Climate4you update July 2013

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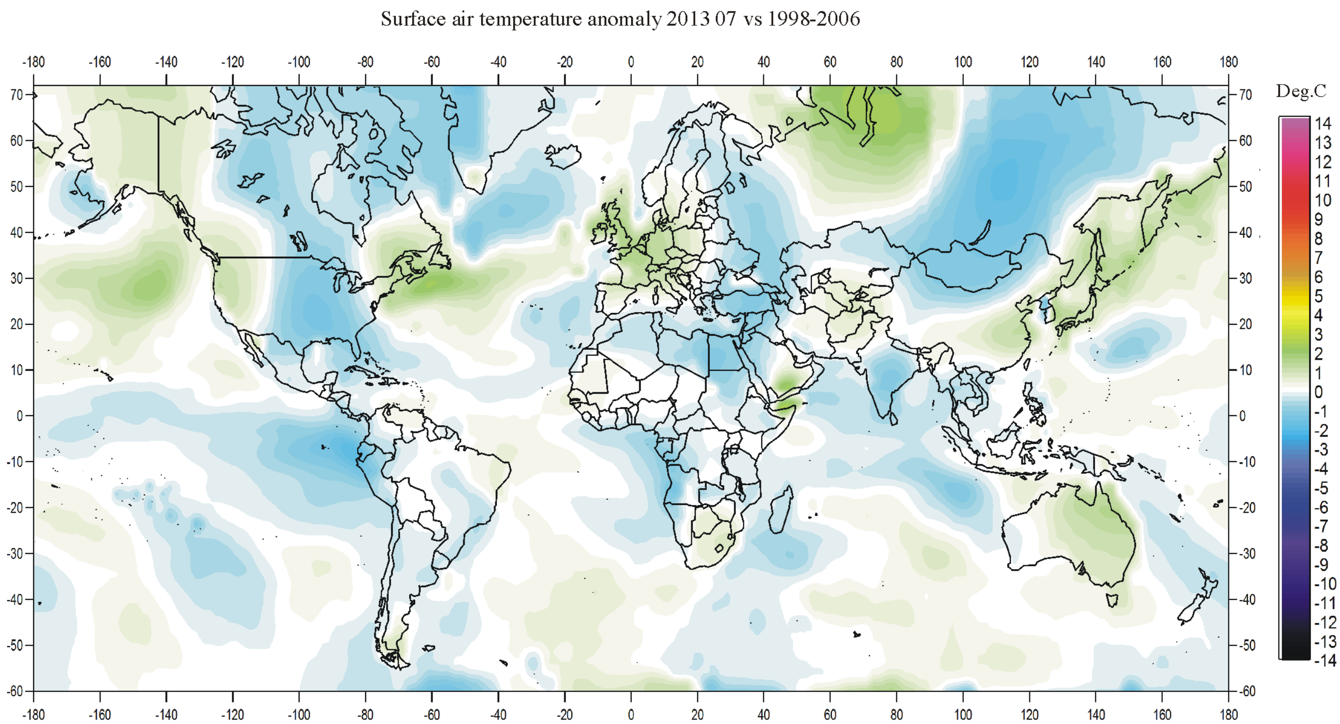
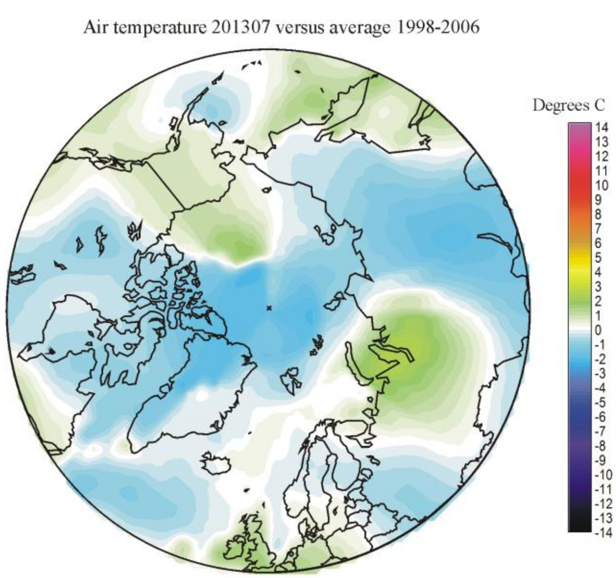
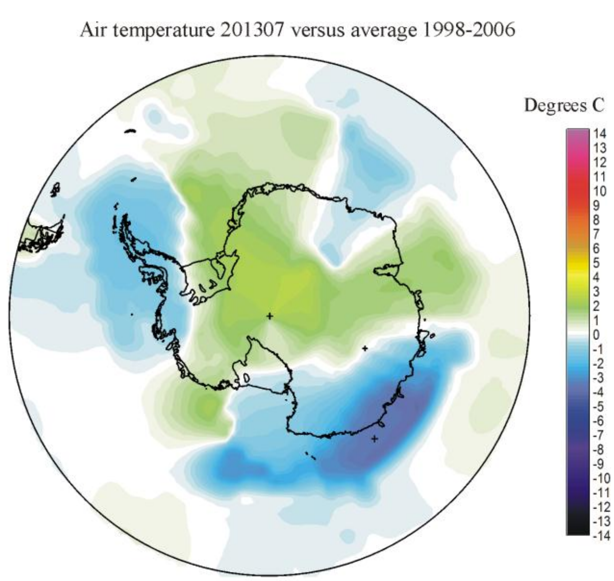
All diagrams in this newsletter as well as links to the original data are available on www.climate4you.com

July 2013 global surface air temperature overview







July 2013 surface air temperature compared to the average 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 July 2013 global surface air temperature overview

General: This newsletter contains graphs showing a selection of key meteorological variables for the past month. *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 and where modern surface air temperatures are increasing or decreasing at the moment. Comparing with a more recent period overcomes this problem.

In addition, the GISS temperature data used for preparing the above diagrams show a rather pronounced temporal instability for data before 2000 (see p.6). Any comparison with the WMO 'normal' period 1961-1990 is therefore influenced by monthly changing values for the so-called 'reference' period, and therefore not very meaningful.

In addition to the above 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 simple moving 37-month average, nearly corresponding to a three year average. The 37-month average is calculated from values covering a range from 18 month before to 18 months after, with equal weight for every month.

The year 1979 has been chosen as starting point in many diagrams, as this roughly corresponds to both the beginning of satellite observations and the onset of the late 20th century warming period. However, several of the records have a much longer record length, which may be inspected in greater detail on www.Climate4you.com.

July 2013 global surface air temperatures

General: On average, global air temperatures were near the 1998-2006 average, although a little cooler than the previous month. All three surface air temperature records continue to show negative temperature trend for the last 5 and 10 years (page 8).

