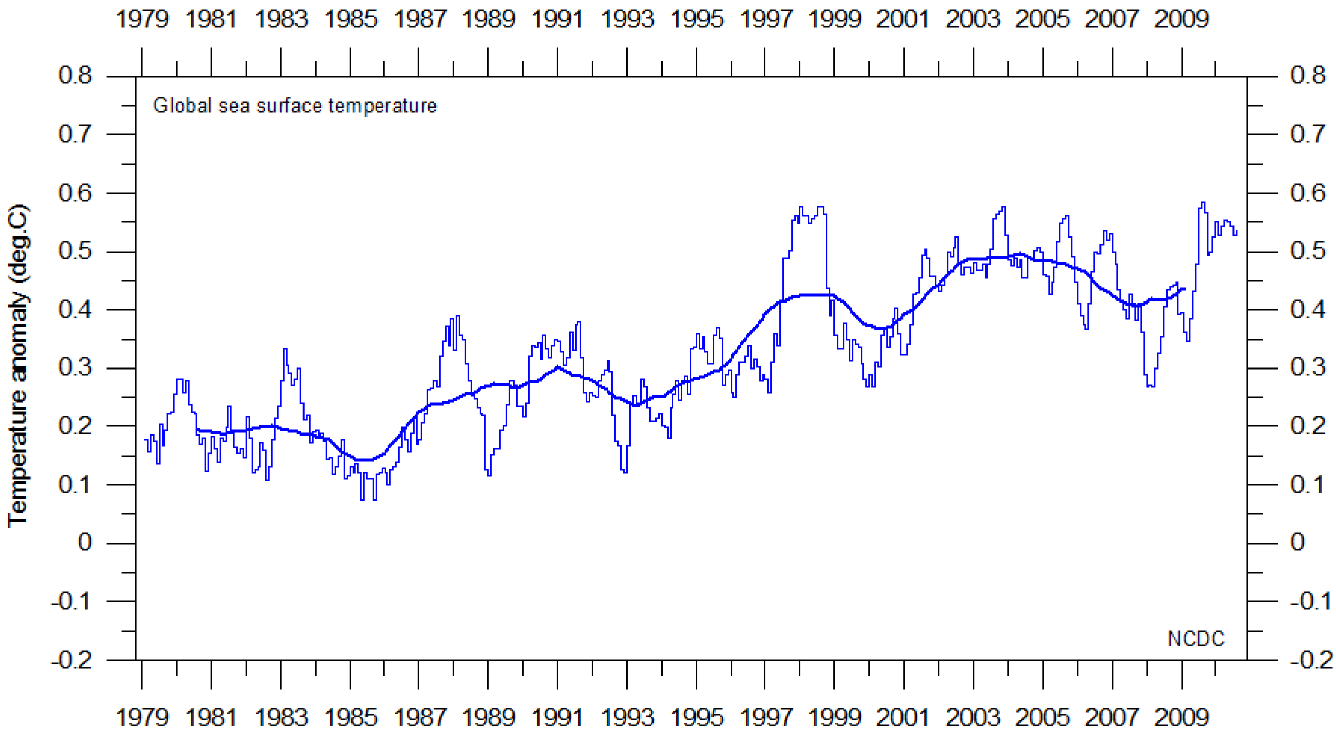
Global sea surface temperature, updated to July 2010



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.

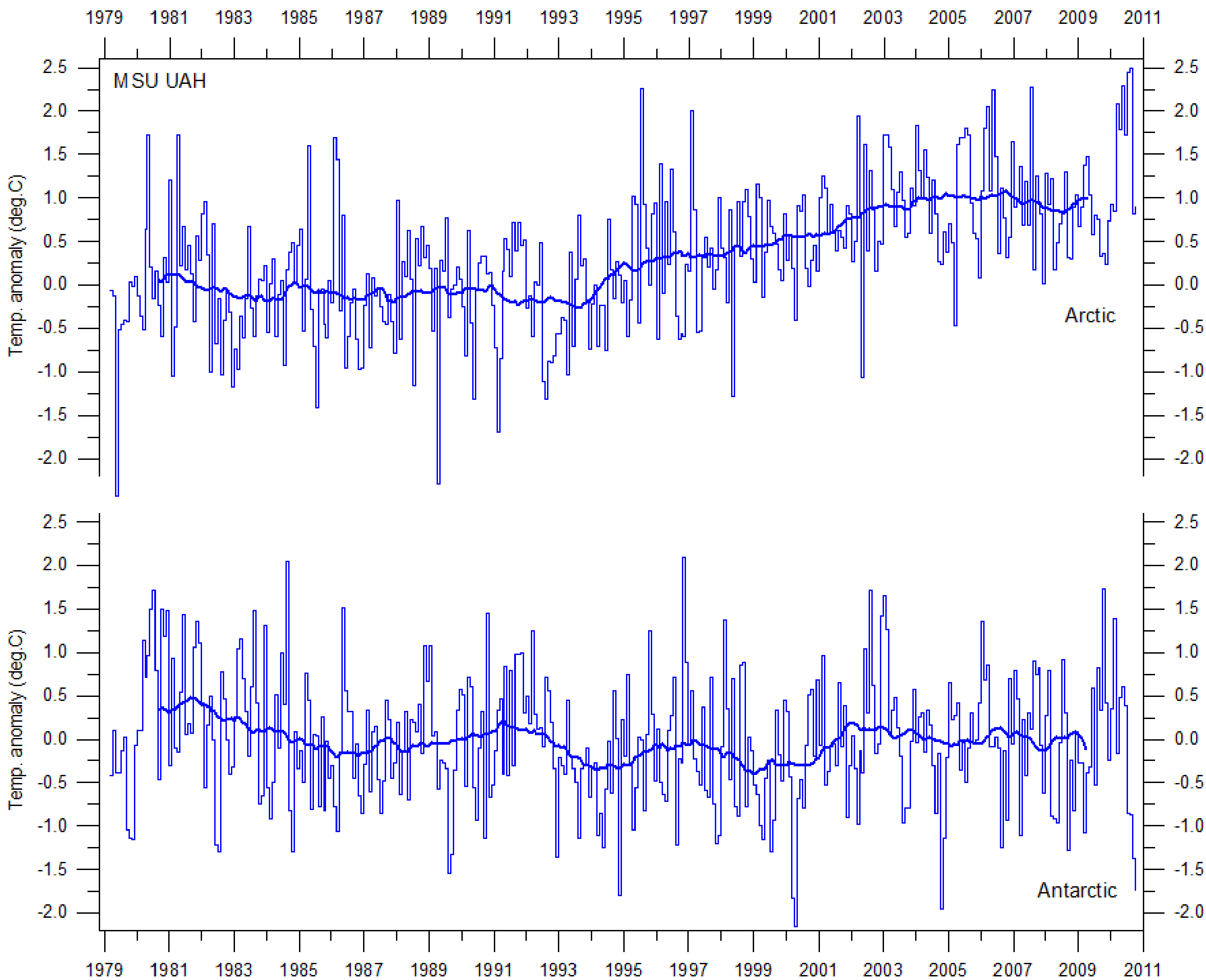


Global monthly average sea surface temperature since 1979 according to University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK. Base period: 1961-1990. The thick line is the simple running 37 month average. Please note that this data series has not yet been updated beyond June 2010.



