Climate4you update February 2010

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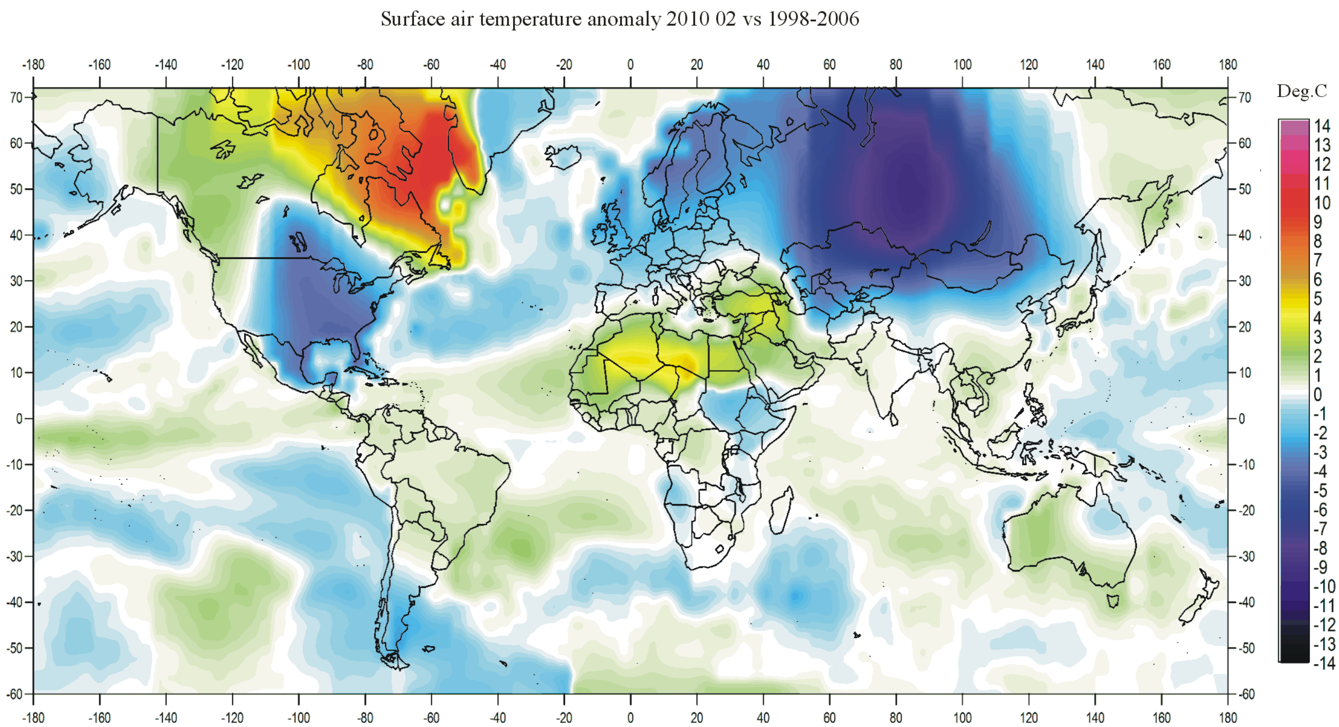
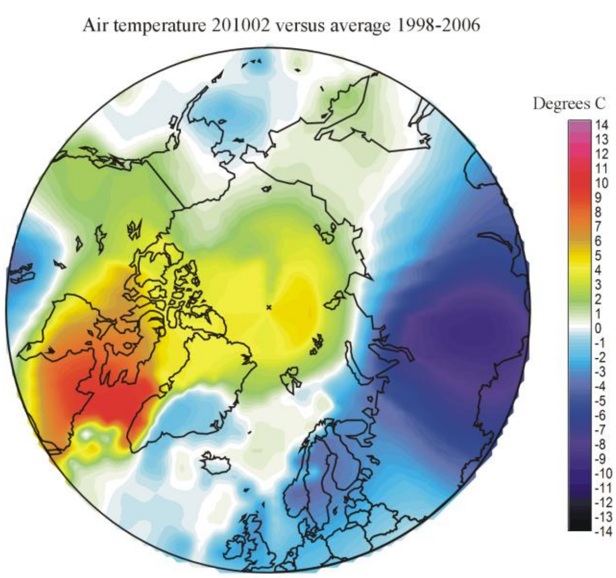
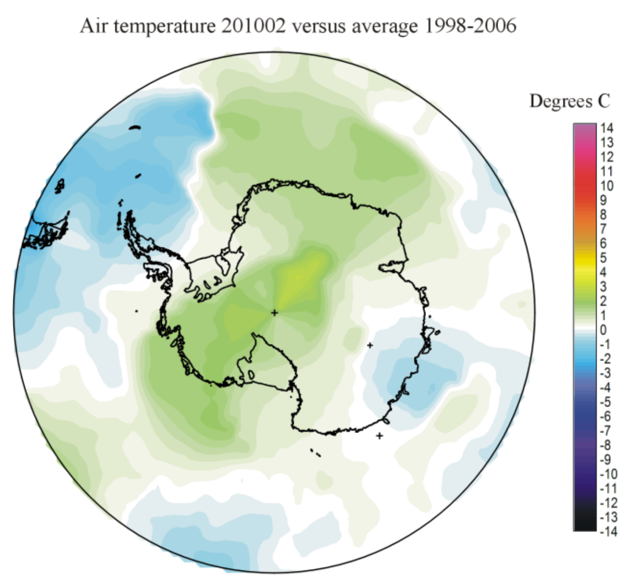
February 2010 global surface air temperature overview







February 2010 surface air temperature compared to the average for February 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 February 2010 global surface air temperature overview

This newsletter contains graphs showing a selection of key meteorological variables for February 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 February 2010 was characterised by varied conditions in the Northern Hemisphere, ranging from very cold to very warm conditions, while the Southern Hemisphere experienced less regional variation.

In the Northern Hemisphere extensive, cold areas covered Europe, Russia and western Siberia, Mongolia, northern China, East Greenland, Mexico, most of USA and parts of Canada. On the other hand, eastern Siberia, most of Canada with western and northern Greenland experienced high temperatures. As was the case for the two previous months, this situation was controlled by a strong Russian-Siberian High Pressure, extending west across parts of Europe. By this, Russia and Europe were exposed to the influence of cold and dry air masses from the east, while western and northern Greenland, most of Canada, and eastern Siberia were exposed to the influence of warm air masses advecting from lower latitudes.

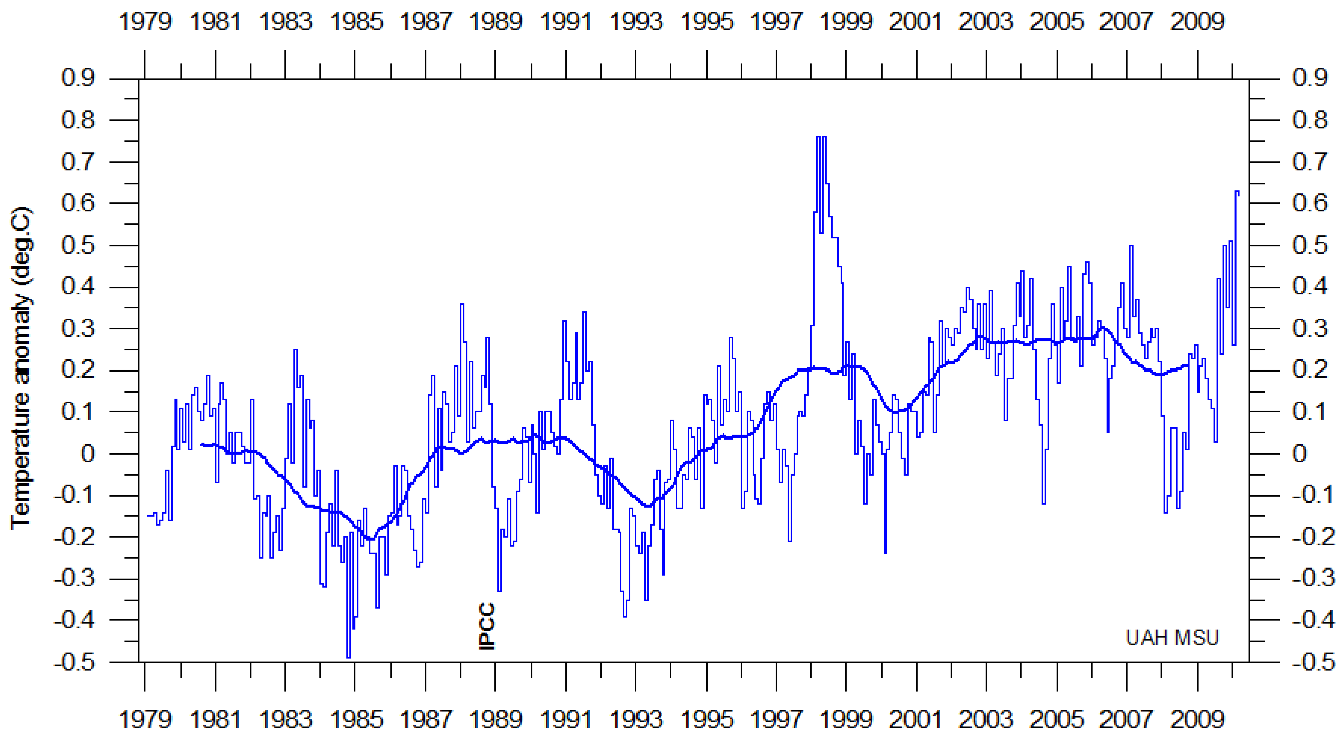
Conditions near Equator were influenced by the still ongoing El Niño in the Pacific Ocean. The atmospheric warming derived from this was partly offset by relatively cold conditions in the western Pacific. At the same time, however, relatively warm conditions extended from the Equatorial Atlantic across northern Africa into eastern Mediterranean. As these regions are located near the Equator, their surface area is considerable, and the effect on the global average surface temperature therefore significant.

In the Southern Hemisphere most areas experienced temperature conditions near the 1998-2006 average. Most of South America and Australia, however, experienced temperatures slightly above average.