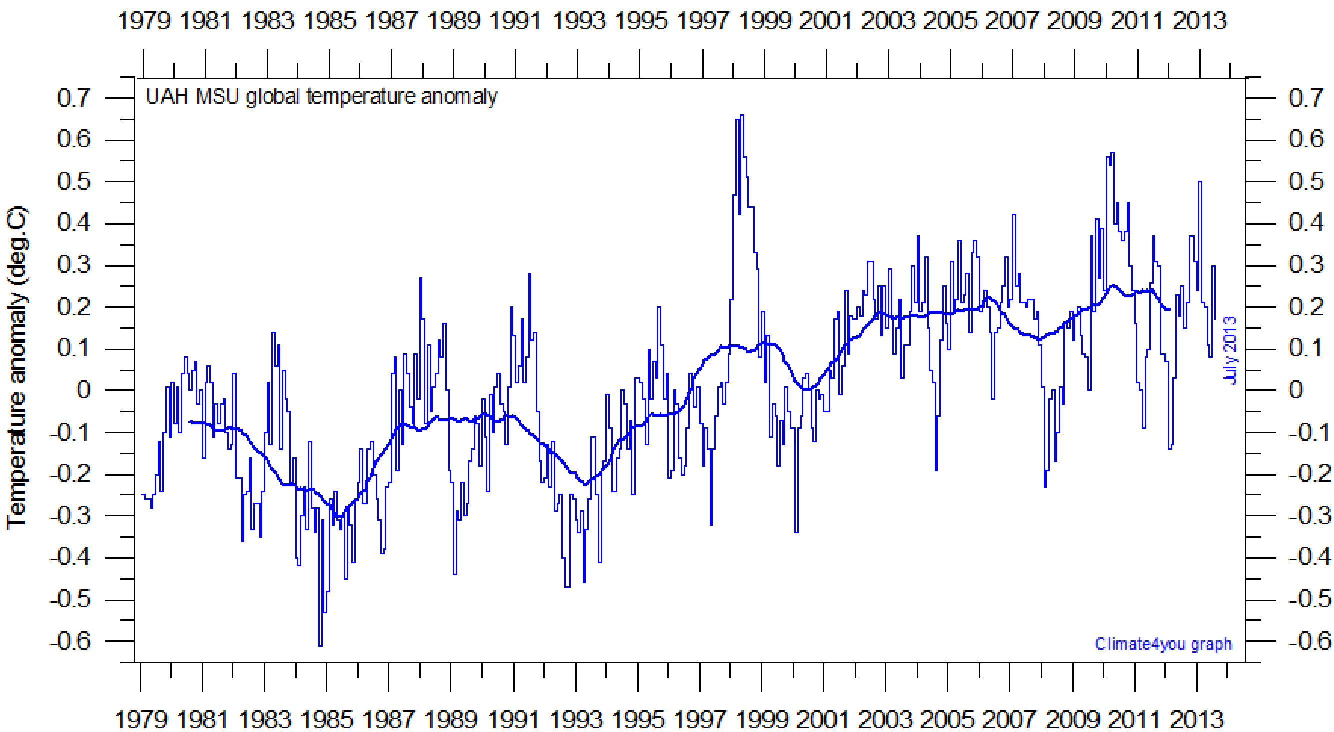
The Northern Hemisphere was characterised by temperature contrasts between individual regions. Most of North America experienced below average temperatures, along with most of Russia and Siberia. Most of the surface air temperatures above the Northern Hemisphere oceans were also relatively low, with the exception of a band of relatively high temperatures centred around 30° N. Most of the Arctic was relatively cold, with the exception of Alaska and a region centred on the lower Ob River in Siberia.

Near Equator temperatures conditions were near or slightly below the 1998-2006 average.

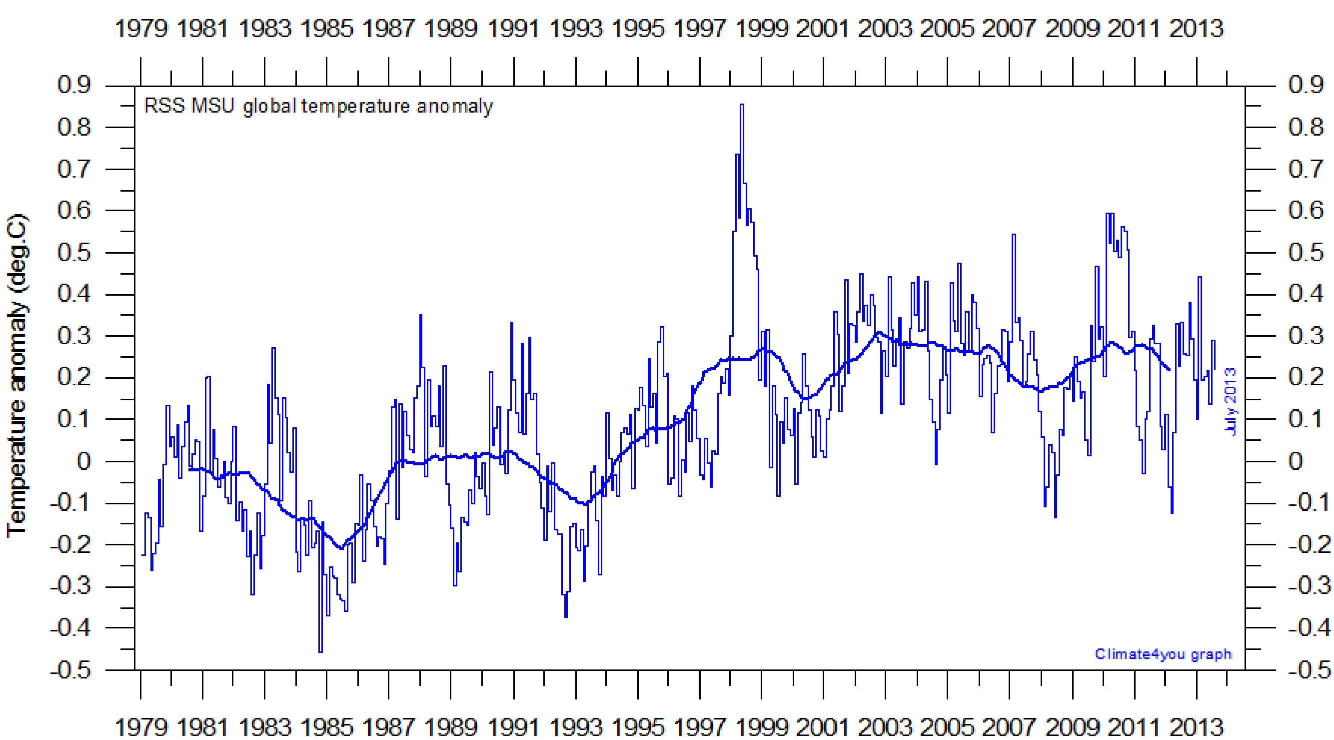
The Southern Hemisphere was mainly near or below average 1998-2006 conditions. The major part of the Antarctic continent had above average temperatures, although less pronounced compared to the previous month.