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 July 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 June 2010

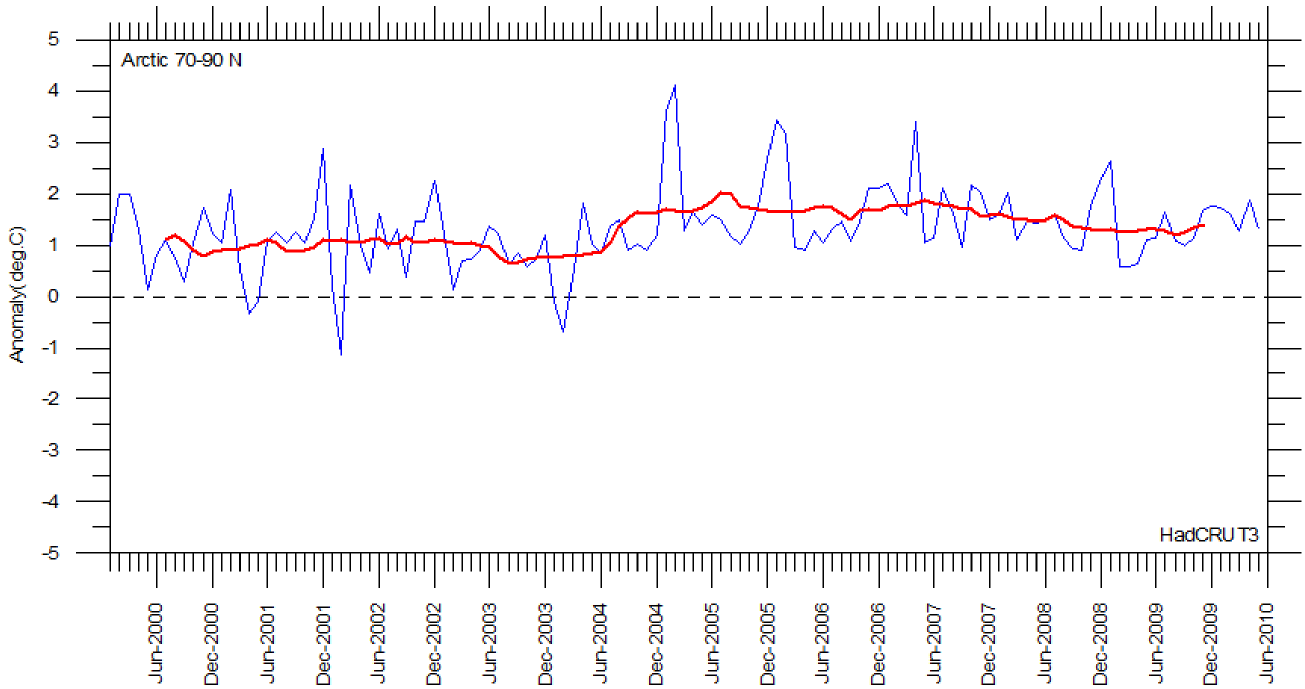


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre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

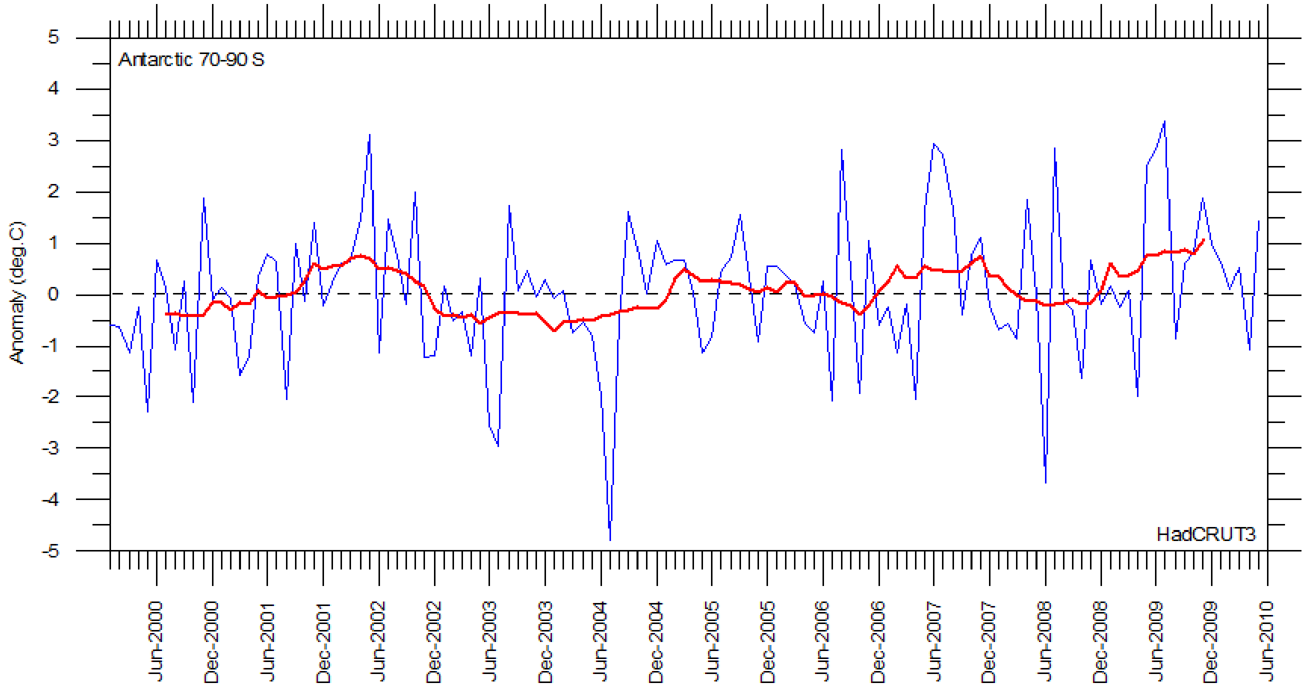


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley 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 June 2010.

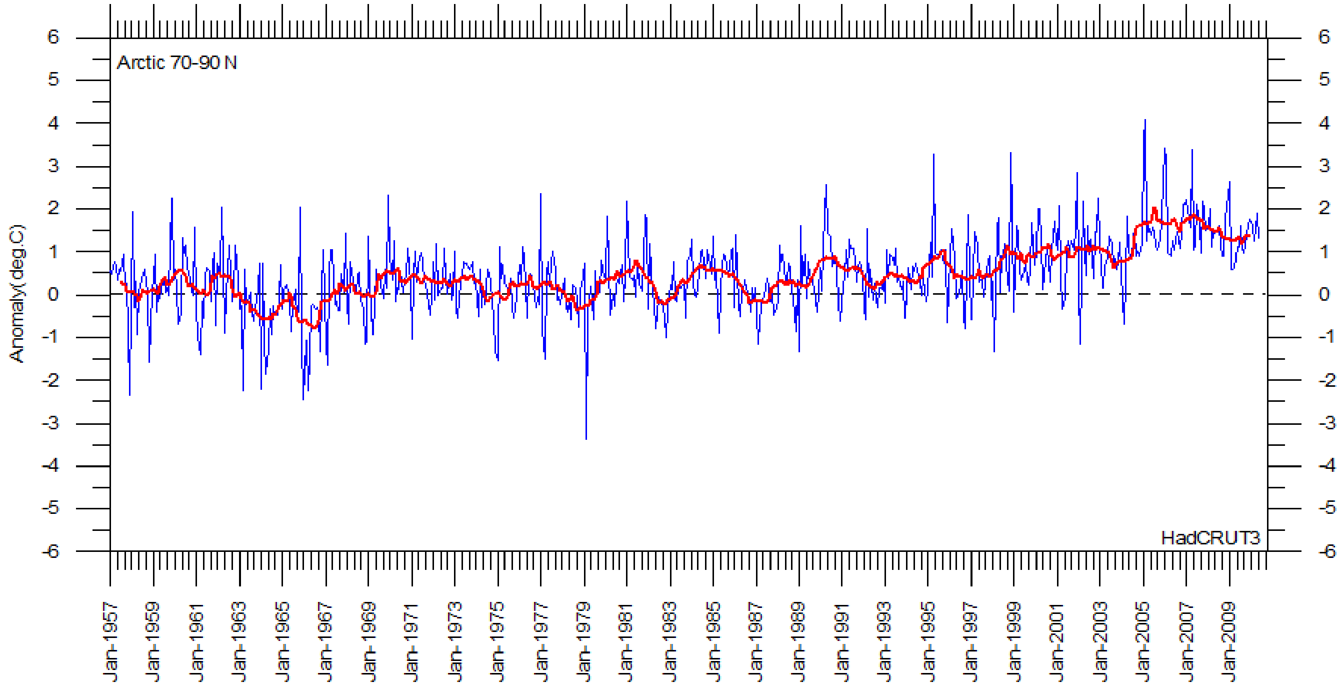


Diagram showing Arctic monthly surface air temperature anomaly 70-90^{o}N since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 has been chosen as starting year, to ensure easy comparison with the maximum length of the realistic Antarctic temperature record shown 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 June 2010.