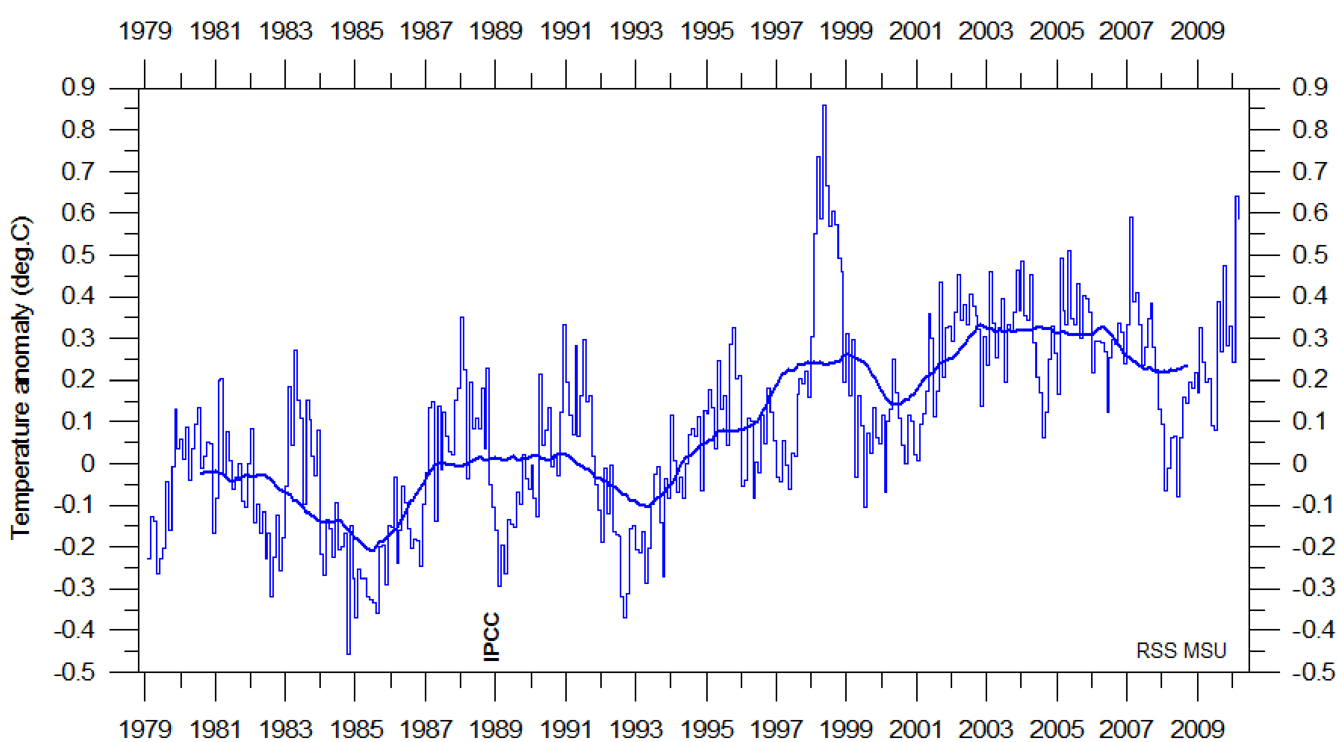
In the Arctic, East Greenland, the Nordic Countries, Russia and western Siberia all experienced relatively low temperatures. In contrast, western and northern Greenland together with most of Canada had temperatures above the 1998-2006 average. As mentioned above, this temperature pattern is at least partly explained by the high air pressure over Russia and Siberia.

In the Antarctic, the air temperature was generally somewhat above the 1998-2006 average, however, with the peninsula and parts of eastern Antarctica experiencing relatively low temperatures.

Lower troposphere temperature from satellites, updated to February 2010

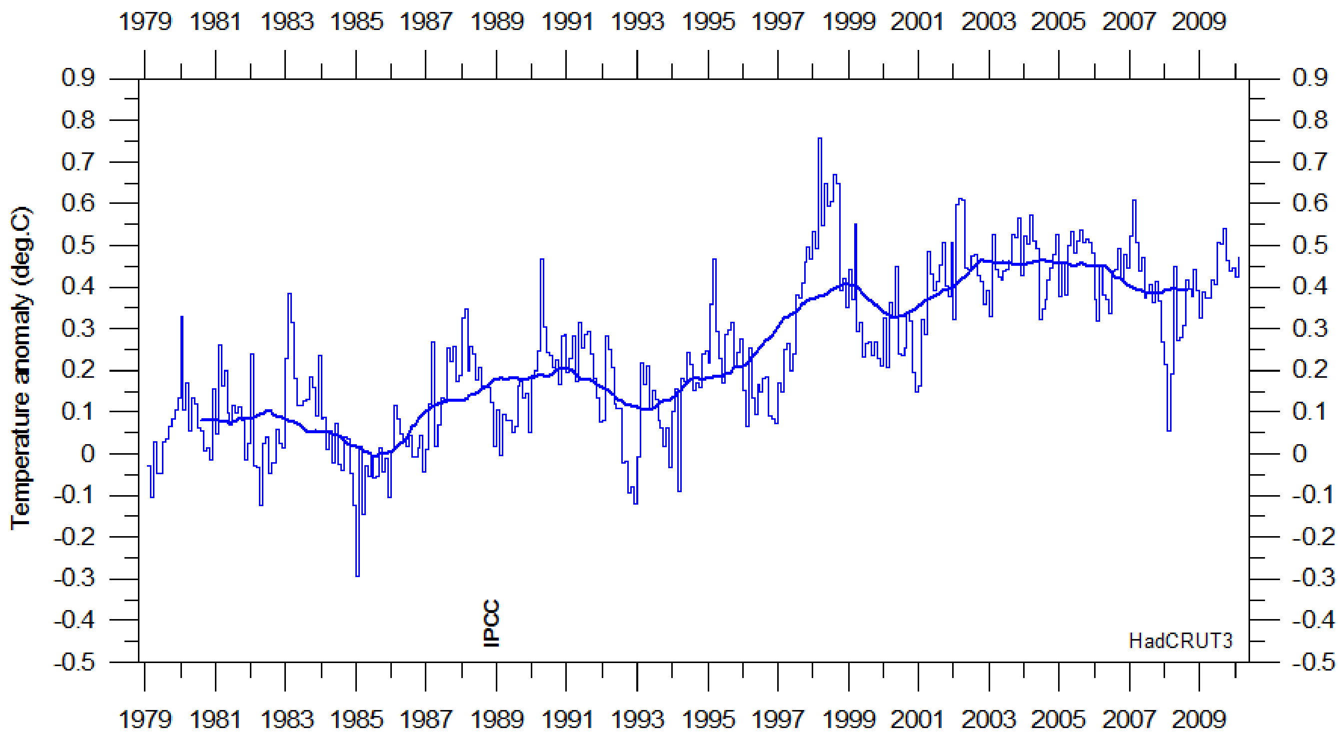


Global monthly average lower troposphere temperature (thin line) since 1979 according to University of Alabama at Huntsville, USA. The thick line is the simple running 37 month average.

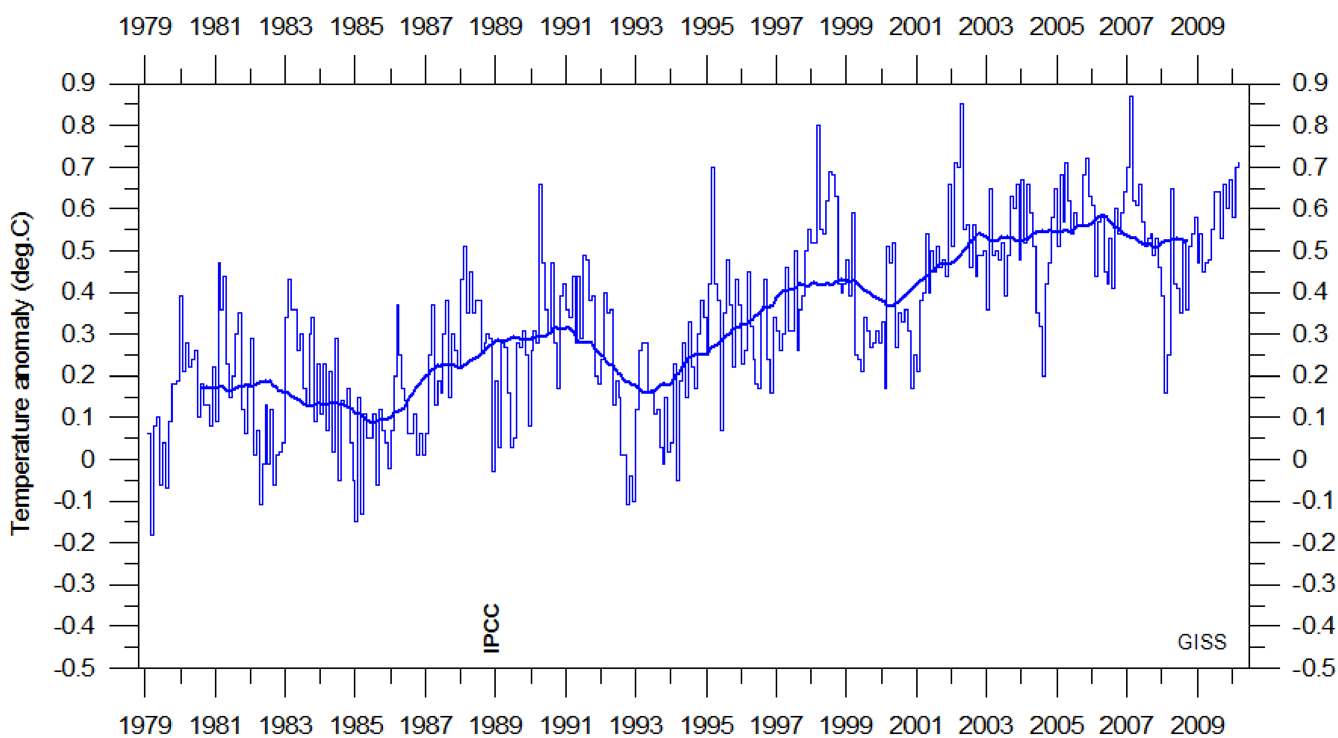


Global monthly average lower troposphere temperature (thin line) since 1979 according to according to Remote Sensing Systems (RSS), USA. The thick line is the simple running 37 month average.

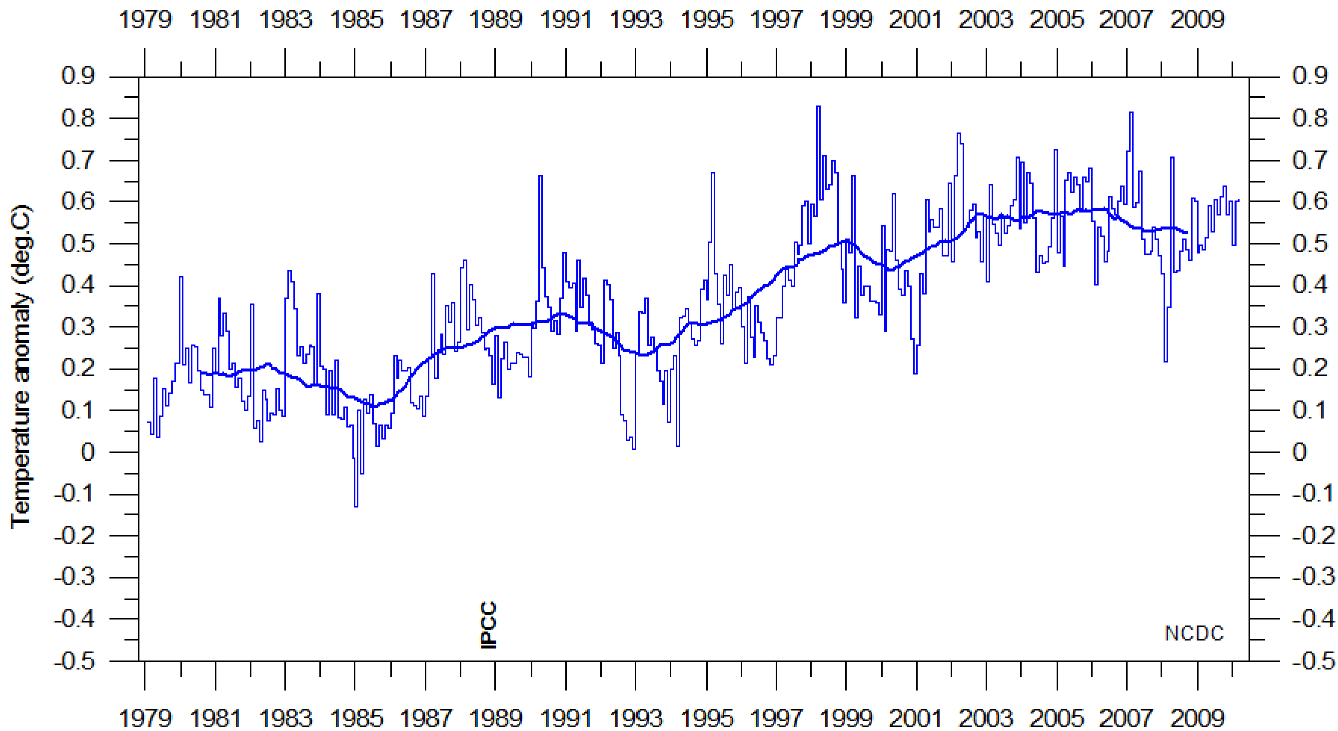
[Global surface air temperature, updated to February 2010]



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 data series has not yet been updated beyond January 2010.