The global oceanic heat content has been rather stable since 2003/2004, although with a small upward trend (page 13).

Lower troposphere temperature from satellites, updated to July 2013

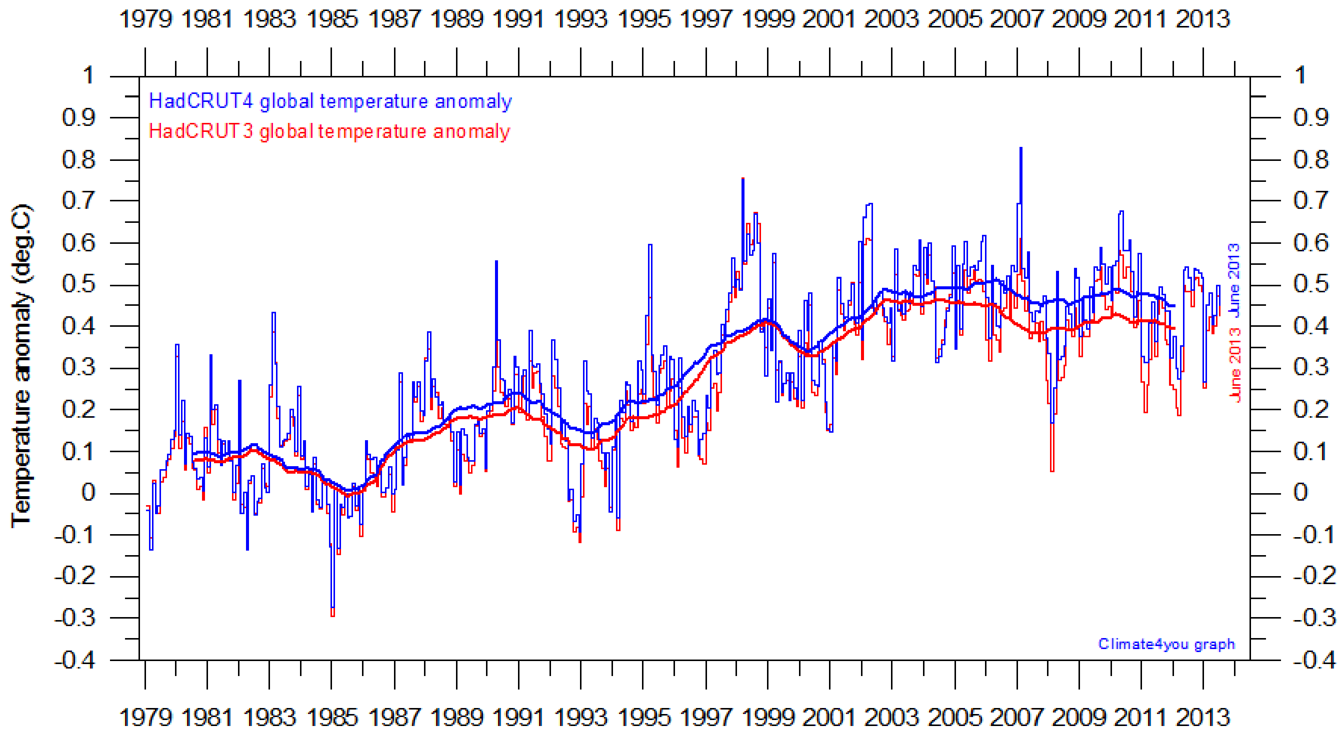


Global monthly average lower troposphere temperature (thin line) since 1979 according to University of Alabama at Huntsville, USA. The thick line is the simple running 37 month average.

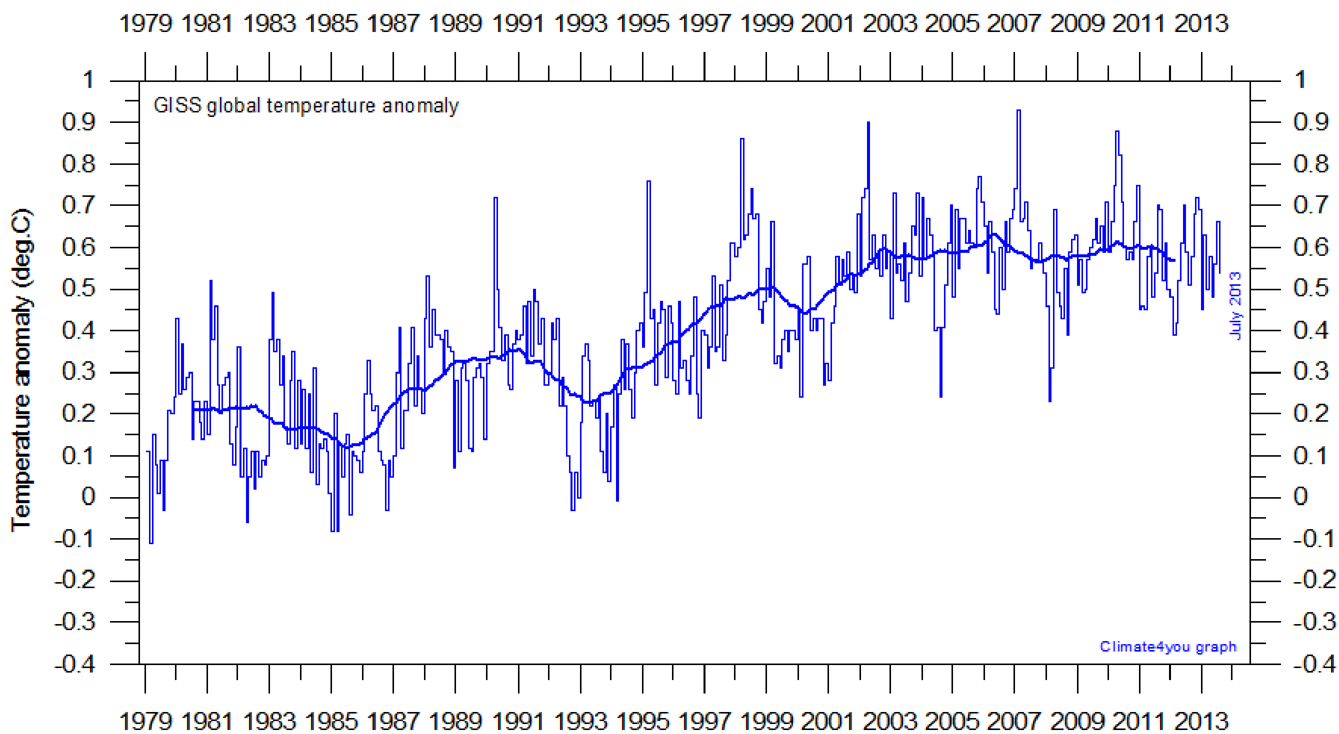


Global monthly average lower troposphere temperature (thin line) since 1979 according to according to Remote Sensing Systems (RSS), USA. The thick line is the simple running 37 month average.