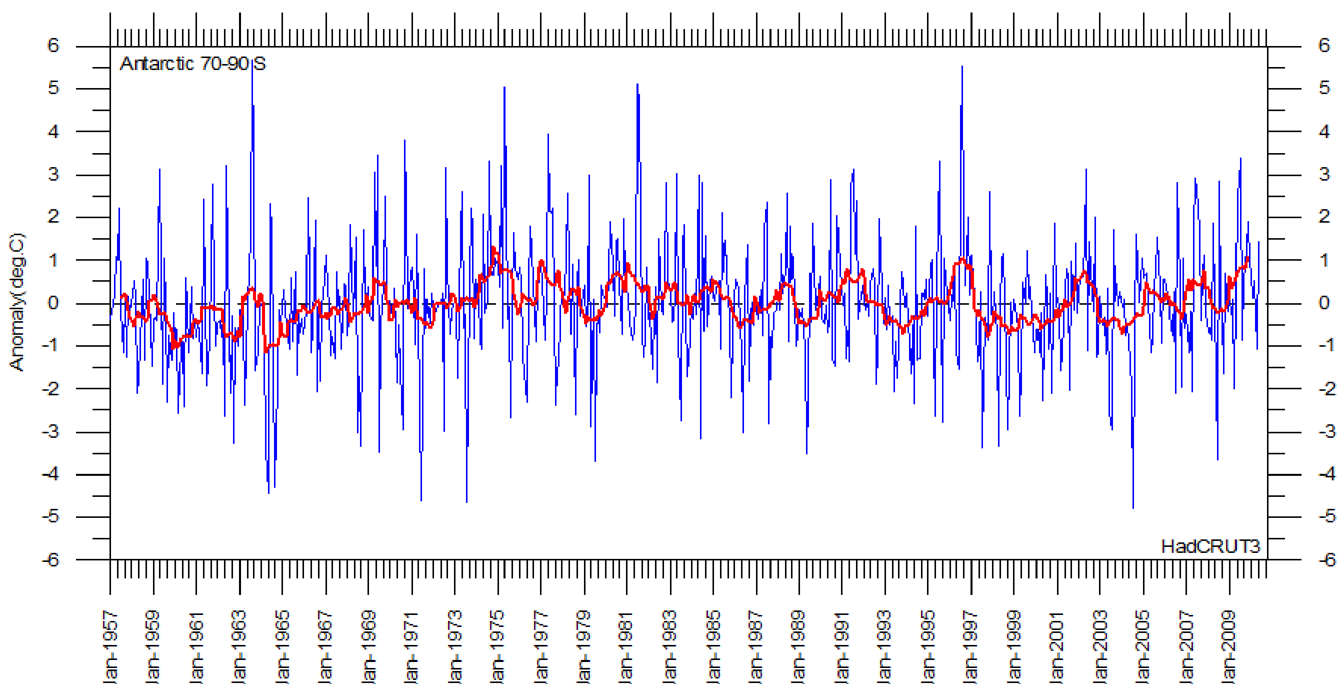


Diagram showing Antarctic monthly surface air temperature anomaly 70-90^{o}S since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 was an international geophysical year, and several meteorological stations were established in the Antarctic because of this. Before 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 June 2010.

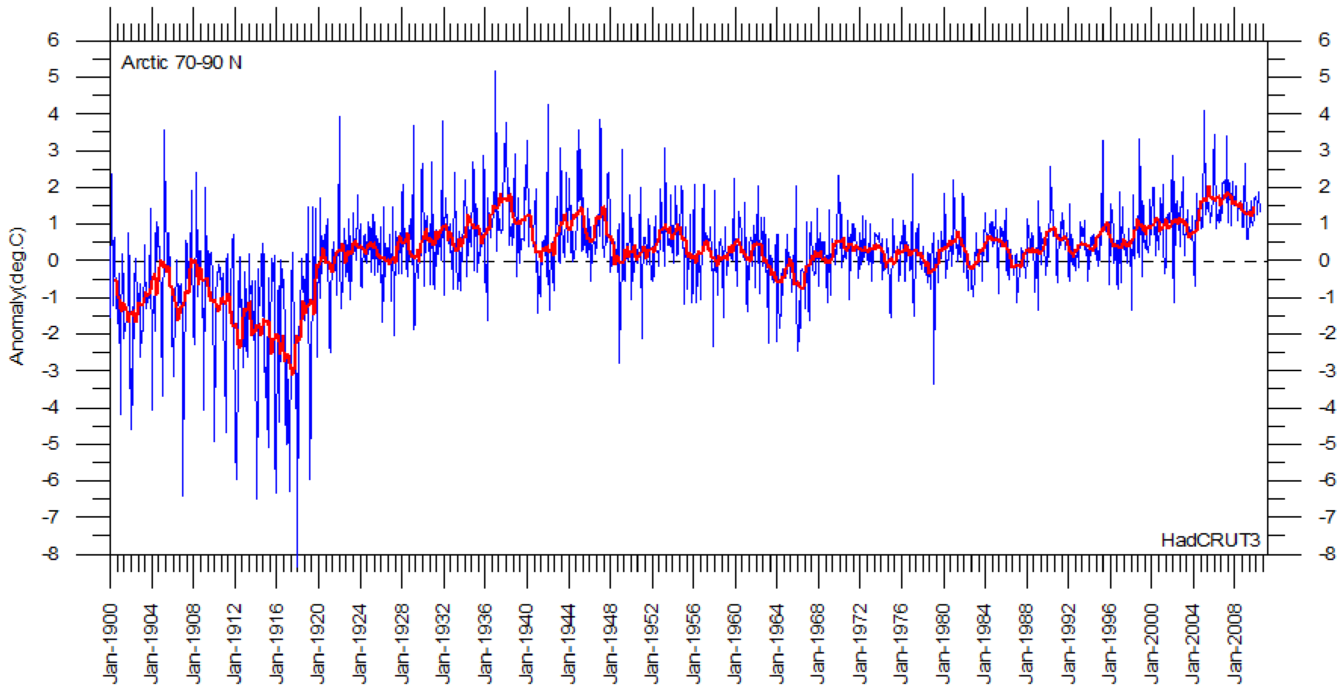


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1900, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. In general, the range of monthly 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. Please note that this data series has not yet been updated beyond June 2010.

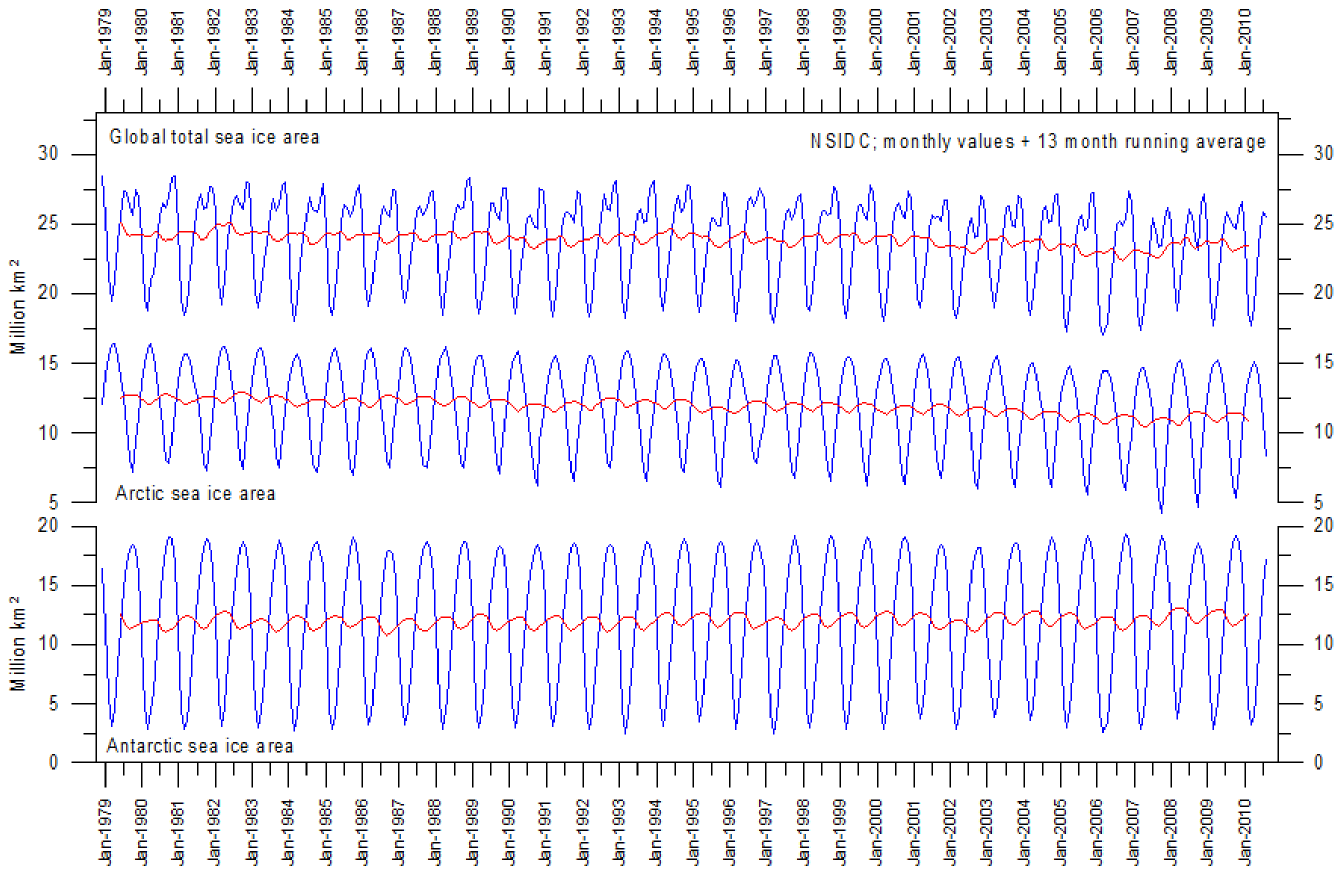
In general, the Arctic temperature record appears to be less variable than the contemporary Antarctic record, presumably at least partly due to the higher number of meteorological stations north of 70°N, compared to the number of stations south of 70°S.