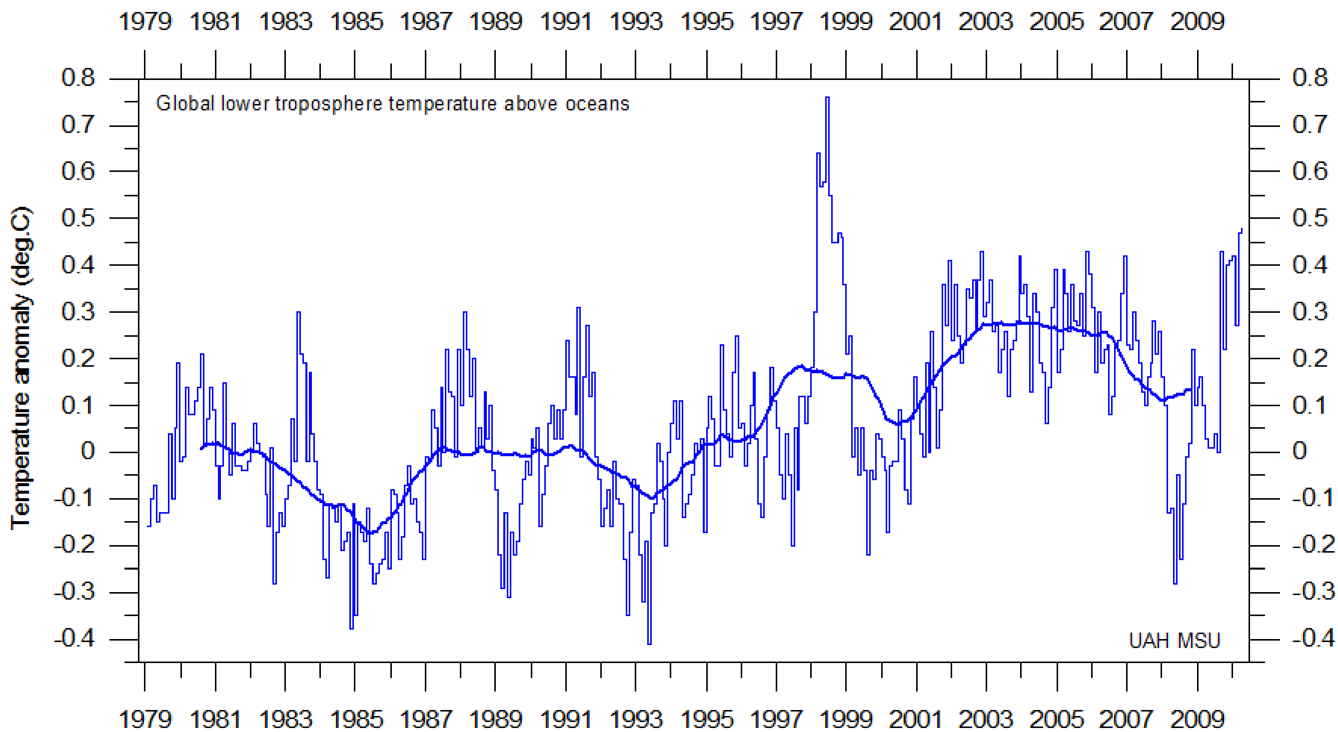
Global monthly average surface air temperature (thin line) since 1979 according to according to the [Goddard Institute for Space Studies] (GISS), at Columbia University, New York City, USA. The thick line is the simple running 37 month average.



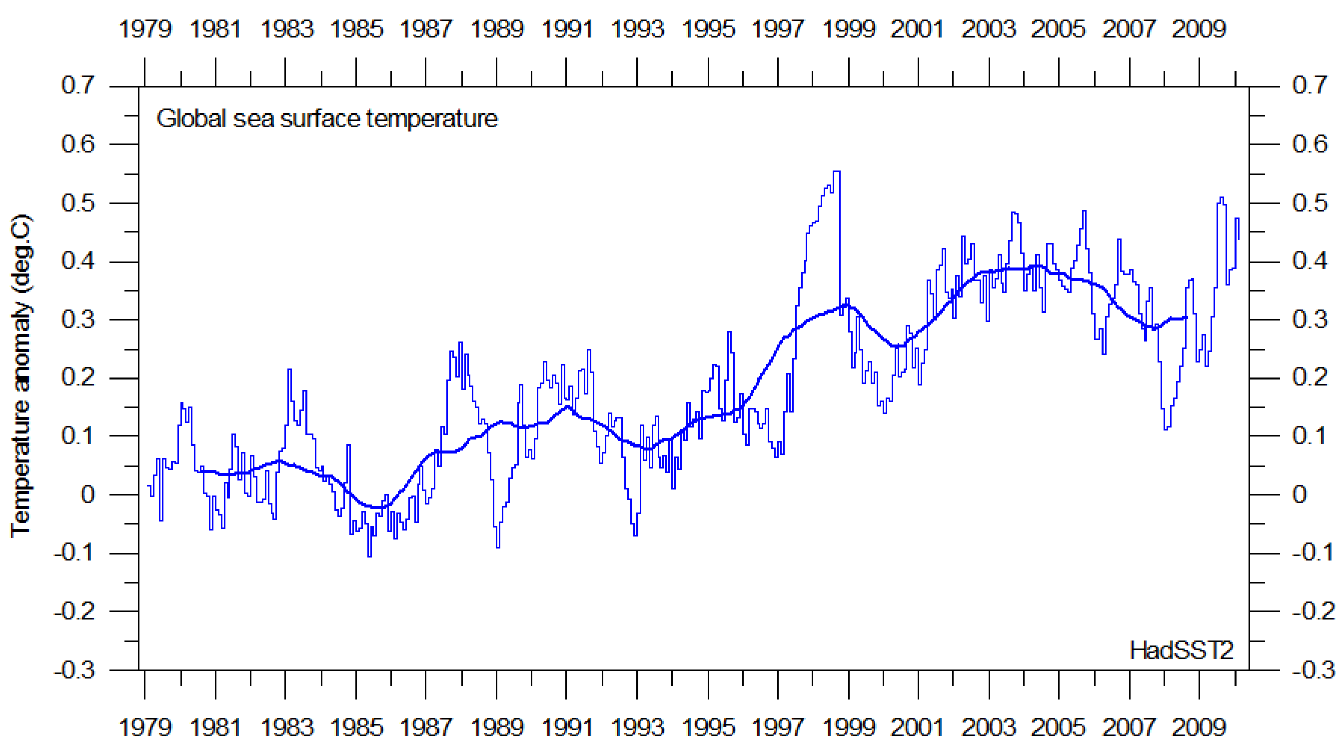
Global monthly average surface air temperature since 1979 according to according to the [National Climatic Data Center](#) (NCDC), USA. The thick line is the simple running 37 month average.

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).

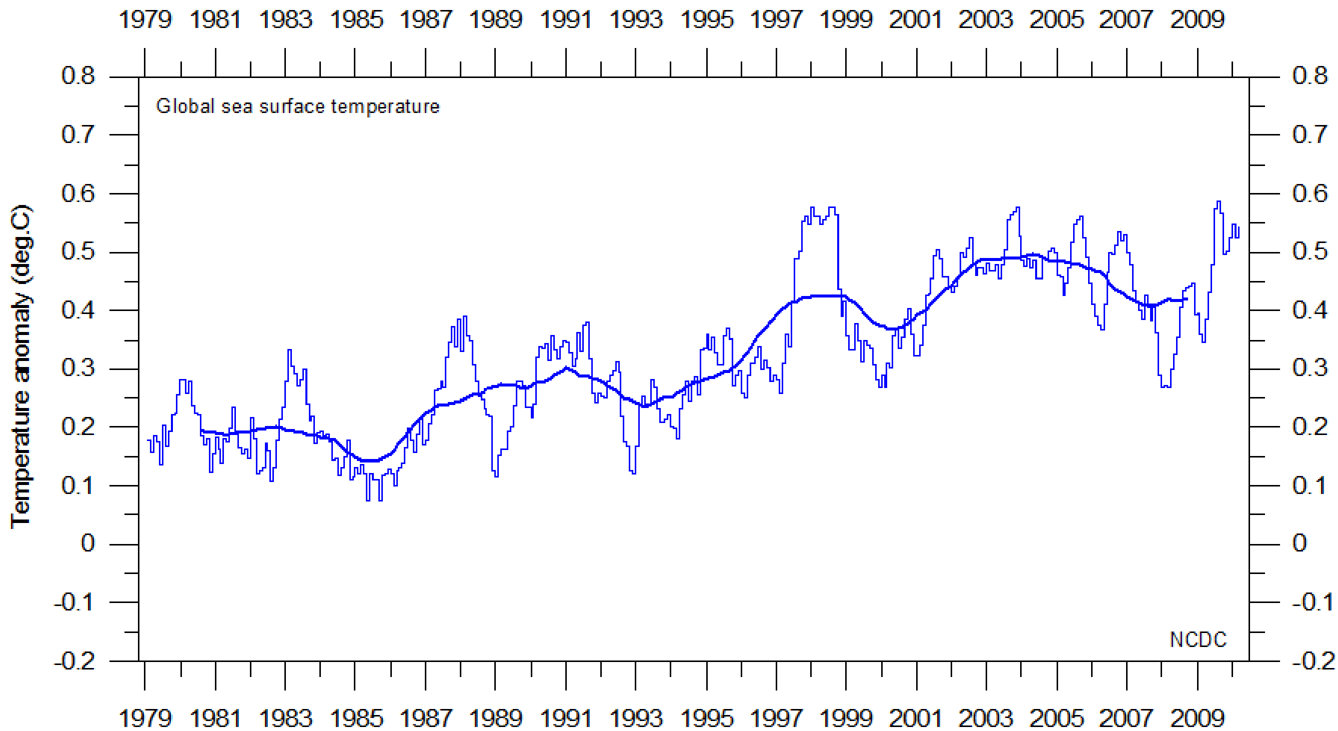
Global sea surface temperature, updated to February 2010



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.