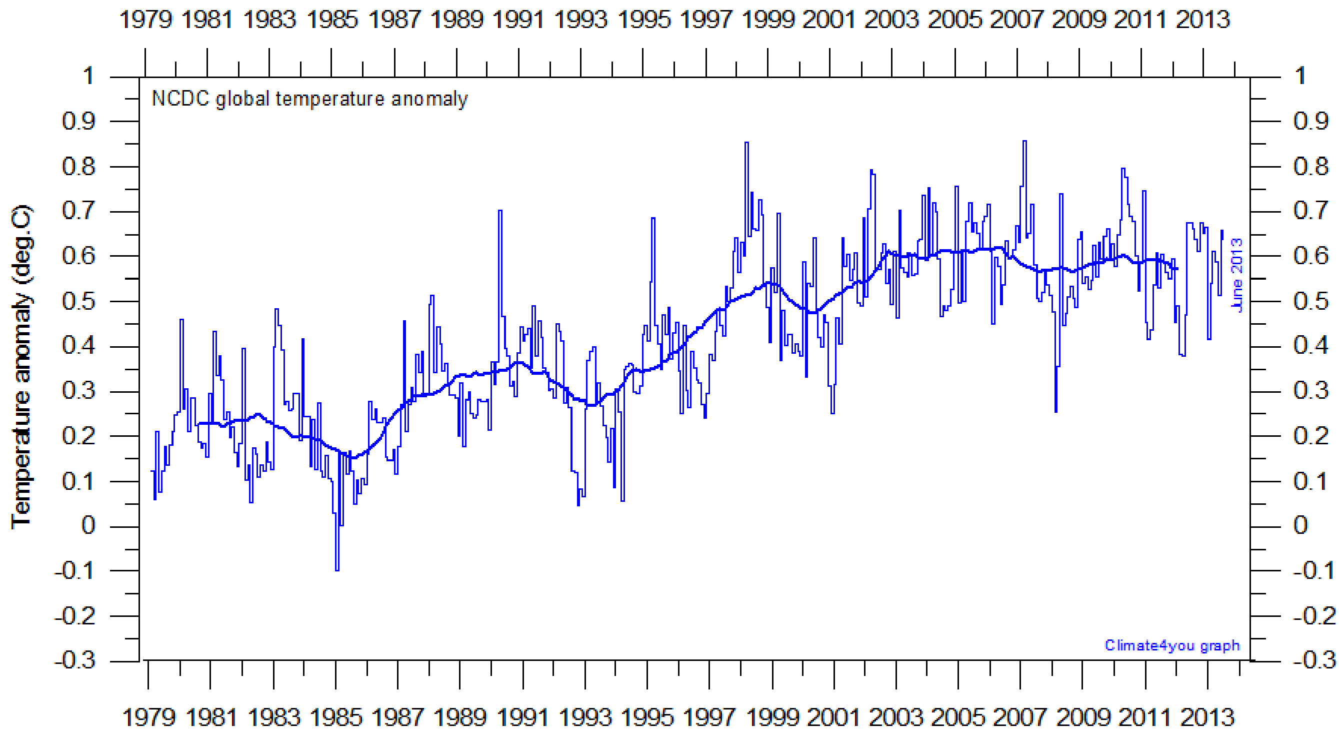
Global surface air temperature, updated to July 2013



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. Version HadCRUT4 (blue) is now replacing HadCRUT3 (red).Please note that this diagram has not been updated beyond June 2013.



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. Please note that this diagram has not yet been updated beyond June 2013.

A note on data record stability:

All the above temperature estimates display changes when one compare with previous monthly data sets, not only for the most recent months as a result of supplementary data being added, but actually for all months back to the very beginning of the records. Presumably this reflects recognition of errors, changes in the averaging procedure, and the influence of other phenomena.

None of the temperature records are stable over time (since 2008). The two surface air temperature records, NCDC and GISS, show apparent systematic changes over time. This is exemplified the diagram on the following page showing the changes since May 2008 in the NCDC global surface temperature record for January 1915 and January 2000, illustrating how the difference between the early and late part of the temperature records gradually is growing by administrative means.

You can find more on the issue of temporal stability (or lack of this) on www.climate4you (go to: *Global Temperature*, followed by *Temporal Stability*).