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°x5° grid cell when calculating means, with no weighting by the areas of the grid dells.

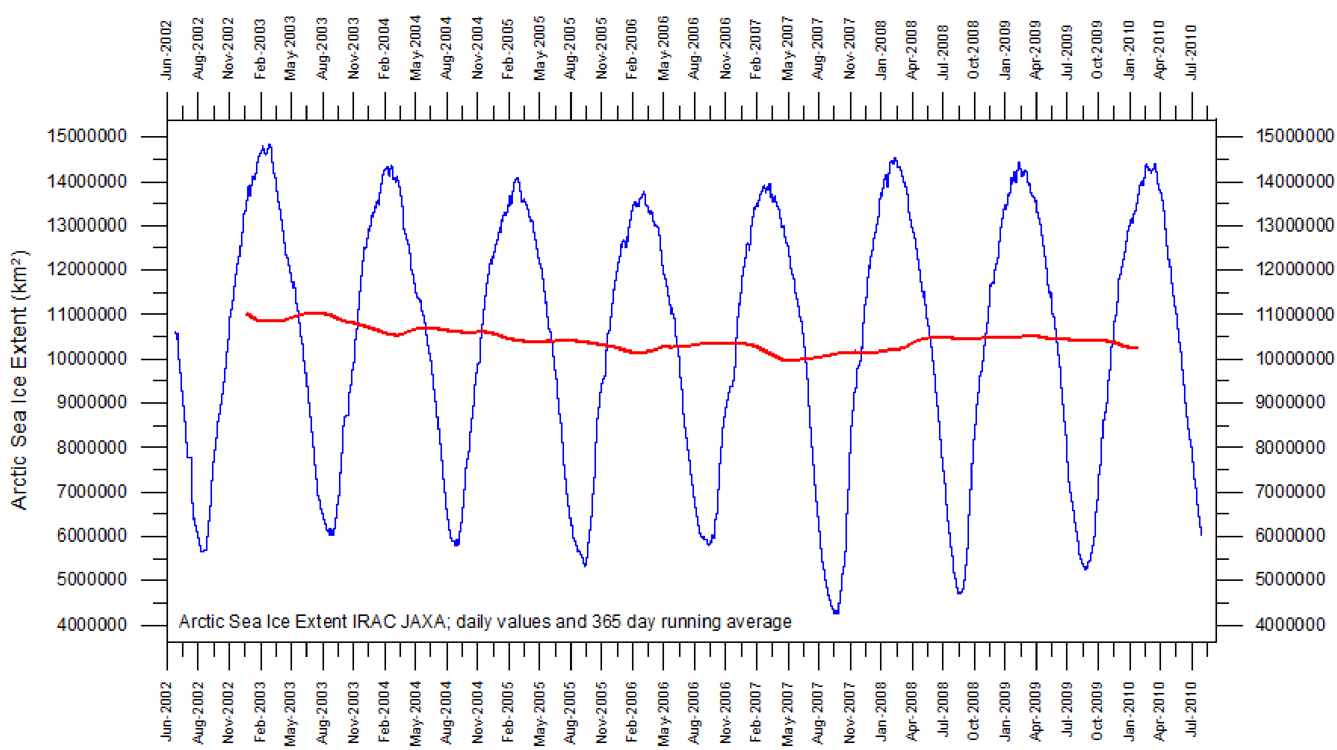
Litterature:

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 July 2010

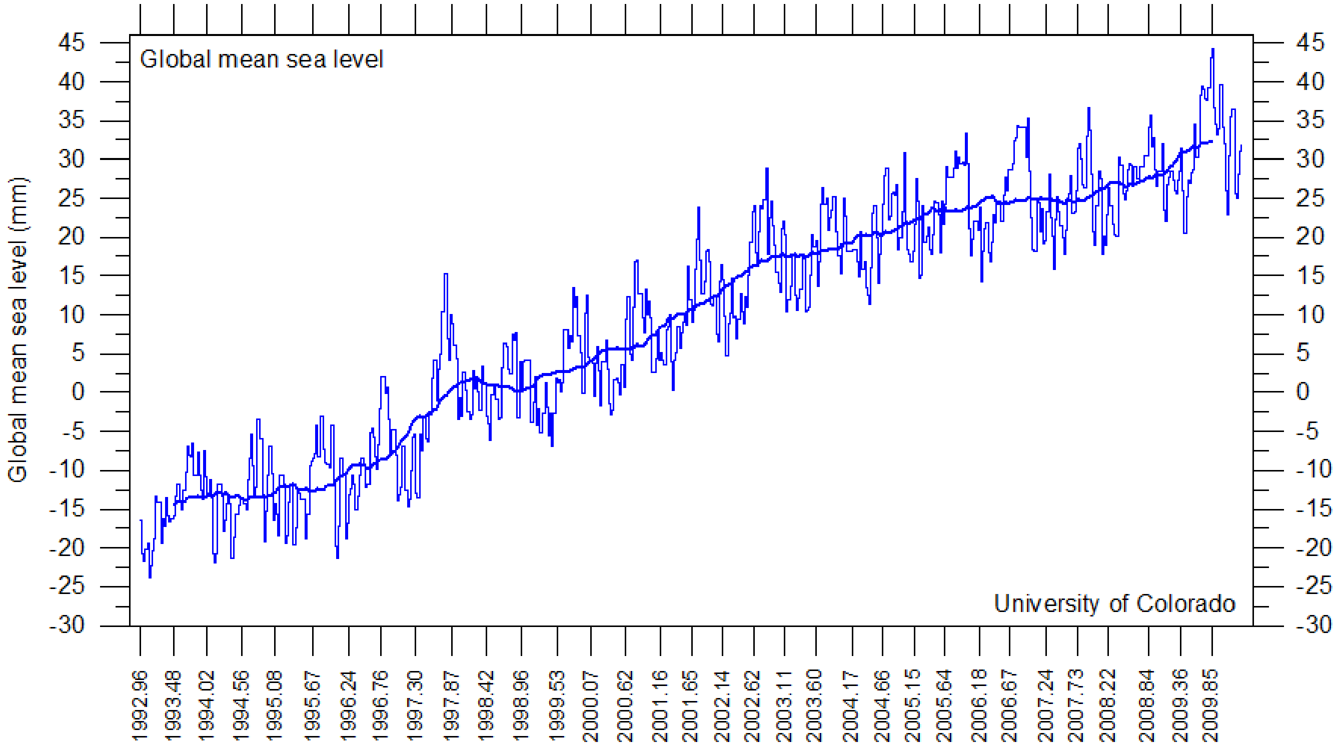


Graphs showing monthly Antarctic, Arctic and global sea ice extent since November 1978, according to the [National Snow and Ice data Center]() (NSIDC).