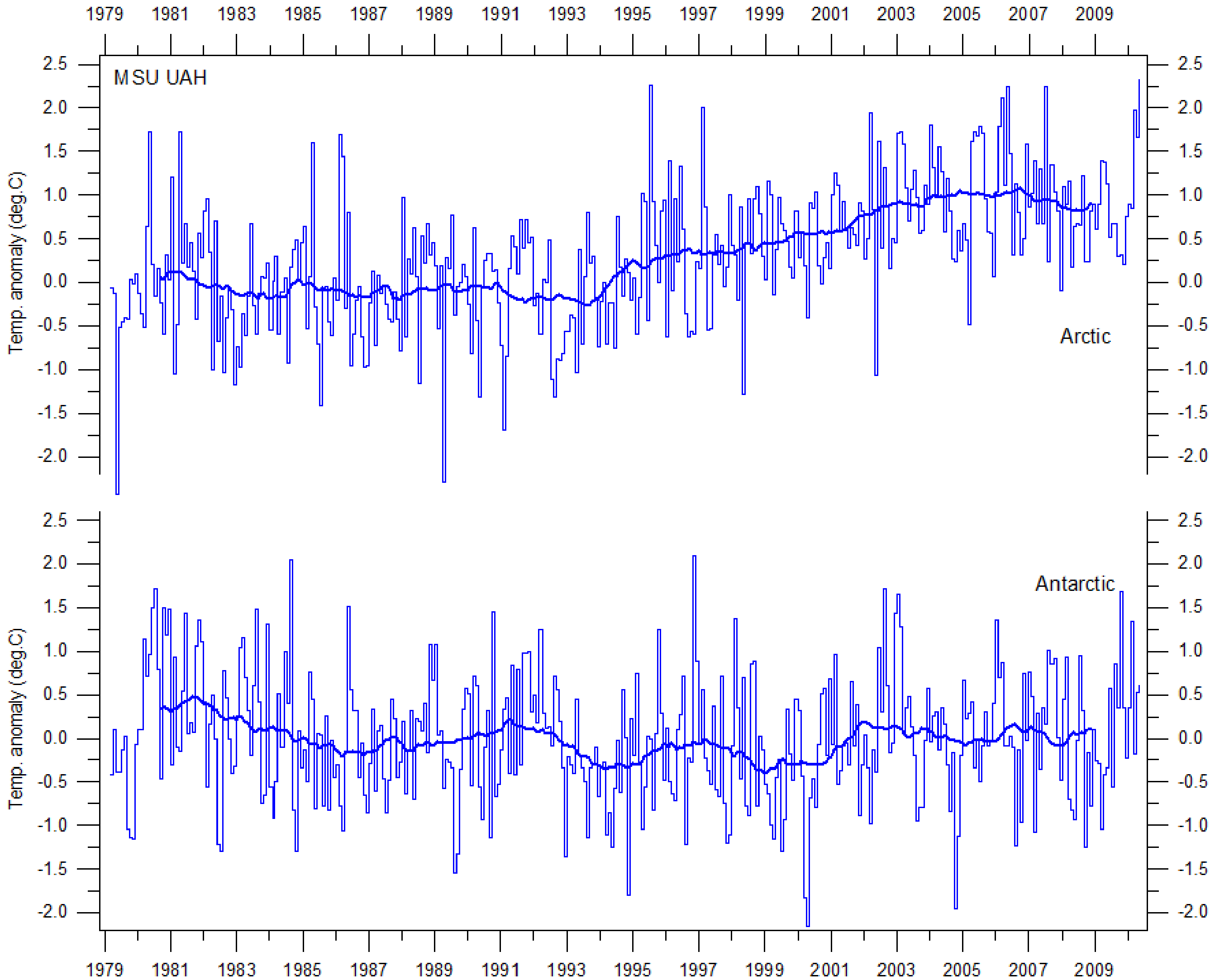


Global monthly average sea surface temperature since 1979 according to University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK. Base period: 1961-1990. The thick line is the simple running 37 month average. Please note that this data series has not yet been updated beyond January 2010.



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 February 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 December 2009

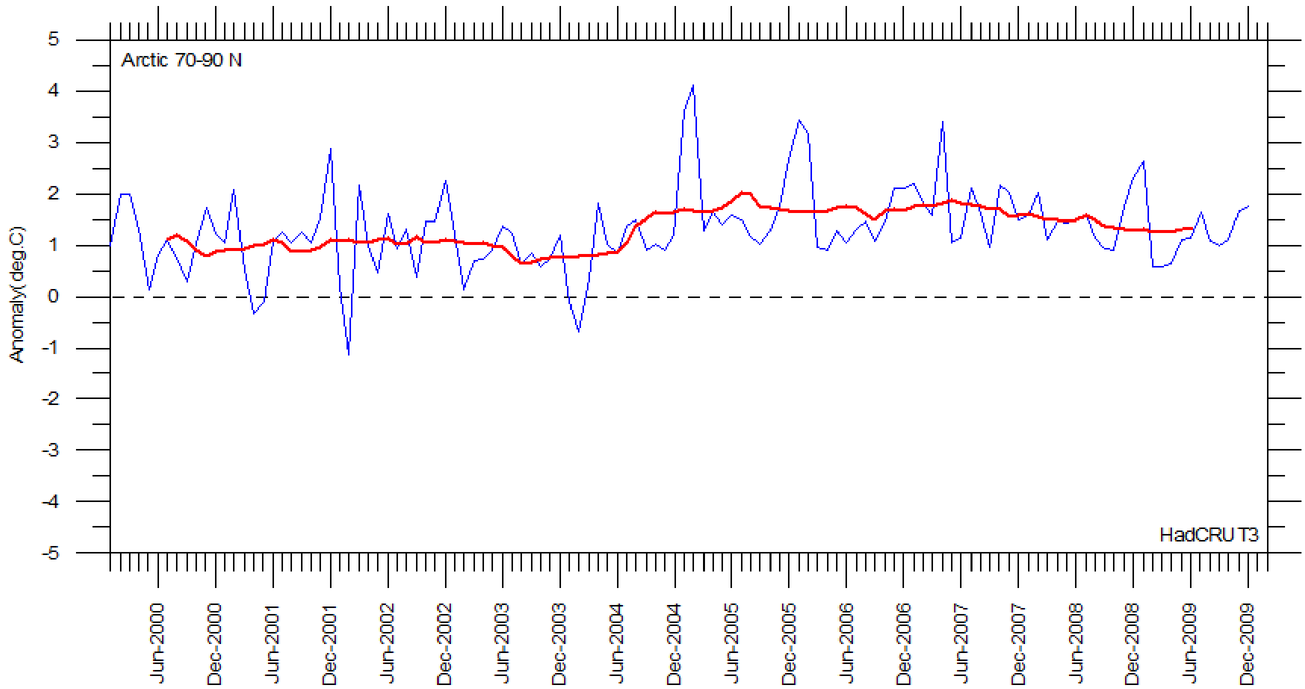


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK. Please note that this data series has not yet been updated beyond December 2009.

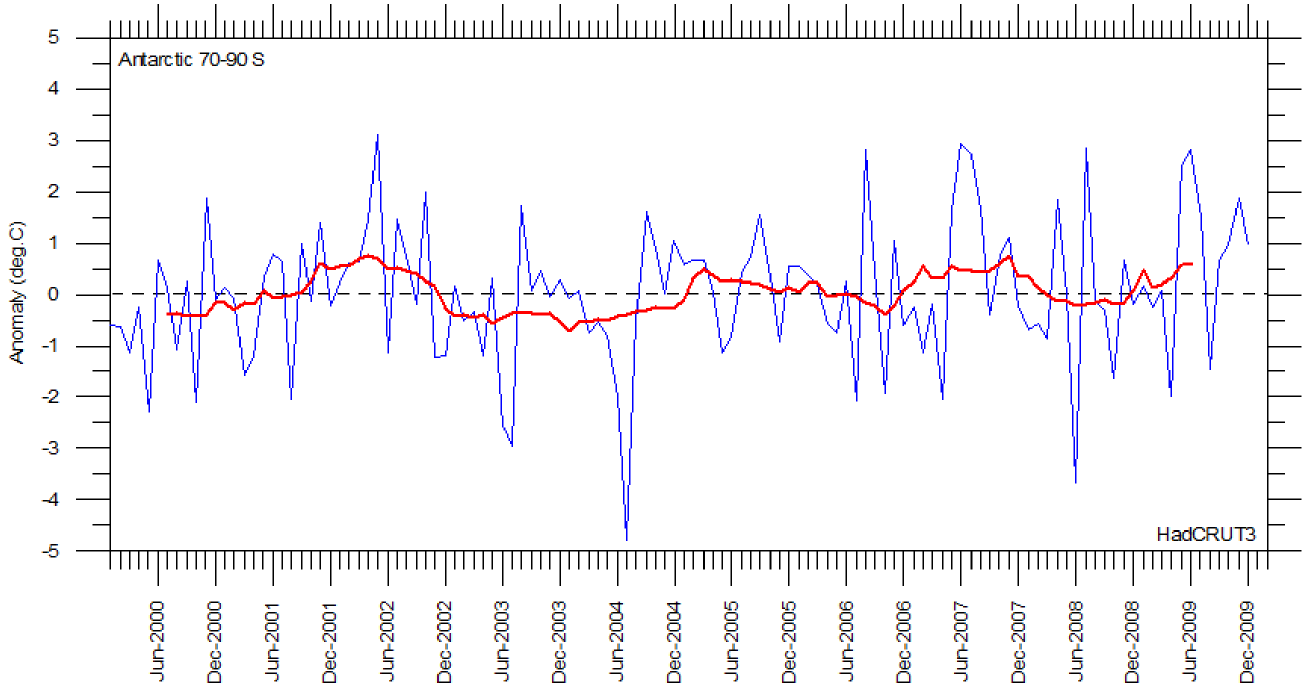


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley 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 December 2009.