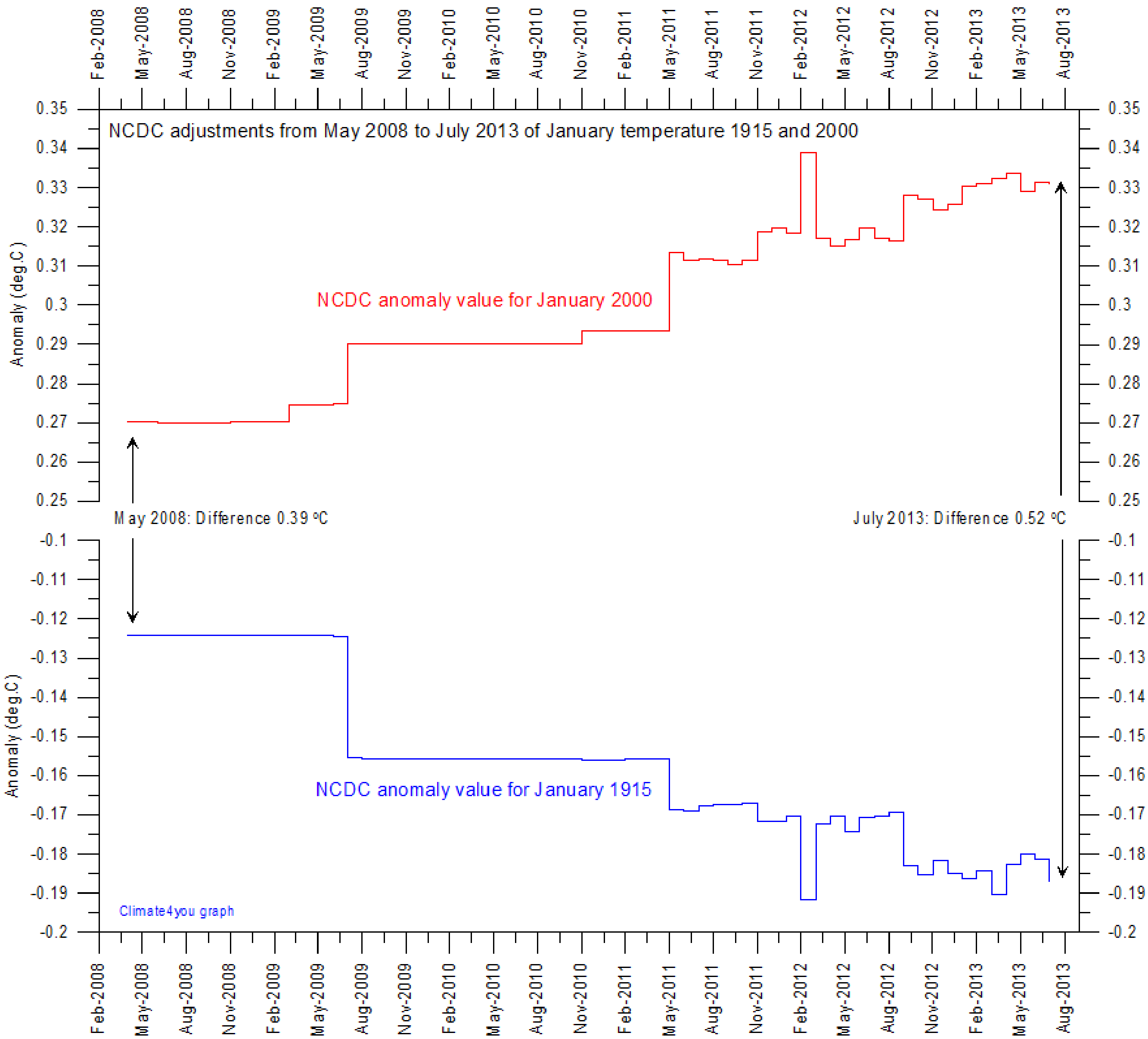


Diagram showing the adjustment made since May 2008 by the [National Climatic Data Center]() (NCDC) in the anomaly values for the two months January 1915 and January 2000.

<u>June 2013:</u> By administrative means the July 2013 temperature increase from January 1915 to January 2000 has grown from 0.39 to 0.52 ^{o}C, representing an about 33% increase of the original temperature increase reported in May 2008.

Global surface air temperature linear trends

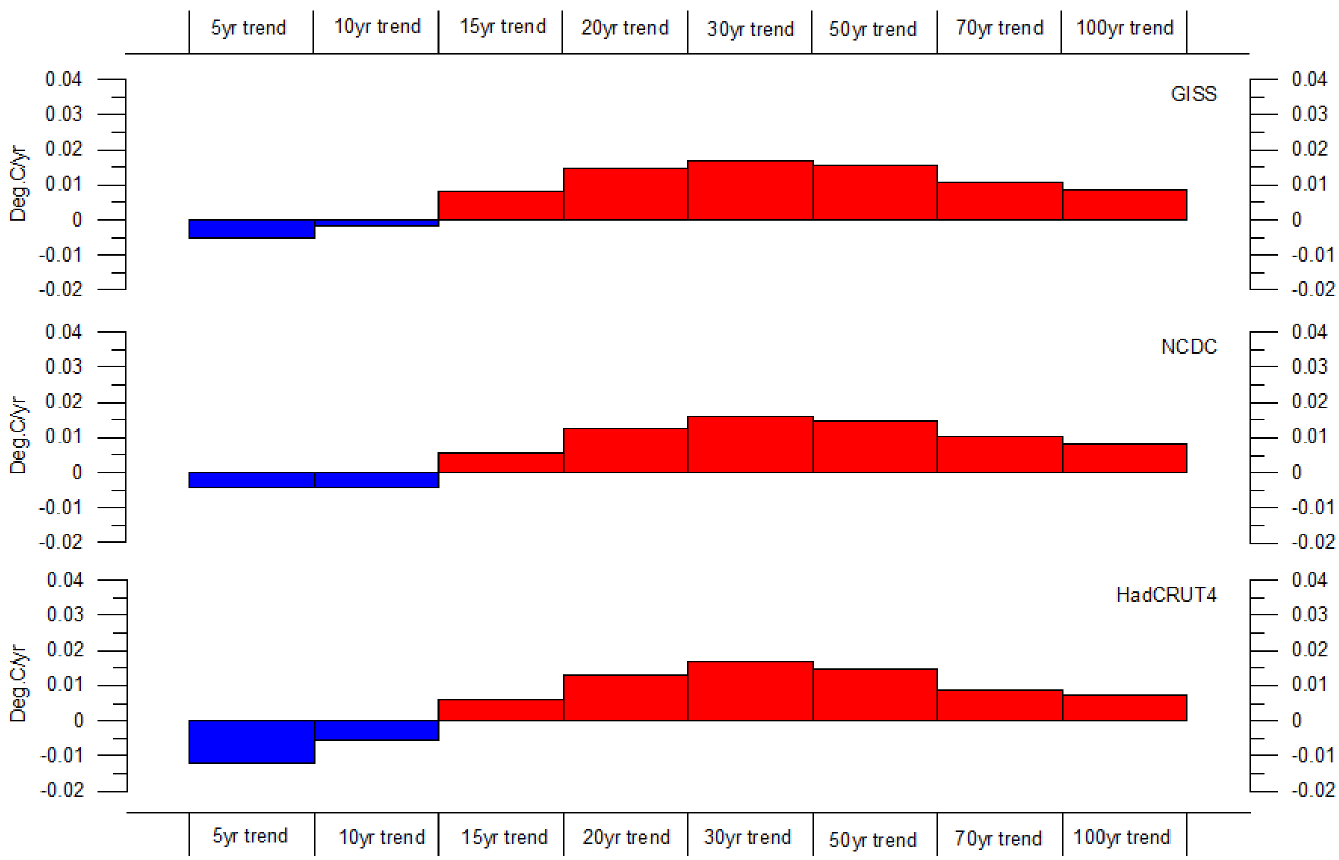
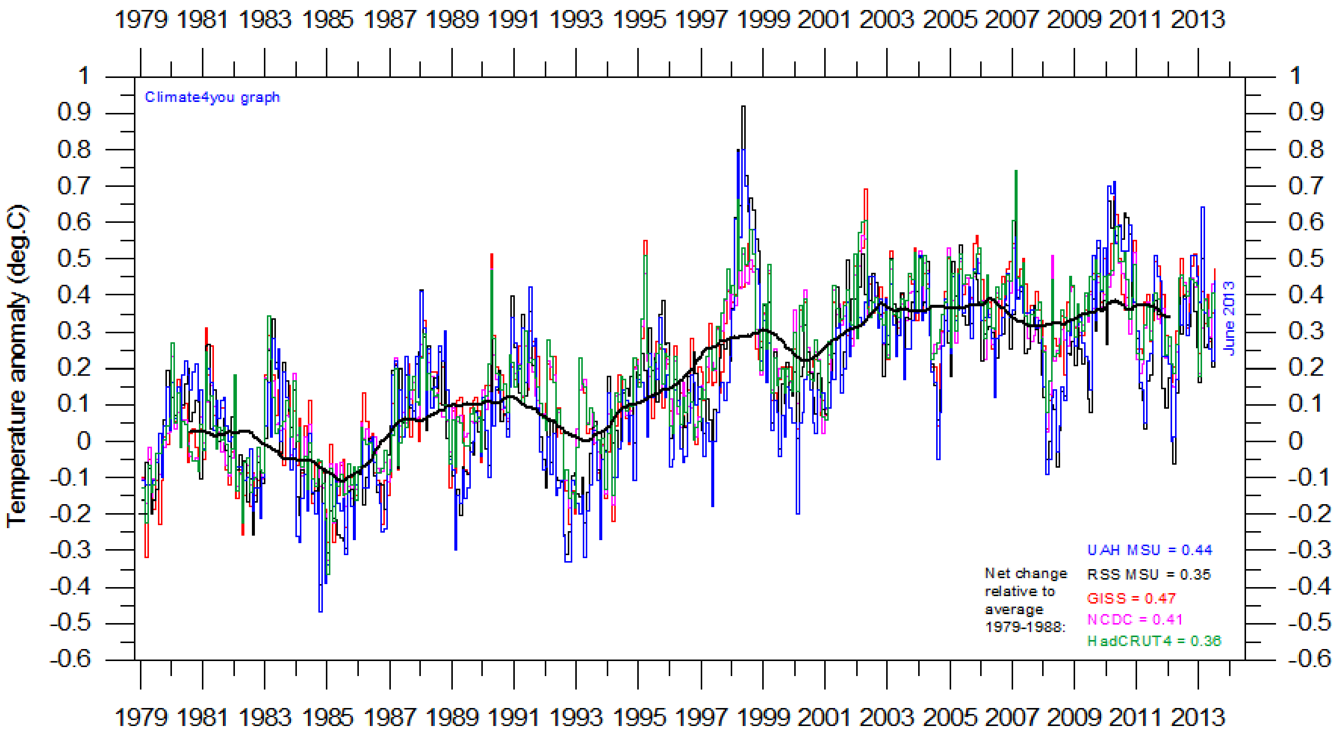