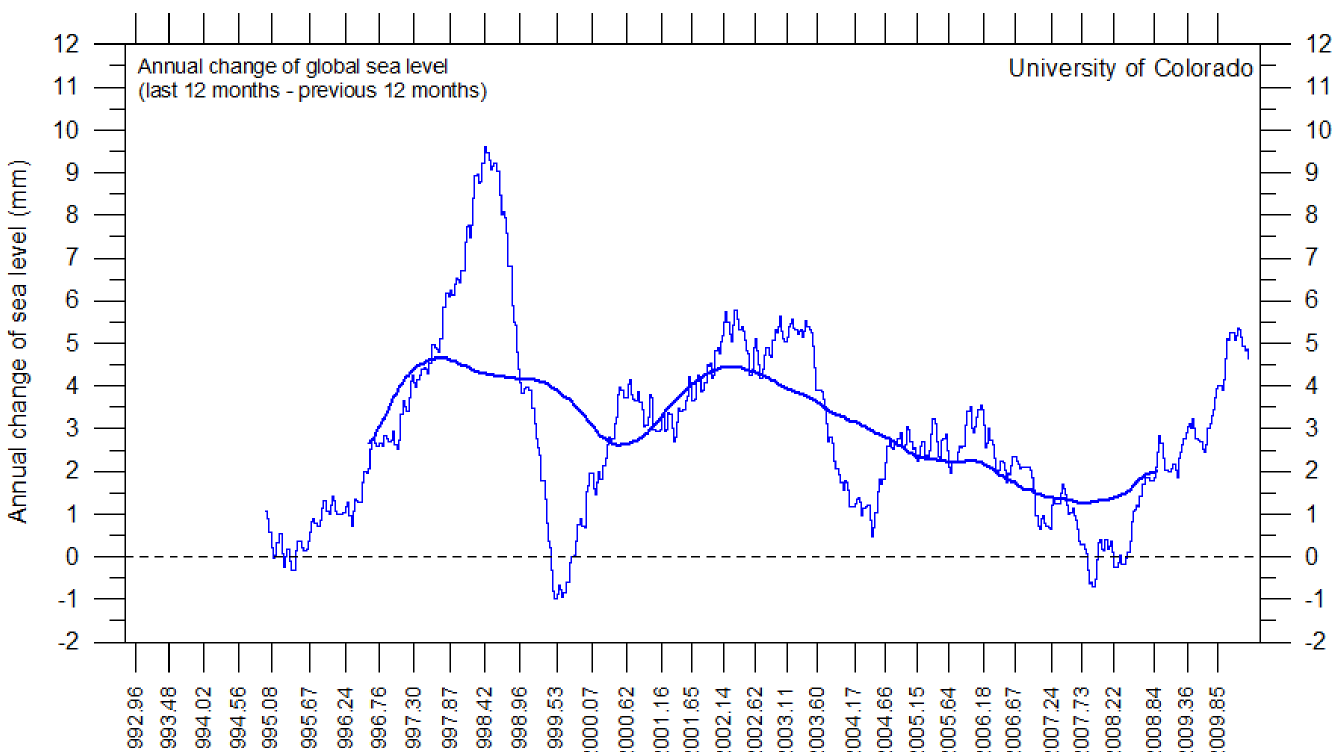


Graph showing daily Arctic sea ice extent since June 2002, to 14/08 2010, by courtesy of [Japan Aerospace Exploration Agency]() (JAXA).

Global sea level, updated to July 2010

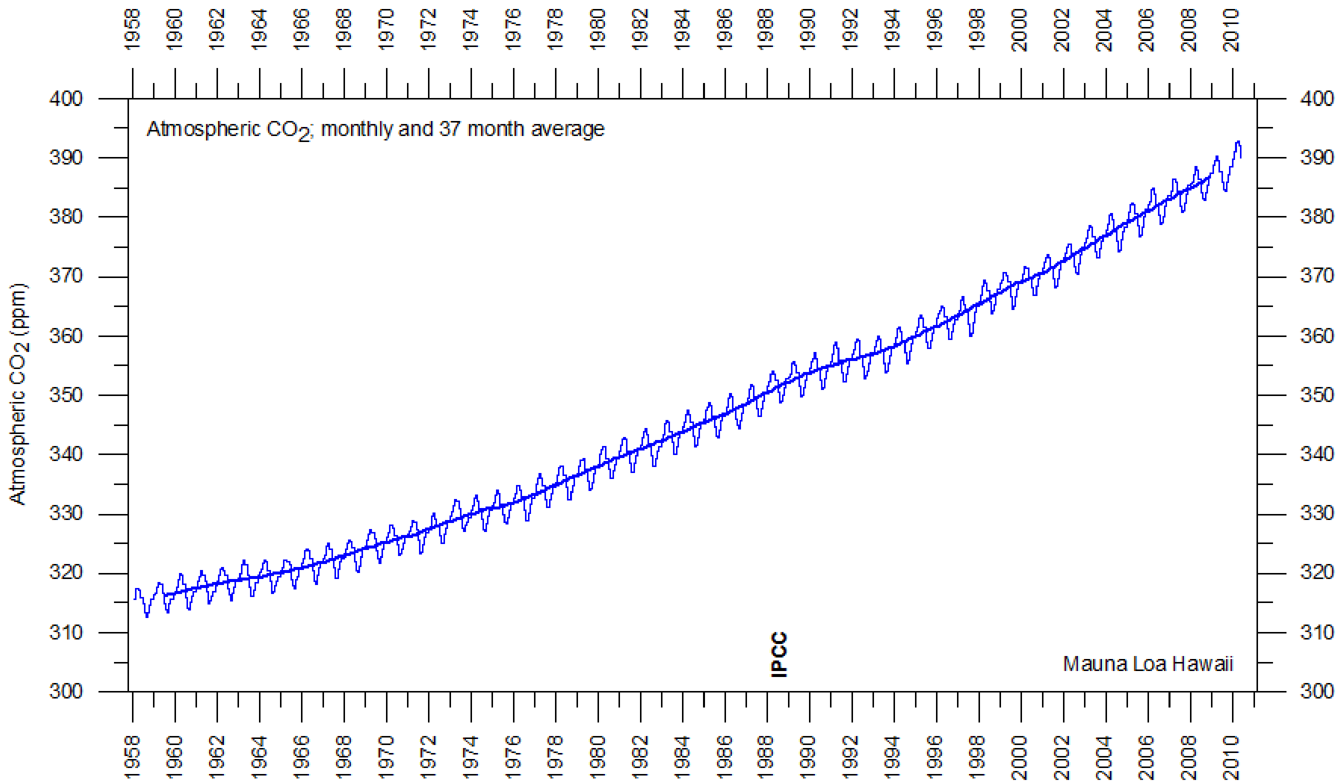


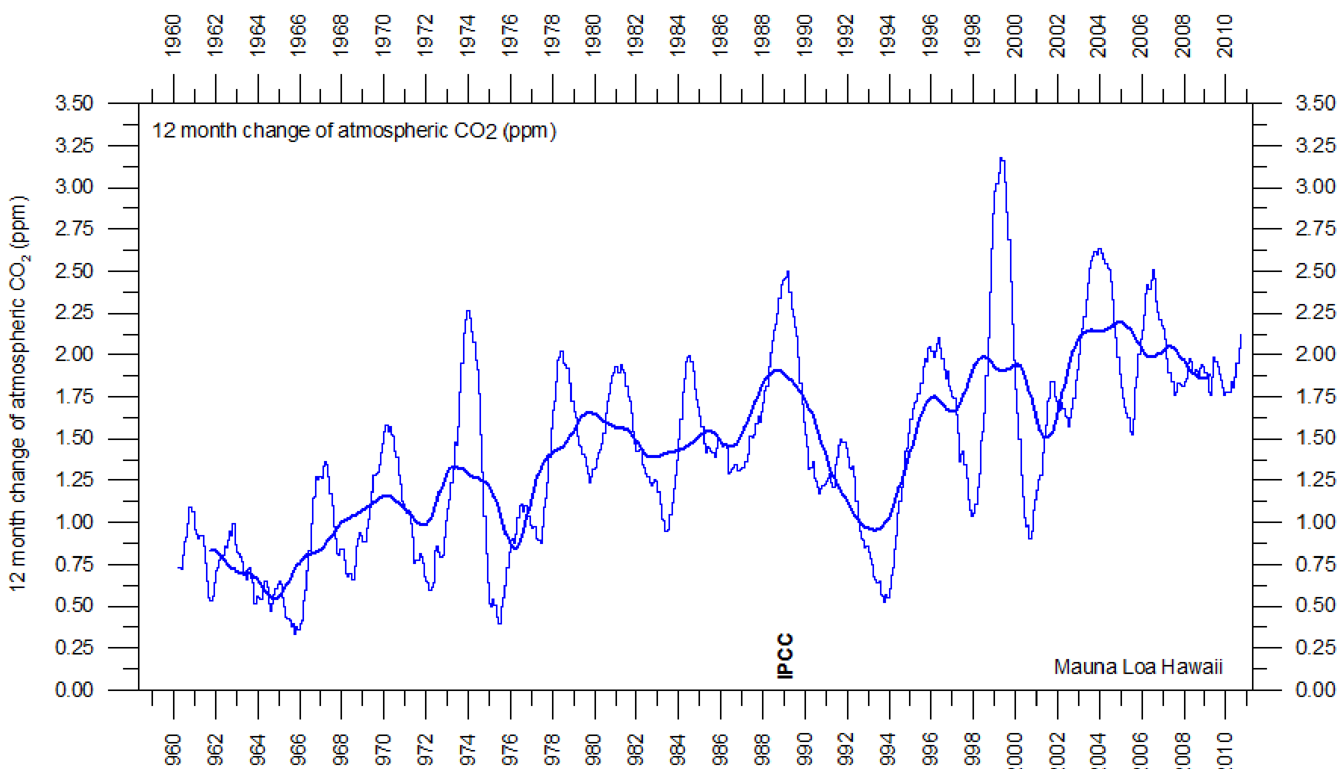
Globa lmonthly sea level since late 1992 according to the Colorado Center for Astrodynamics Research at [University of Colorado at Boulder](), USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.