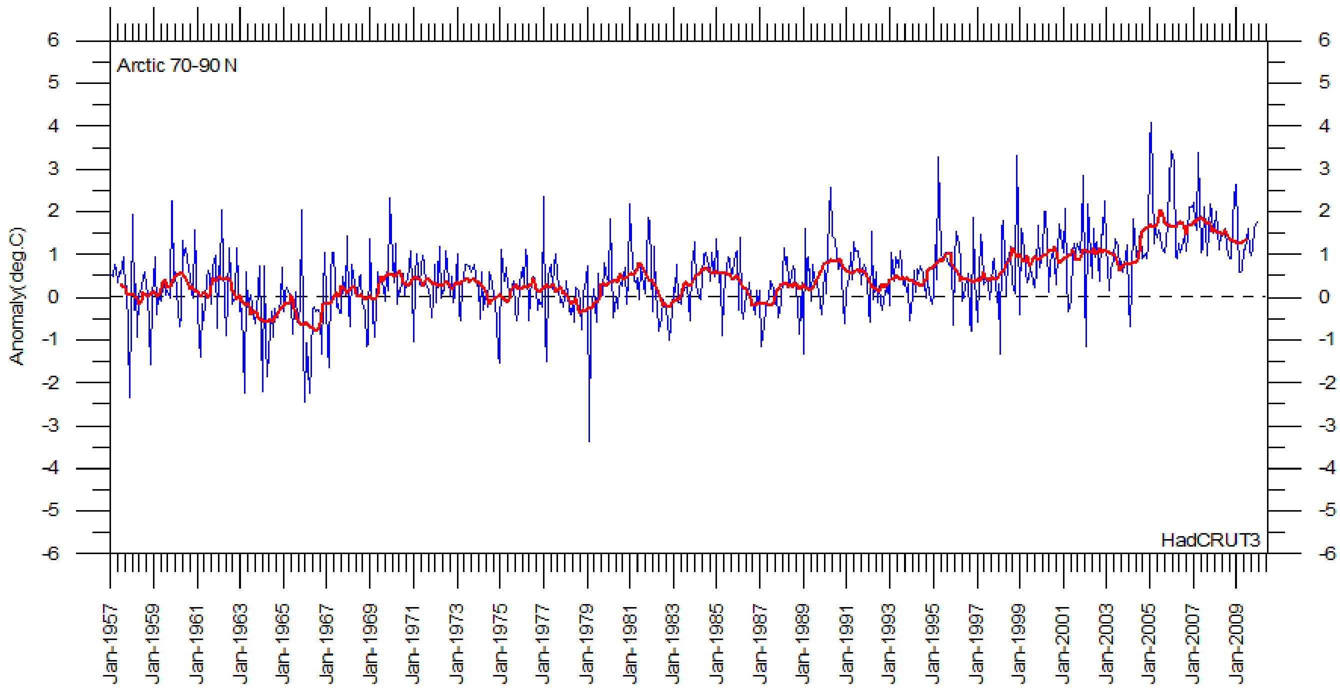


Diagram showing Arctic monthly surface air temperature anomaly 70-90^{o}N since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 has been chosen as starting year, to ensure easy comparison with the maximum length of the realistic Antarctic temperature record shown 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 December 2009.

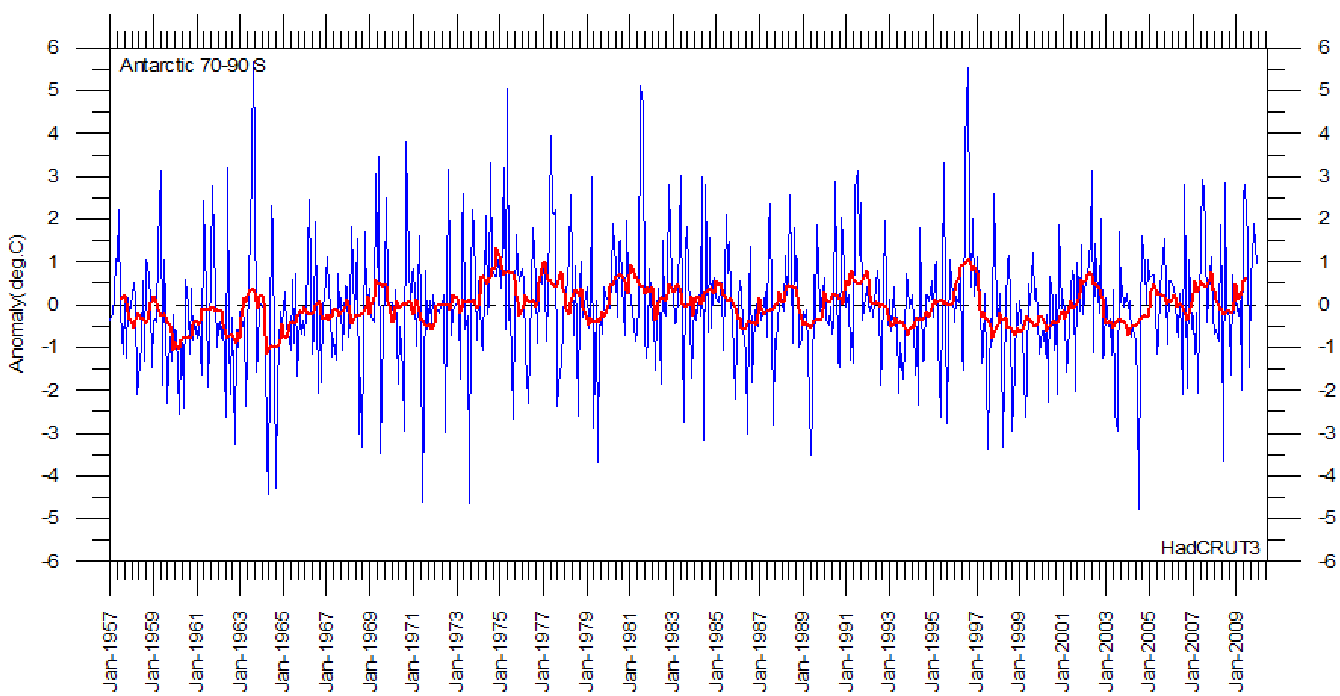


Diagram showing Antarctic monthly surface air temperature anomaly 70-90^{o}S since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 was an international geophysical year, and several meteorological stations were established in the Antarctic because of this. Before 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 December 2009.

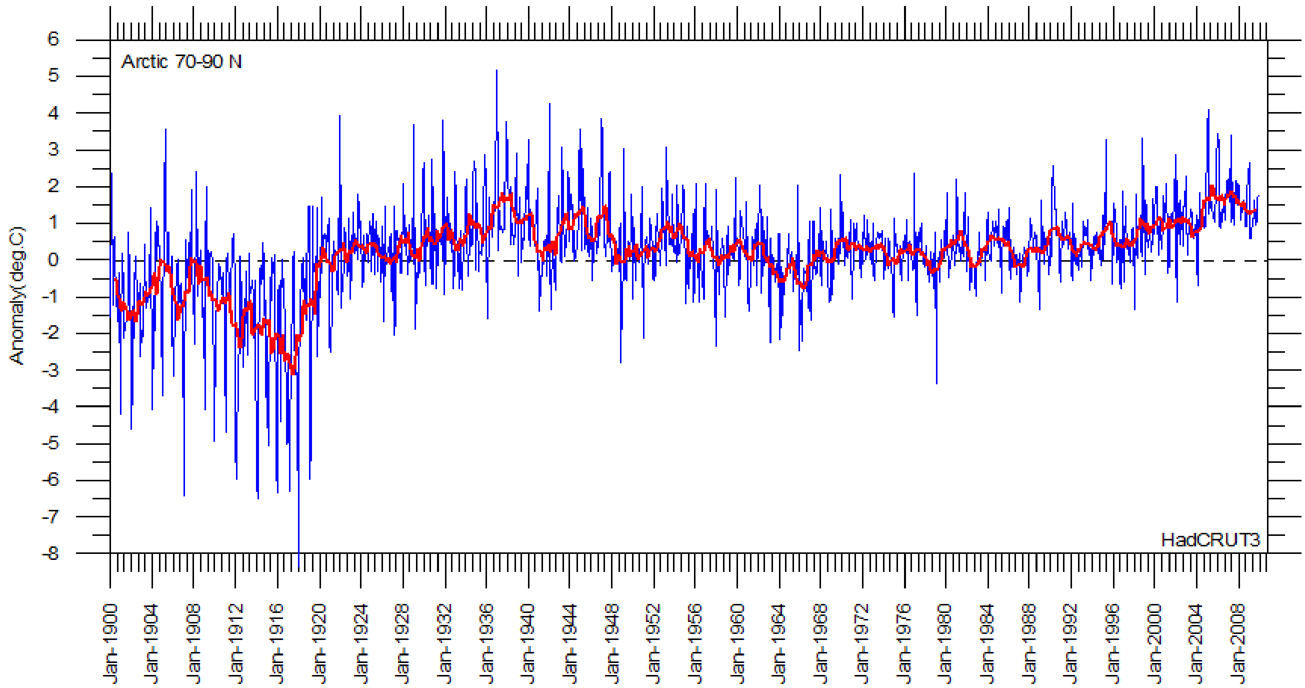
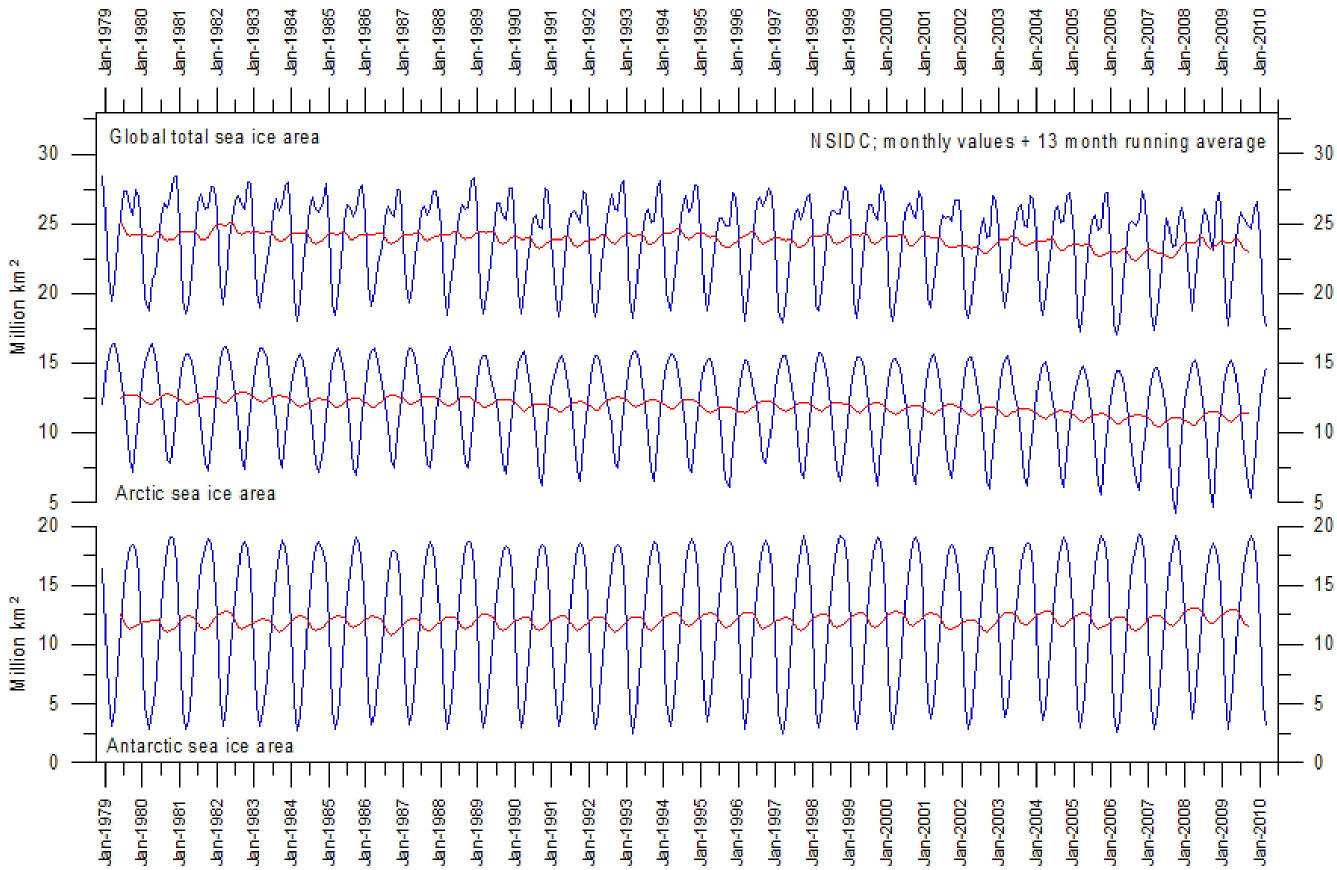