Diagram showing the latest 5, 10, 20, 30, 50, 70 and 100 year linear annual global temperature trend, calculated as the slope of the linear regression line through the data points, for three surface-based temperature estimates (GISS, NCDC and HadCRUT4). Last month included in all analyses: June 2013.

All in one, updated to June 2013

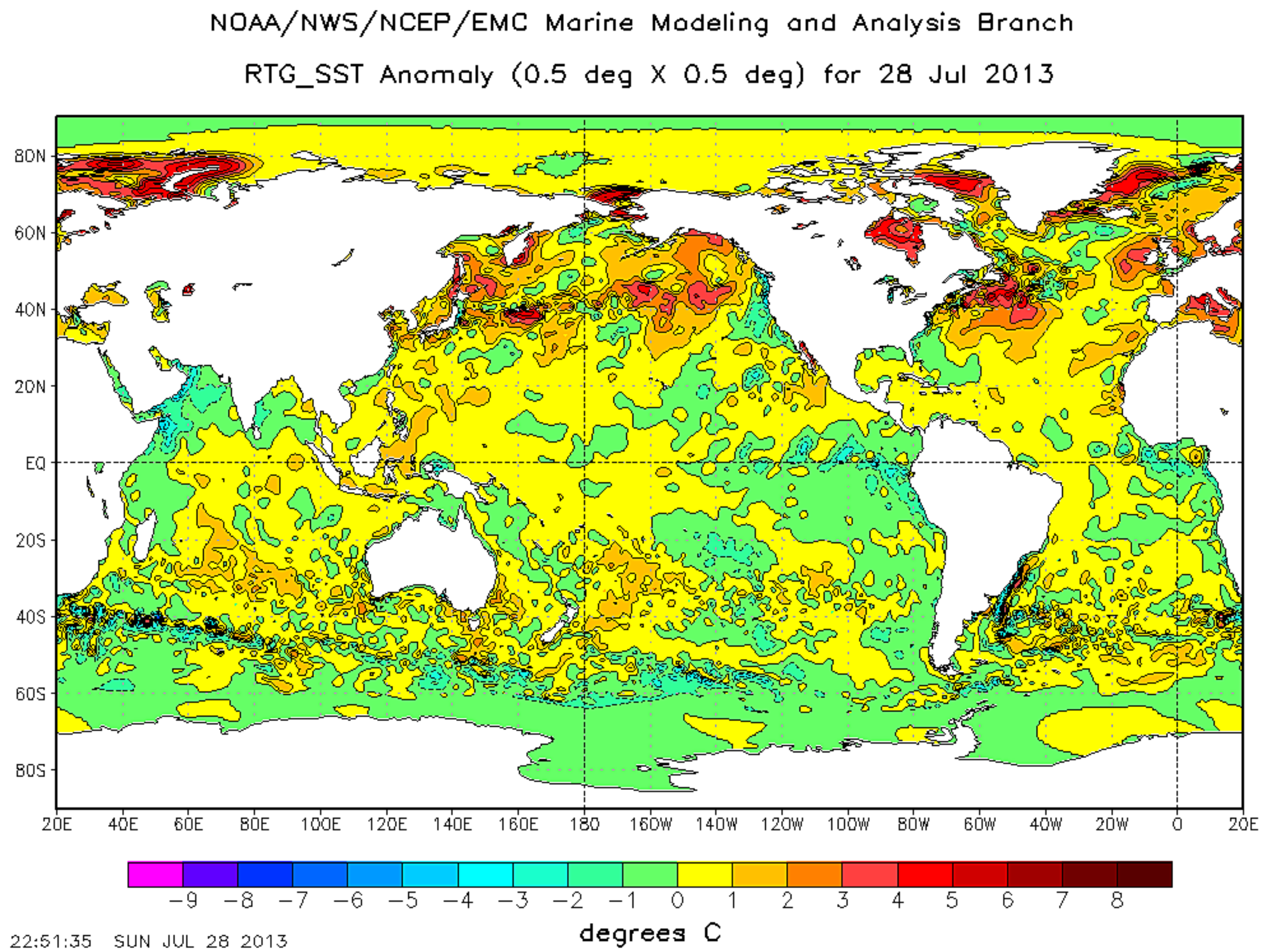


Superimposed plot of all five global monthly temperature estimates. As the base period differs for the individual temperature estimates, they have all been normalised by comparing with the average value of the initial 120 months (10 years) from January 1979 to December 1988. The heavy black line represents the simple running 37 month (c. 3 year) mean of the average of all five temperature records. The numbers shown in the lower right corner represent the temperature anomaly relative to the individual 1979-1988 averages.

It should be kept in mind that satellite- and surface-based temperature estimates are derived from different types of measurements, and that comparing them directly as done in the diagram above therefore in principle may be problematical. However, as both types of estimate often are discussed together, the above diagram may nevertheless be of some interest. In fact, the different types of temperature estimates appear to agree quite well as to the overall temperature variations on a 2-3 year scale, although on a shorter time scale there are often considerable differences between the individual records.

All five global temperature estimates presently show an overall stagnation, at least since 2002. There has been no increase in global air temperature since 1998, which however was affected by the oceanographic El Niño event. This stagnation does not exclude the possibility that global temperatures will begin to increase again later. On the other hand, it also remain a possibility that Earth just now is passing a temperature peak, and that global temperatures will begin to decrease within the coming years. Time will show which of these two possibilities is correct.