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.

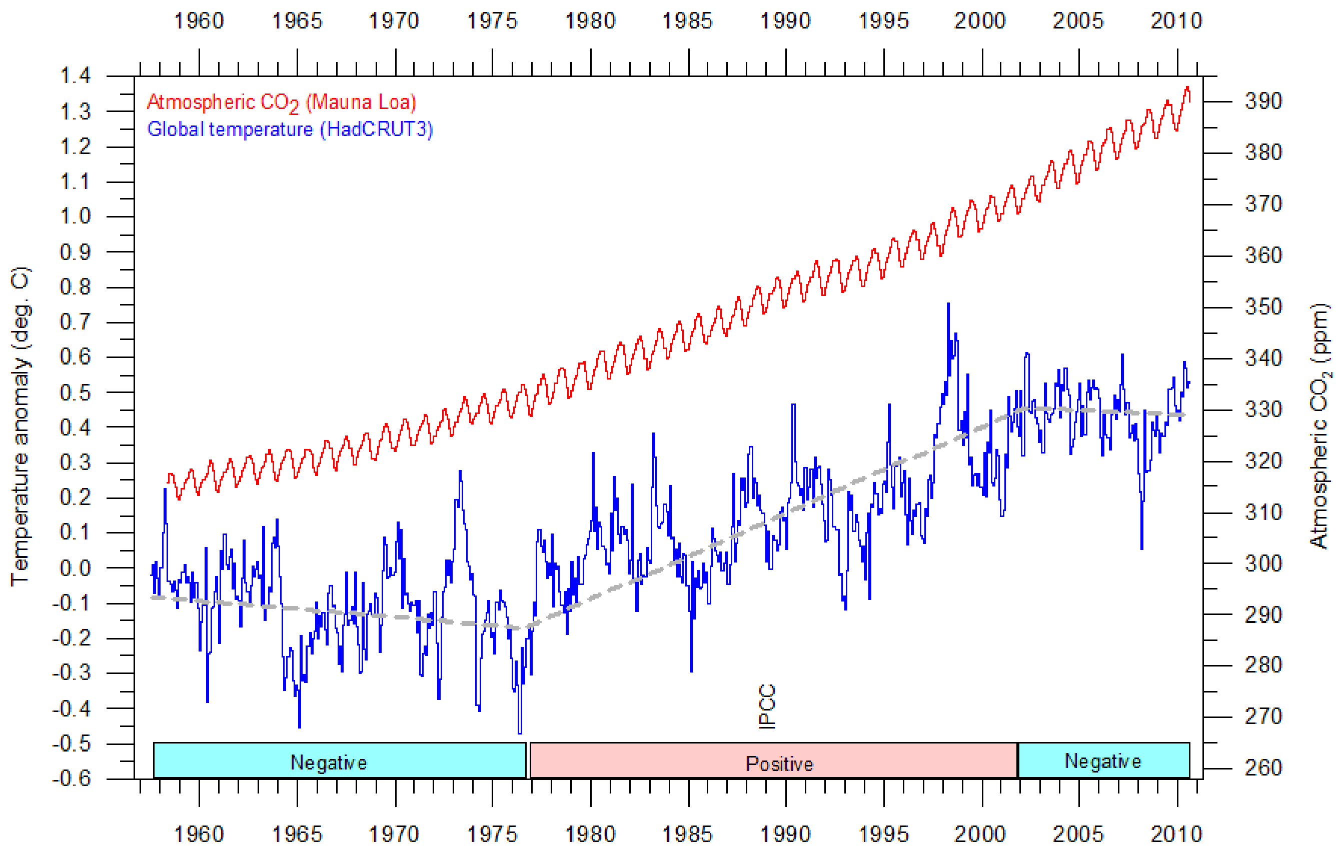
[Atmospheric CO_2, updated to July 2010]