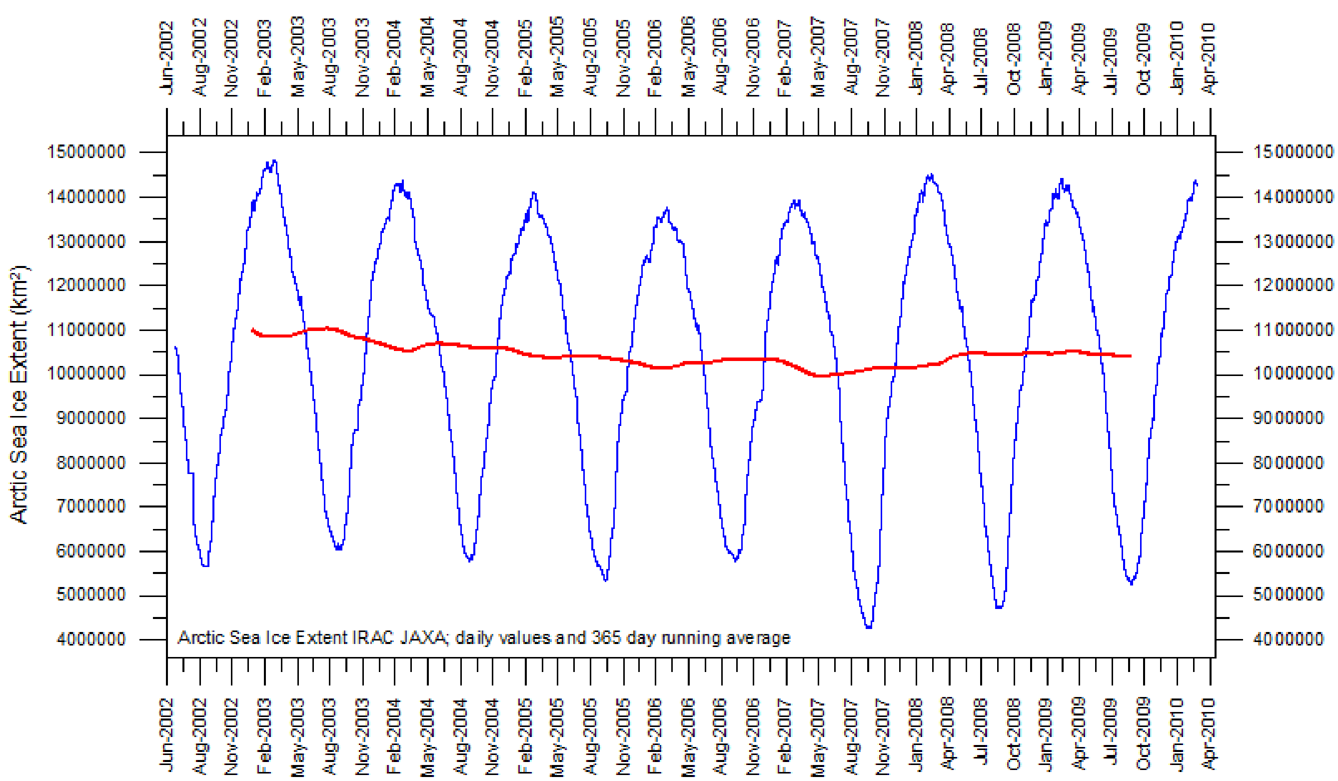
Diagram showing Arctic monthly surface air temperature anomaly 70-90^{o}N since January 1900, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. In general, the range of monthly 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 December 2009.

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.

Arctic and Antarctic sea ice, updated to February 2010

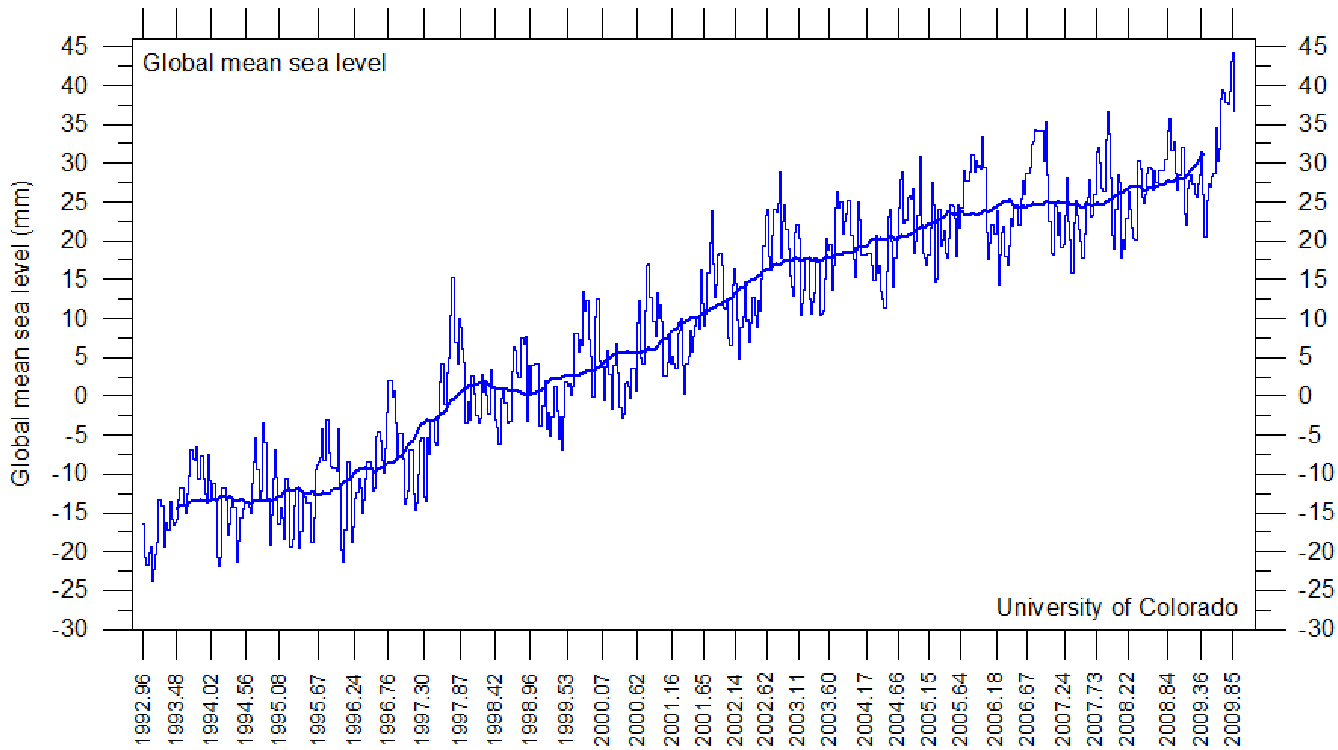


Graphs showing monthly Antarctic, Arctic and global sea ice extent since November 1978, according to the [National Snow and Ice data Center](#) (NSIDC).

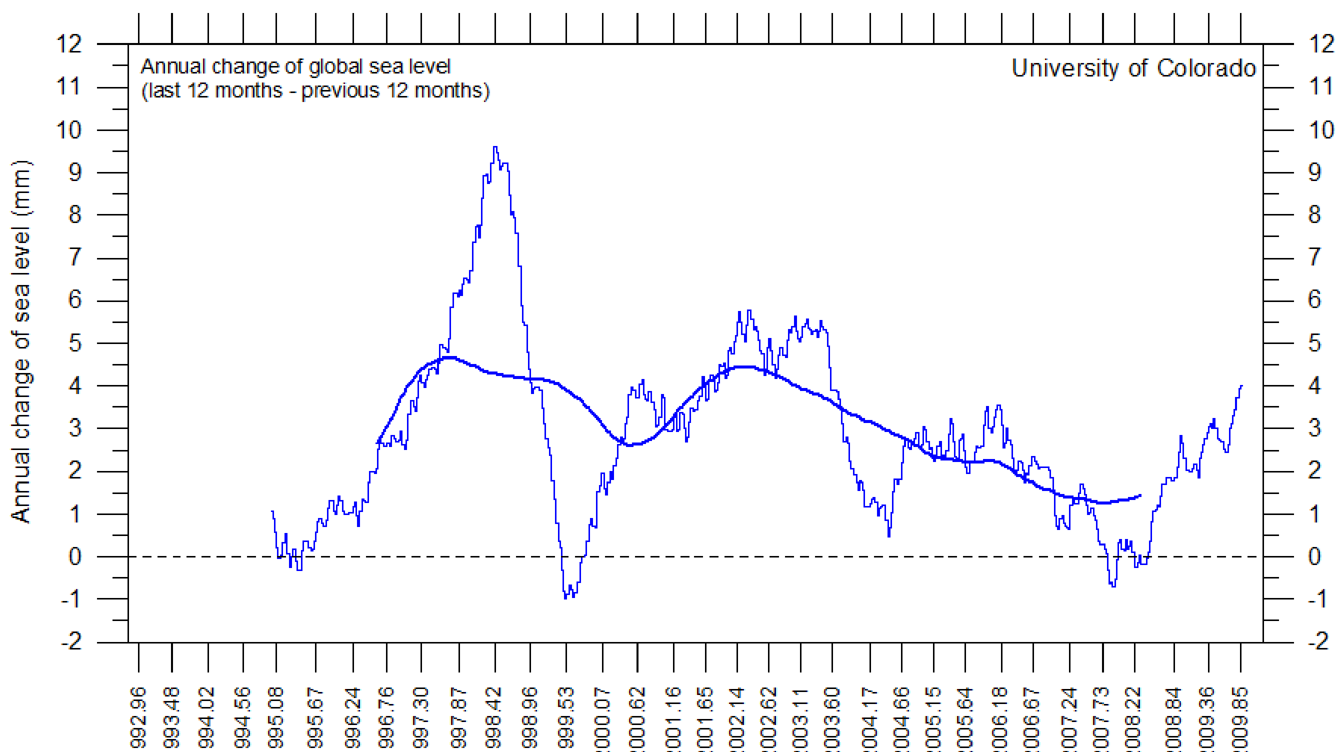


Graph showing daily Arctic sea ice extent since June 2002, to 16/03 2010, by courtesy of [Japan Aerospace Exploration Agency](#) (JAXA).