Global sea surface temperature, updated to late July 2013



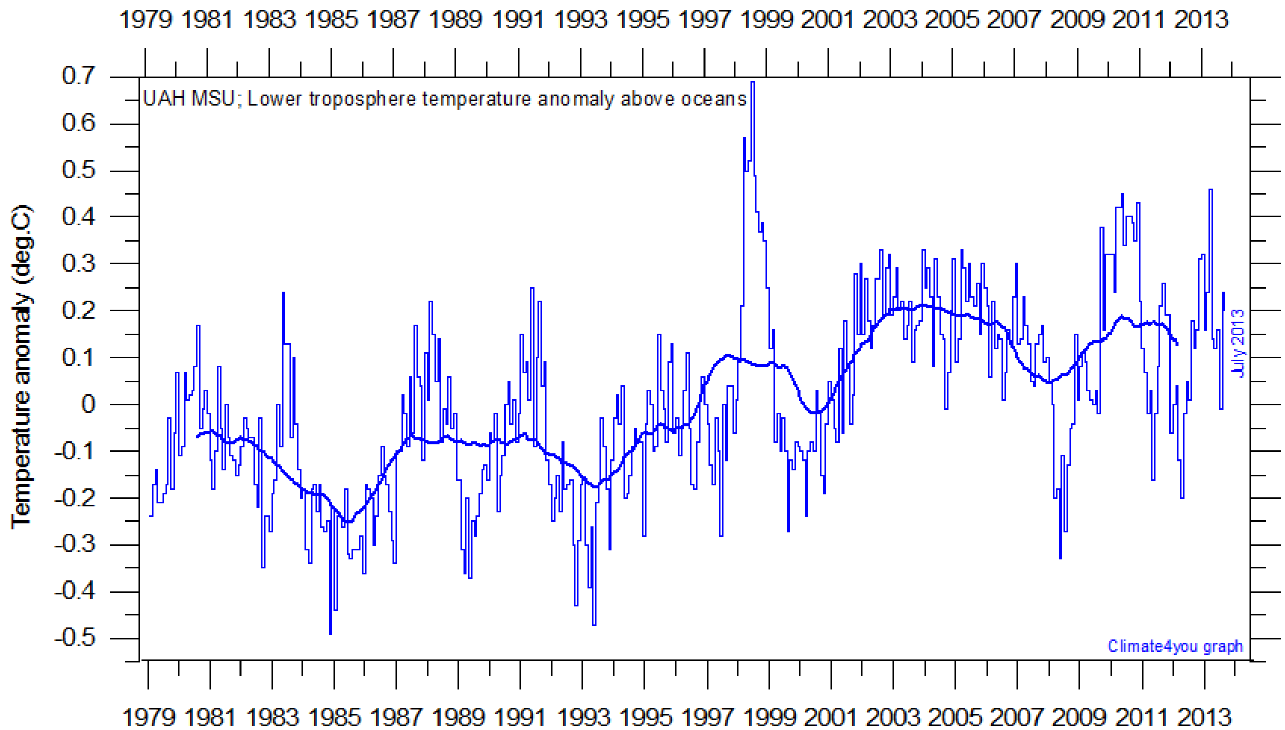
Sea surface temperature anomaly on 28 July 2013. Map source: National Centers for Environmental Prediction (NOAA).

Because of the large surface areas involved especially near Equator, the temperature of the surface water in these regions is important for the global atmospheric temperature (p.3-5).

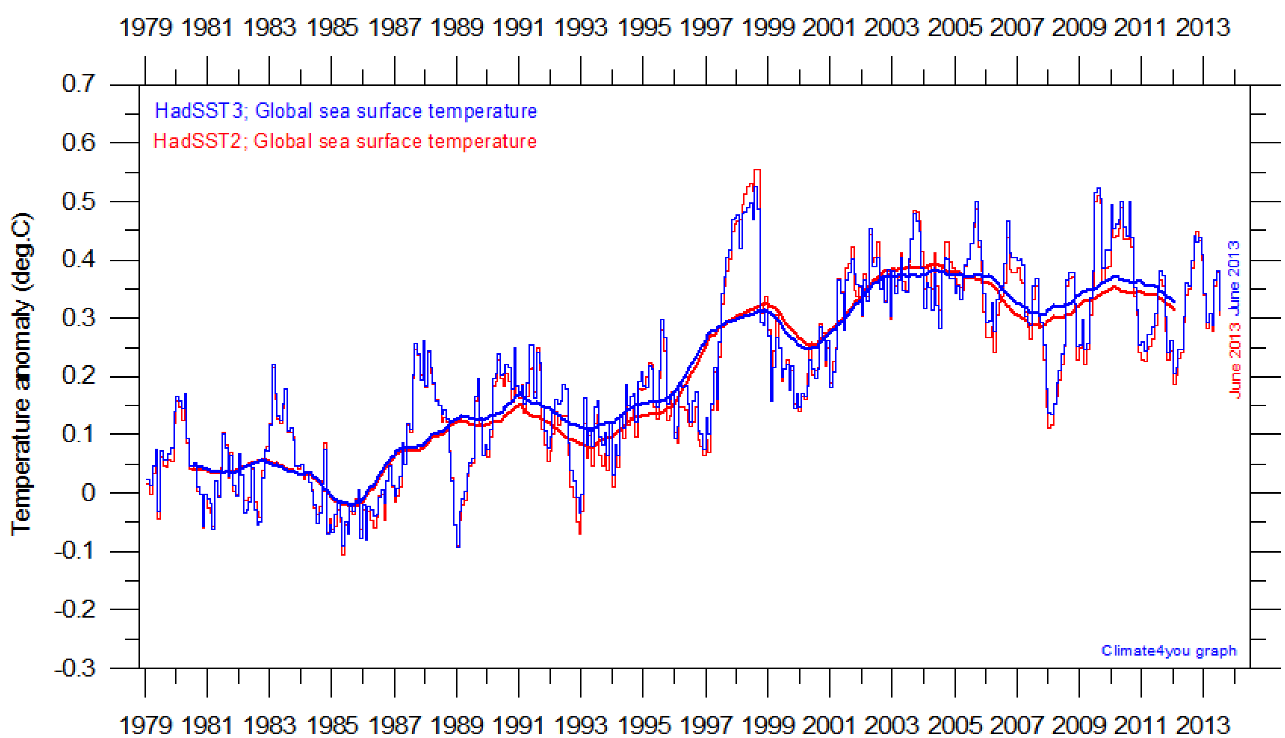
Relatively cold water is spreading across the Pacific Ocean near the Equator, and may influence global air temperatures in the months to come.

The significance of any such short-term cooling or warming reflected in air temperatures should not be over stated. Whenever Earth experiences cold La Niña or warm El Niño episodes (Pacific Ocean) major heat exchanges takes place between the Pacific Ocean and the atmosphere above, eventually showing up in estimates of the global air temperature.