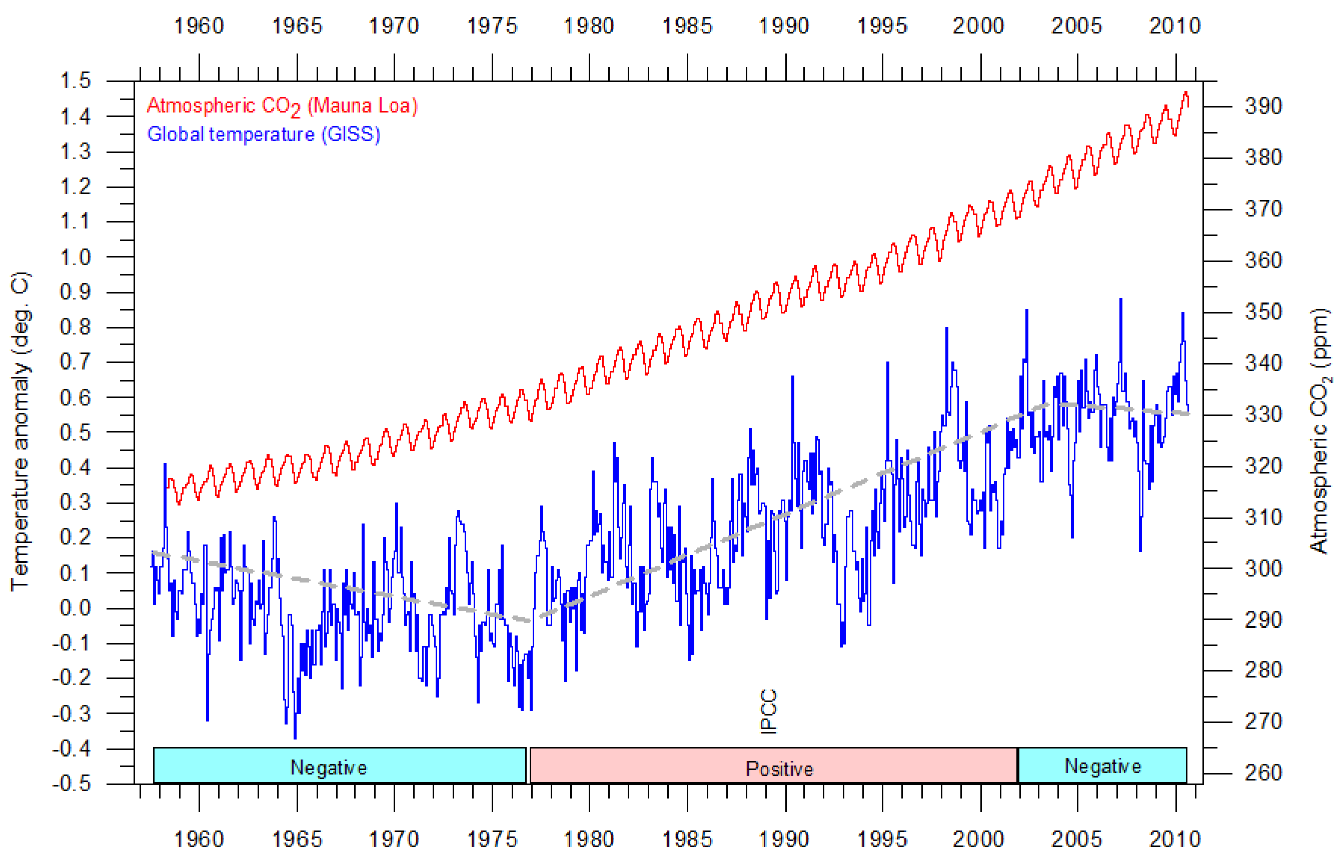


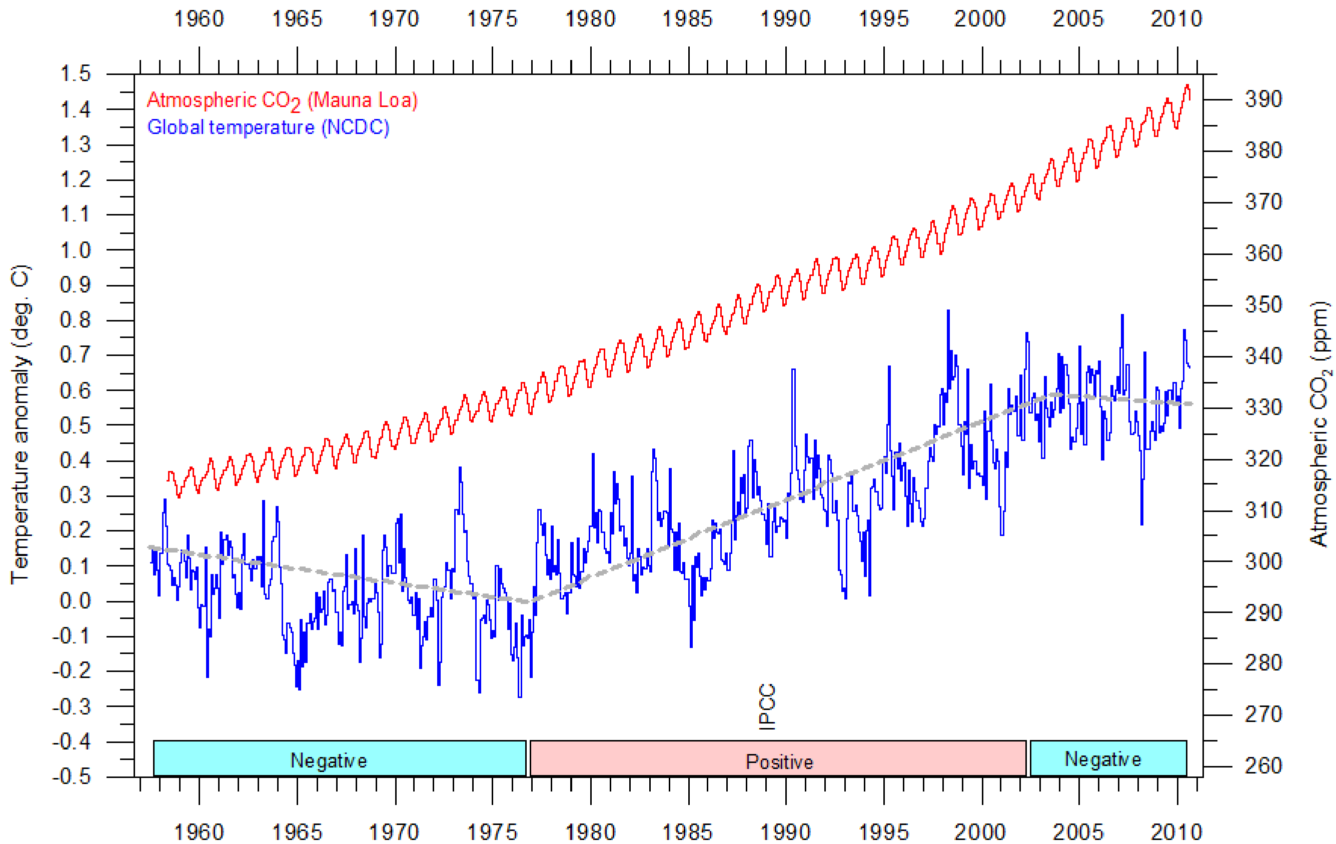


Monthly amount of atmospheric CO_2 (above) and annual growth rate (below; average last 12 months minus average preceding 12 months) of atmospheric CO_2 since 1959, according to data provided by the [Mauna Loa Observatory], Hawaii, USA. The thick line is the simple running 37 observation average, nearly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

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

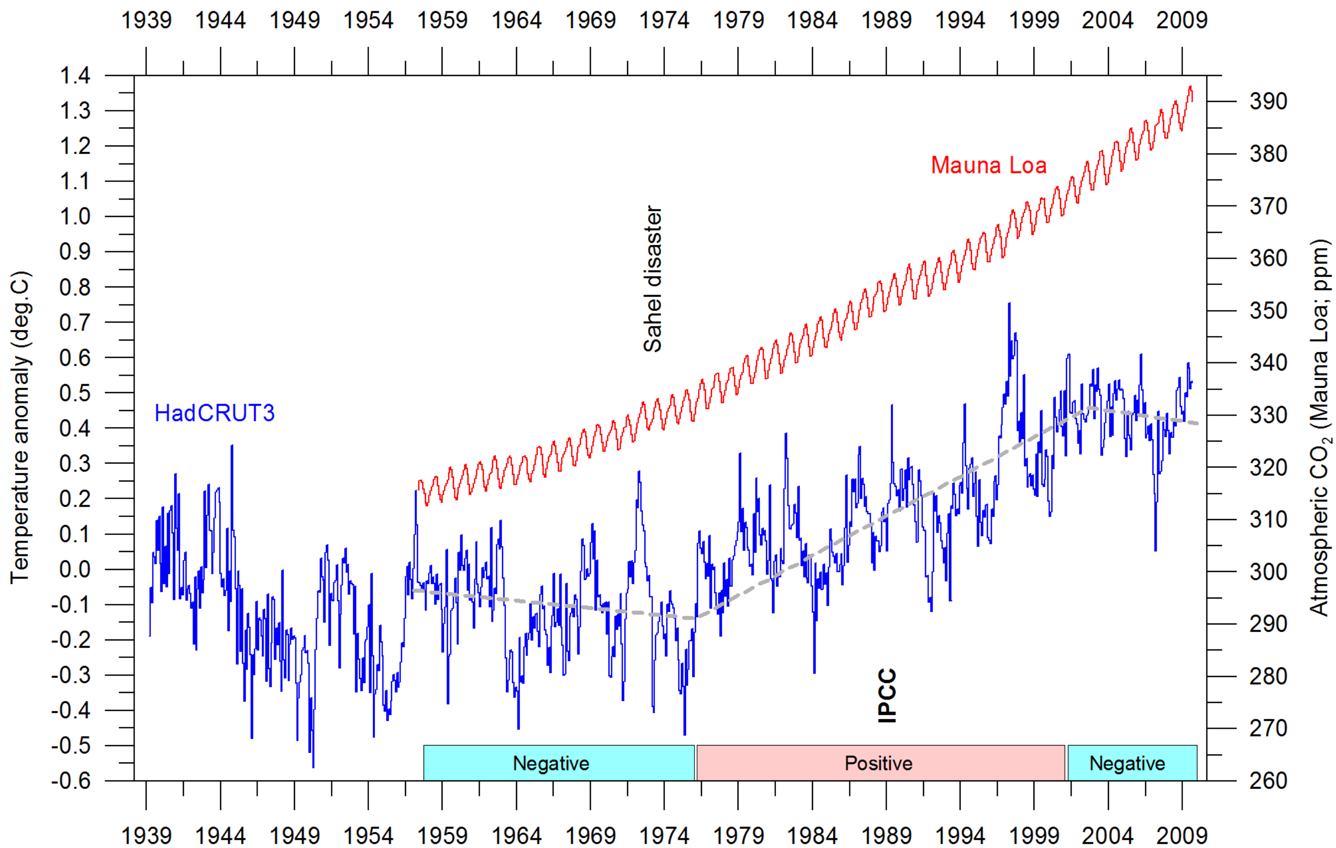
Most climate models assume the greenhouse gas carbon dioxide CO_2 to influence significantly upon global temperature. Thus, it is relevant to compare the different global temperature records with measurements of atmospheric CO_2, as shown in the diagrams above. Any comparison, however, should not be 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.