Global sea level, updated January 2010

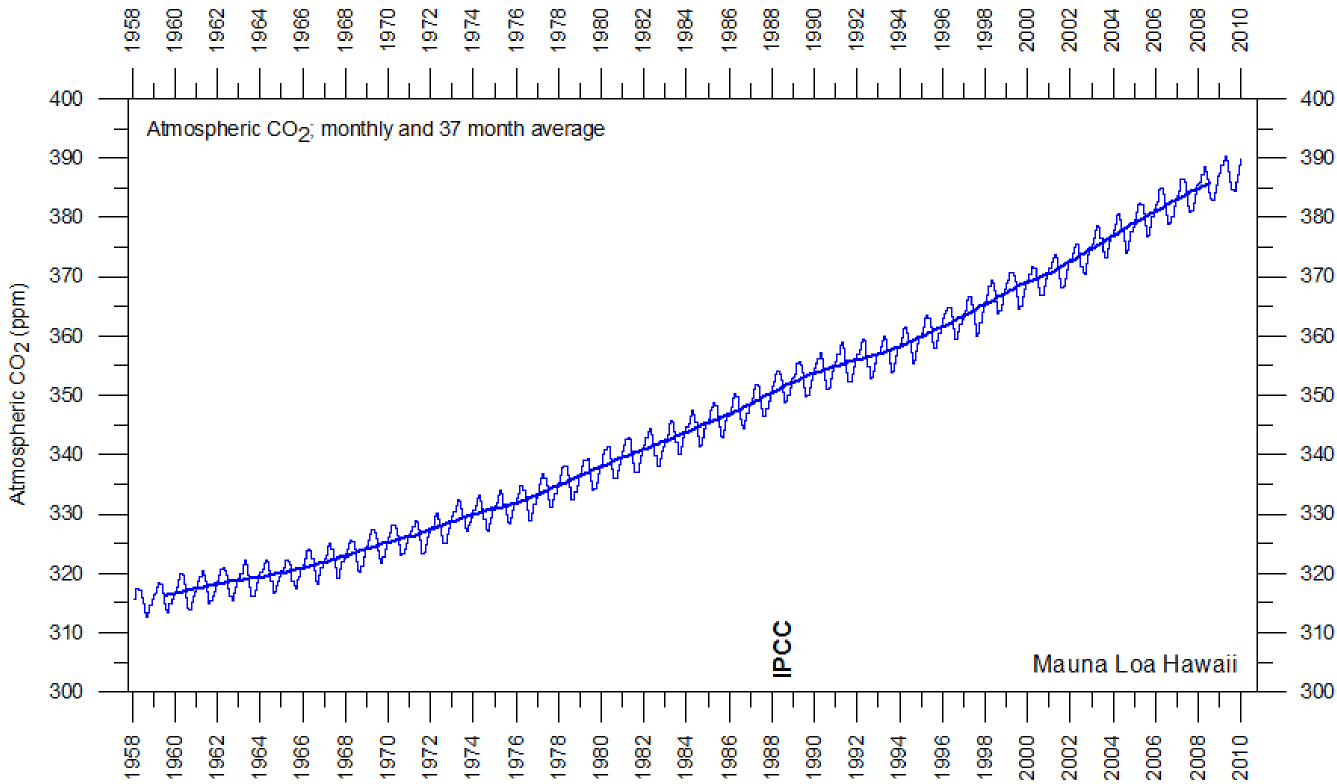


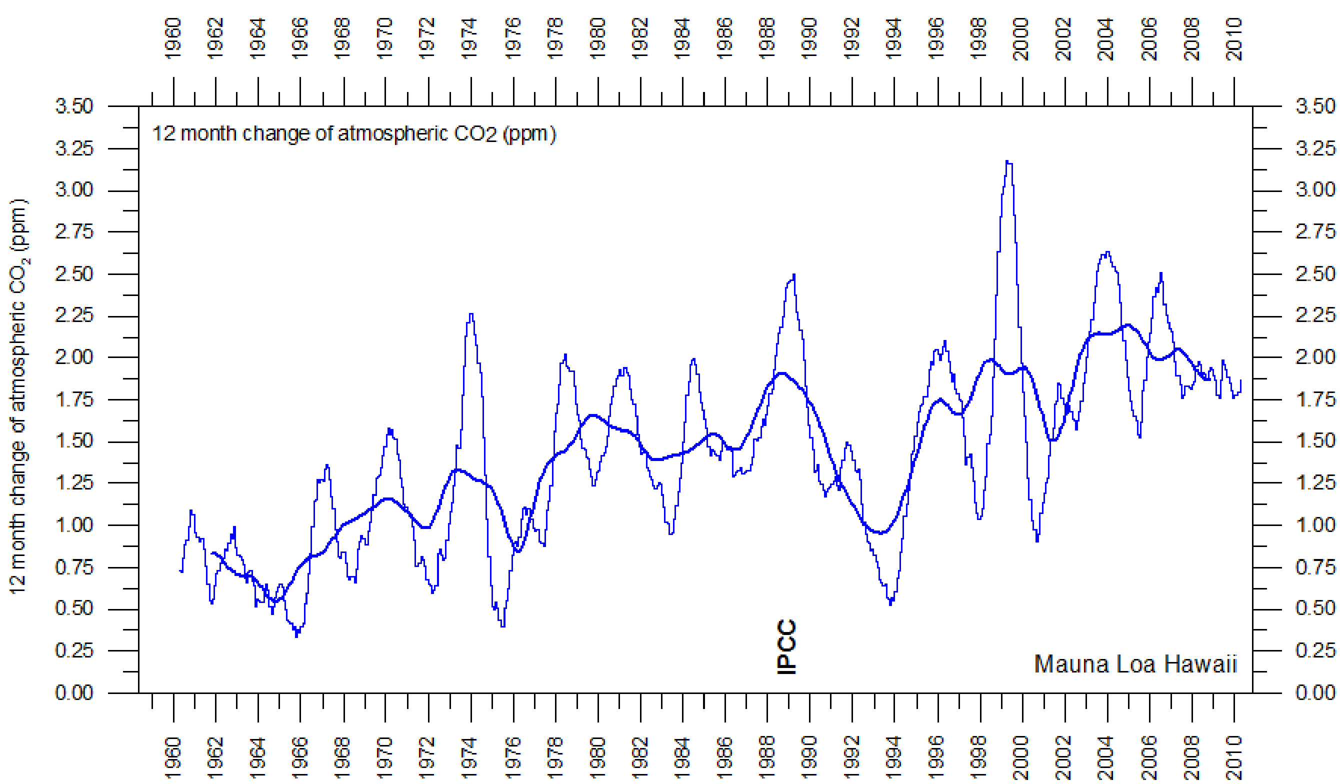
Globa lmonthly sea level since late 1992 according to the Colorado Center for Astrodynamics Research at University of Colorado at Boulder, USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.



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.

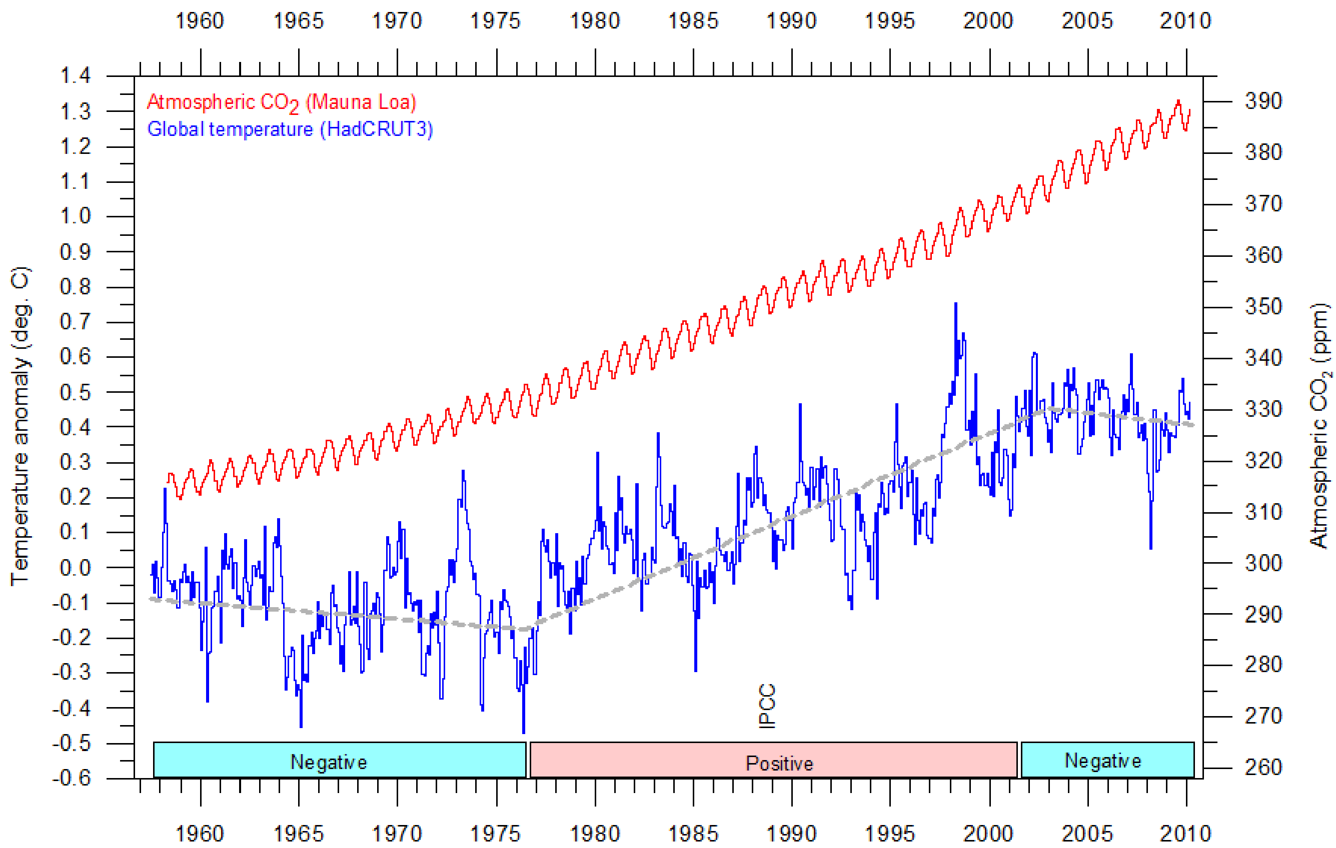
Atmospheric CO_2, updated to February 2010

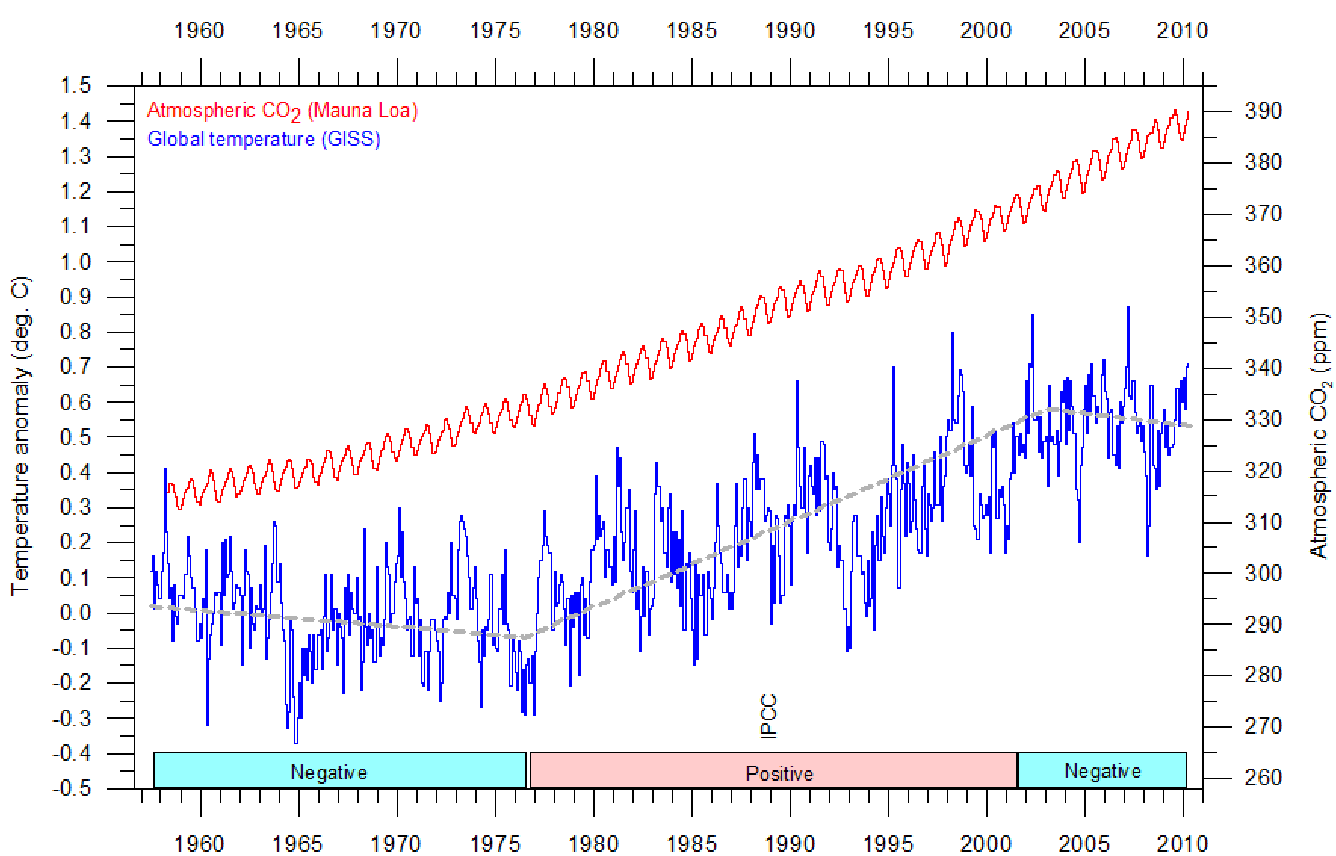


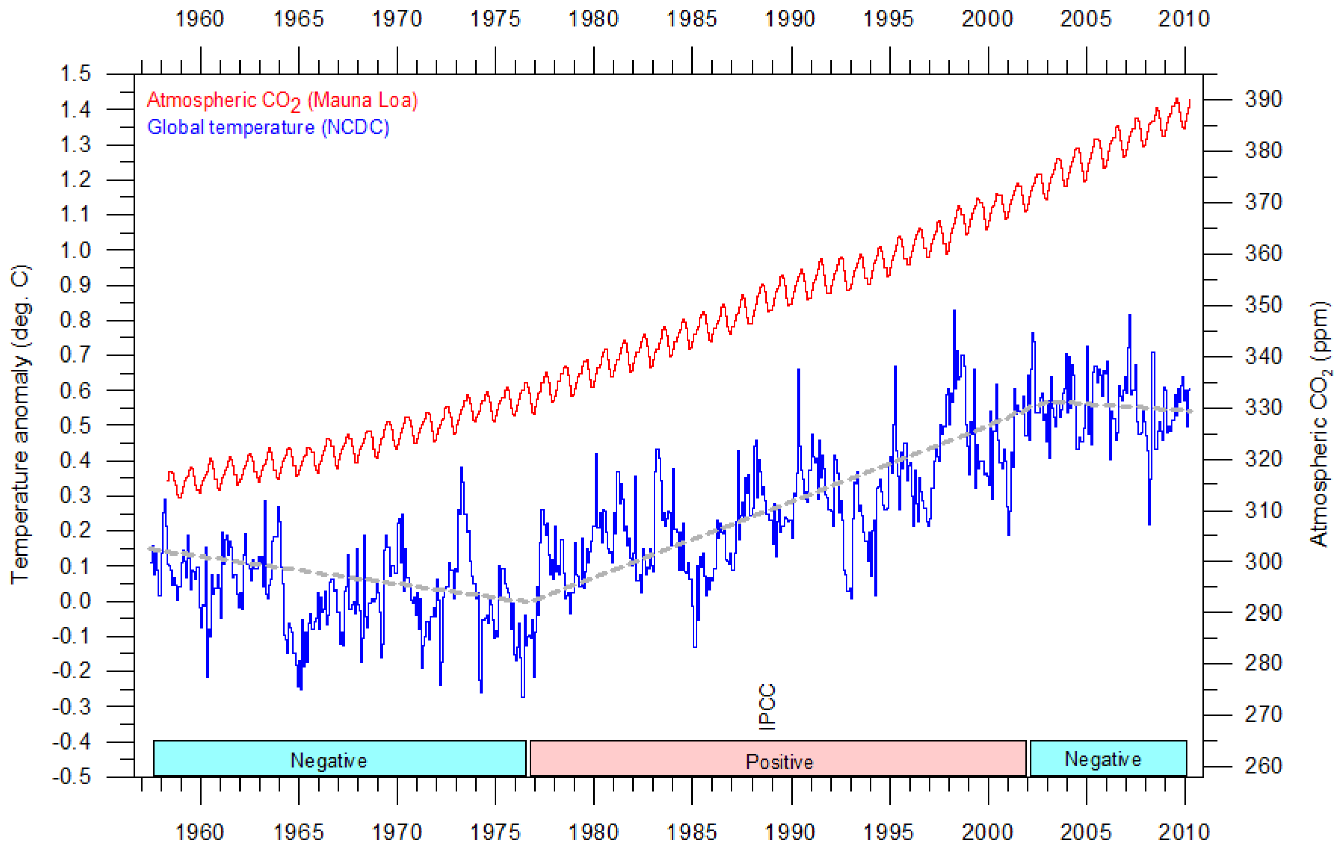


Monthly amount of atmospheric CO_2 (above) and annual growth rate (below; average last 12 months minus average preceding 12 months) of atmospheric CO_2 since 1959, according to data provided by the [Mauna Loa Observatory](), Hawaii, USA. The thick line is the simple running 37 observation average, nearly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

Global surface air temperature and atmospheric CO_2, updated to February 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 data series has not yet been updated beyond January 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.

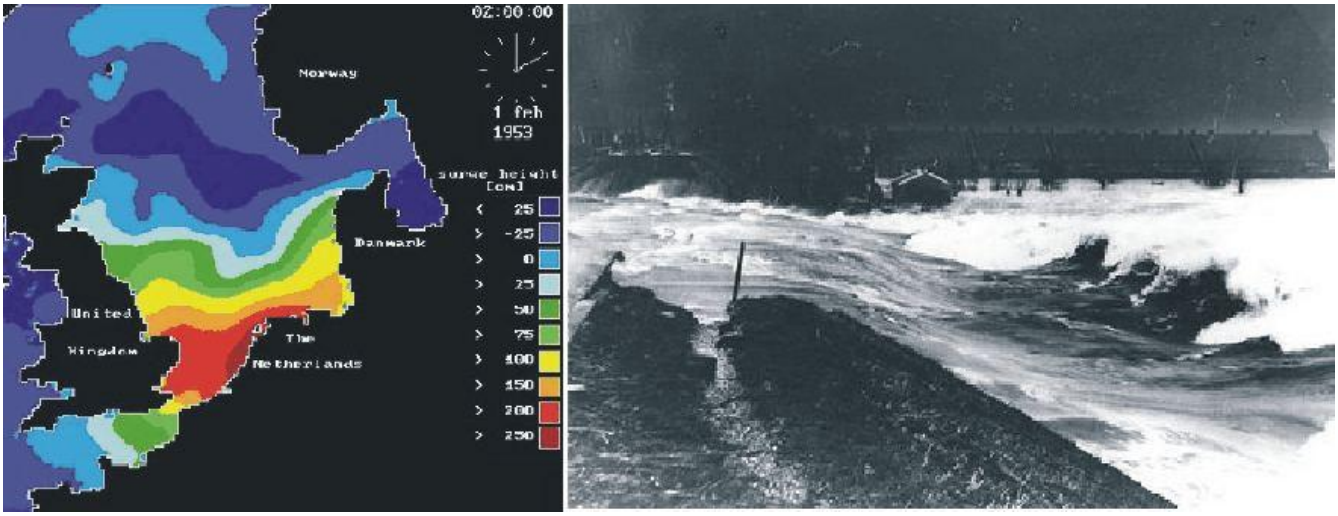
It is of cause equally inappropriate to present new meteorological record values, whether daily, monthly or annual, as support for the hypothesis ascribing high importance of atmospheric CO_2 for global temperatures. Any such short-period meteorological record value may well be the result of other phenomena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

1953: Storm and flooding in the Netherlands



The storm surge created by the 31 January 1953 storm over the North Sea (left). The deep red colour indicate a surge height of more than 250 cm. Sea water streaming trough a developing breach in a dike in the Netherlands (right).

On 30 January 1953, a cyclone was developing south of Iceland. The depression was travelling in direction of Scotland and was intensifying to a strong storm. After passing Scotland, the storm centre followed the jet stream towards southeast across the North Sea and intensified further into a storm of almost hurricane force in the afternoon of 31 January.

When the depression reached the Netherlands this region of the North Sea was having a high spring tide. The sea level rose further by northwesterly winds on the rear side of the cyclone and by the low air pressure associated with the storm centre (see figure above). Shortly after midnight between 31 January and 1 February, at 3h24, the highest recorded water level was reached, 4.55 metres above normal water level at Amsterdam. Water began to run over the dikes at several places, rapidly eroding deep channels, and extensive areas of the Netherlands were covered by the sea during February 1, 1953. In total, 89 dikes were breached, and especially Zuid-Holland, Zeeland and Nord-Brabant were severely hit by the flooding.

At the following high tide, in the afternoon of 1 February, there was another flood, claiming more lives and destroying more property. As many dikes had already been breached the previous night, the sea water now has unhindered access to the lowlying areas behind the dikes and sea walls.

Officially, 1835 people lost their lives by this flooding. Lack of proper warning of the impending flood explains at least part of this high number of casualties, as people generally were unable to prepare for the flood. An estimated 30,000 animals drowned, and 47,300 buildings were damaged or destroyed.

A collapsed dike after the storm (left). The river barge de Twee Gebroeders stranded in the Groenendijk dike gap (centre). A damaged building surrounded by sea water (right).

The dyke along the river *Hollandse IJssel* protected three million people living in the provinces of South and Nord Holland from flooding. The dike was, however, on the brink of collapse, and a gap was rapidly developing. A complete collapse of this dike would have endangered the lives of the large population living in the area. As a last resort, the captain of the river barge *de Twee Gebroeders* (*The Two Brothers*) navigated his ship into the developing gap in the dike (see photo above). The ship actually managed to plug the gap, whereby many lives presumably were saved.

Also in UK, the North Sea flood of 1953 was one of the most devastating natural disasters ever recorded. More than 1,600 km of coastline was damaged, and sea walls were breached, inundating 1,000 km². Flooding forced 30,000 people to be evacuated from their homes, and 24,000 properties were seriously damaged.

References:

Lamb, H.H. 1991. *Historical Storms of the North Sea, British Isles and Northwest Europe.* Cambridge University Press, Cambridge, 204 pp.

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

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

18 March 2010.