1972: The Sahel disaster



Diagrams showing HadCRUT3 monthly global surface air temperature estimate (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. 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.

The period of global cooling from about 1940 to about 1978 (see diagram above) which affected USSR severely (see Climate4you May 2010 Report), also had negative effects in other areas, especially in the Sahel region in North Africa, because of reduced precipitation. Also parts of India and China were experiencing precipitation below what was previously considered normal. The drought reached a climax in 1972 and 1973 in the Sahel region along the southern fringe of the Sahara desert zone, because of the overall tendency of all climate zones to move in direction of Equator during periods of global cooling, and vice versa in periods of global warming. The African monsoon, like that over India and southern Asia, represents the seasonal northward displacement of the convergence zone between the surface wind systems of both hemispheres, and the accompanying rains.

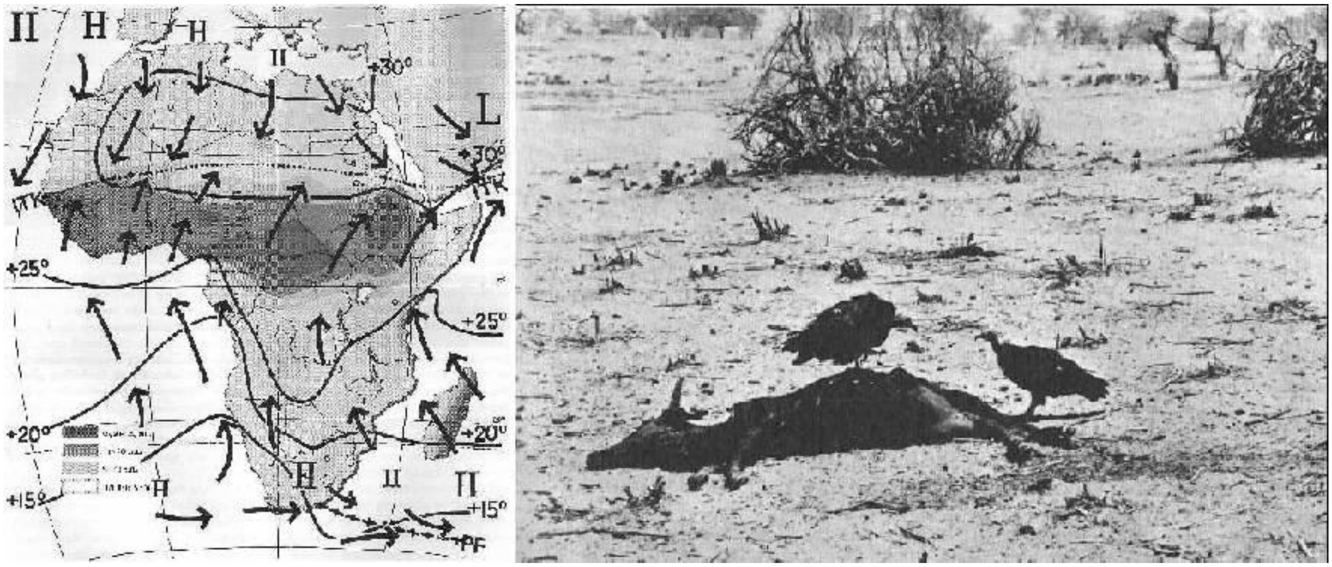
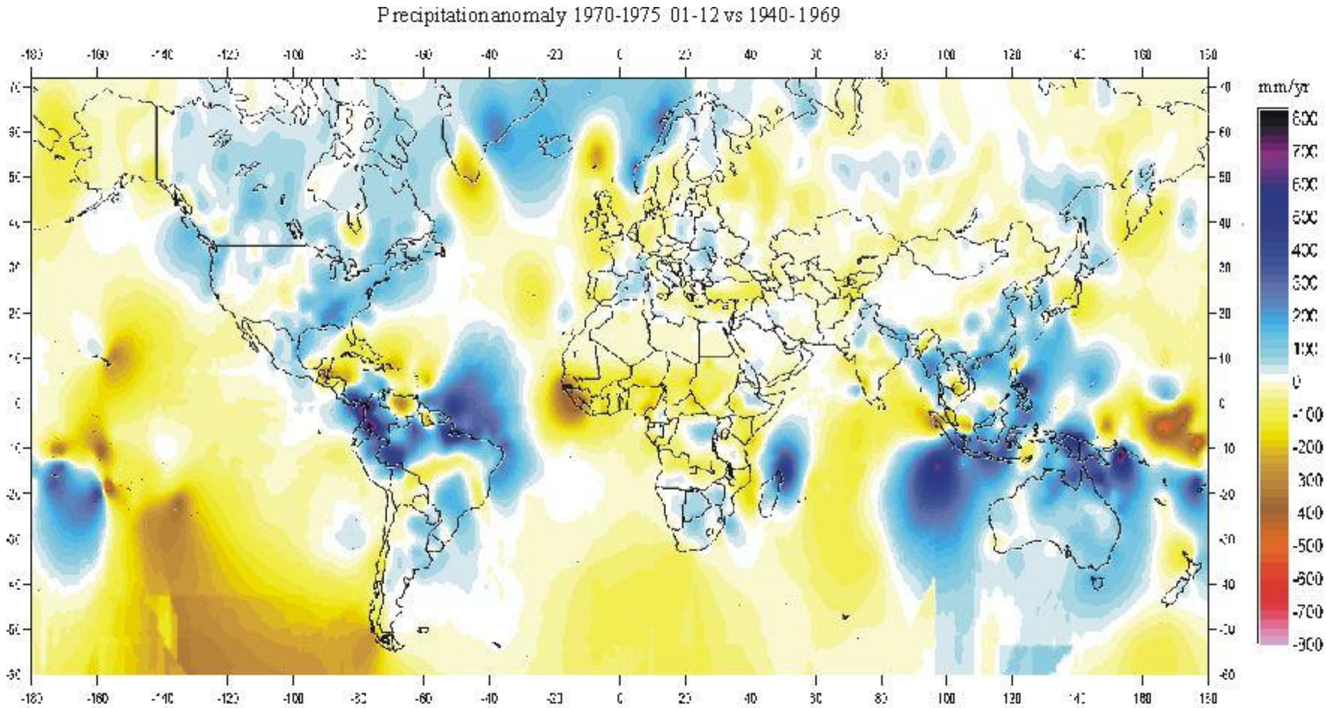


Diagram showing the average distribution of precipitation in Africa in July (left). Photo from Niger in the Sahel zone from the great drought of the 1970s (right).

The drought in the Sahel region had disastrous effects. An estimated 100,000 to 200,000 people and perhaps four million cattle died in the zone stretching across Africa from the Sahel in the west to Ethiopia in the east. There was also a mass migration of people leaving their homes and land, travelling southwards towards more humid regions, creating social stress in many countries. The important coffee harvest in Ethiopia, Kenya and the Ivory Coast and the harvest of ground nuts, sorghum and rice in Nigeria were also sharply reduced (Lamb 1995).

The social unrest and stress caused by the 1972-1973 drought and famine in North Africa seem to have had other repercussions. It may have been a contributing factor to the revolution which toppled the old imperial regime in Ethiopia. And in several leading scientific, technical and administrative institutions in many countries there was some confusion about how to interpret this climatic development and to revise attitudes to climate. Most immediately, the hopes that had been raised by the Green Revolution of being able to meet indefinitely the food demands of the world's rising population were seen to have been unrealistic optimistic.



Map showing the deviation of the average precipitation 1970-1975, compared to average conditions 1940-1969. 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. Precipitation scale in mm w.e. per year. Data source: NASA Goddard Institute for Space Studies *(GISS).*

It has been shown (Lamb 1977) that the behaviour of the monsoon over west Africa is related to the northern hemisphere westerlies in middle latitudes. In periods when blocking anticyclones (high pressure areas) or northerly winds over western and northern Europe especially in winter and spring divert a branch of the upper westerlies (the jet stream) and much of the cyclone activity into the Mediterranean, the monsoon commonly fails to penetrate so far north as usual, or is late, over west Africa and elsewhere south of the Sahara. In such years the zone across Africa from Senegal and the Sahel to Ethiopia is liable to be stricken by drought.

References:

Lamb, H.H. 1977. Climate, present, past and future. Volume 2. Climatic history and the future. Methuen & Co Ltd., London, 835 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)

20 August 2010.