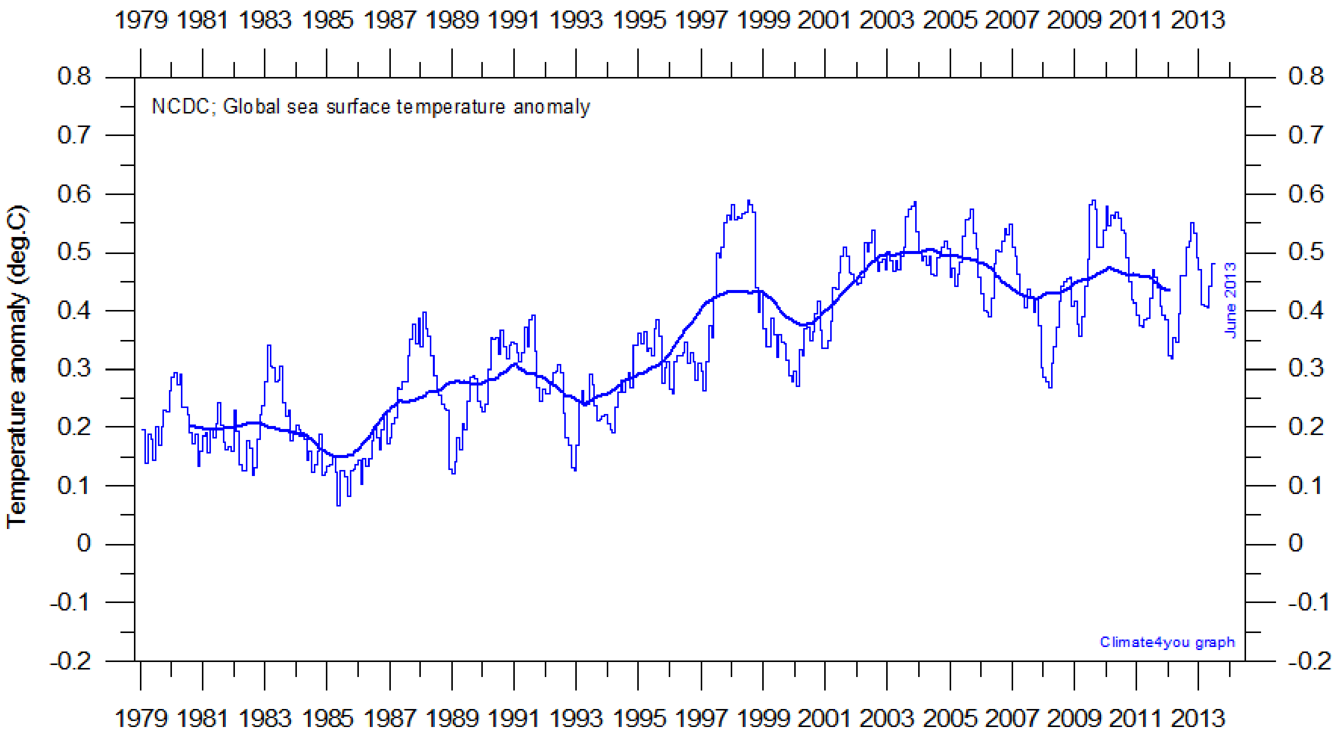
However, this does not reflect similar changes in the total heat content of the atmosphere-ocean system. In fact, net changes may be small, as such heat exchanges mainly reflect redistribution of energy between ocean and atmosphere. What matters is the overall temperature development when seen over a number of years.



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.

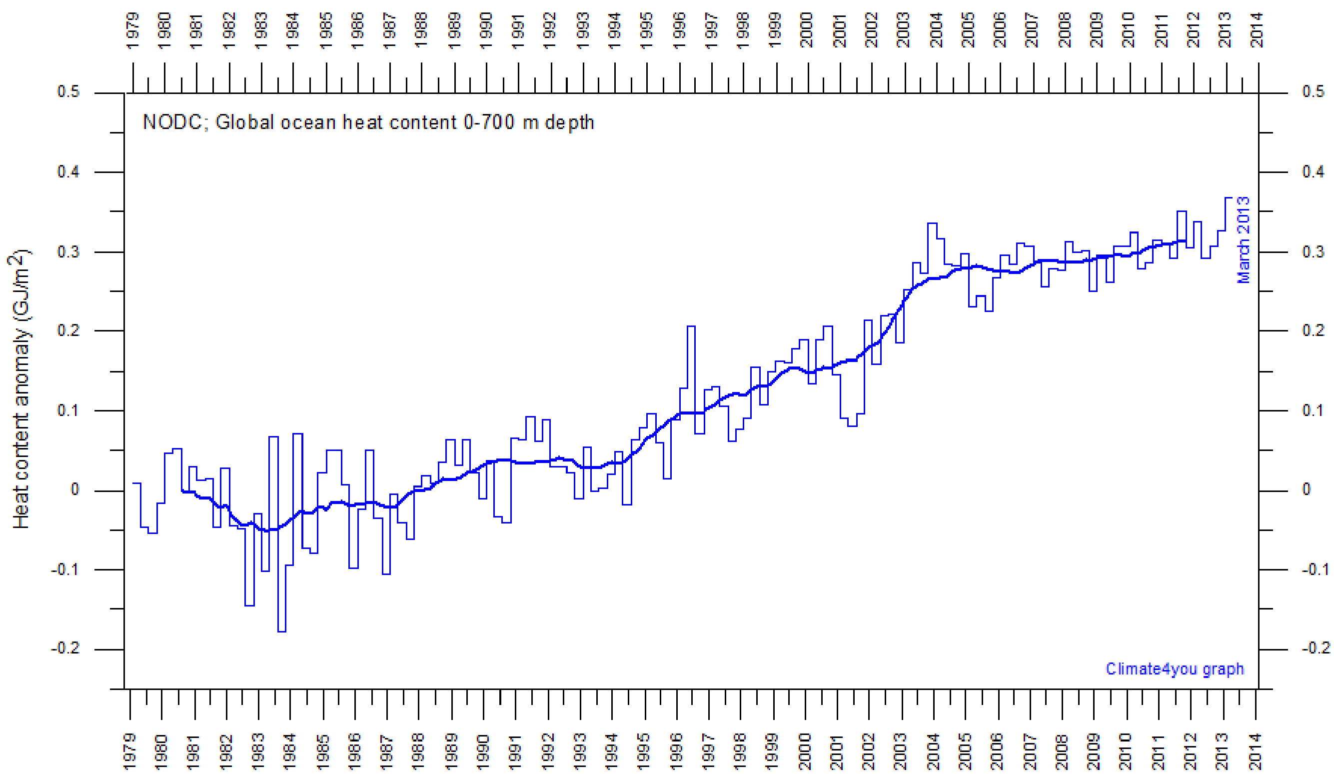


Global monthly average sea surface temperature since 1979 according to University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK. Base period: 1961-1990. The thick line is the simple running 37 month average. Please note that this diagram is not updated beyond June 2013.

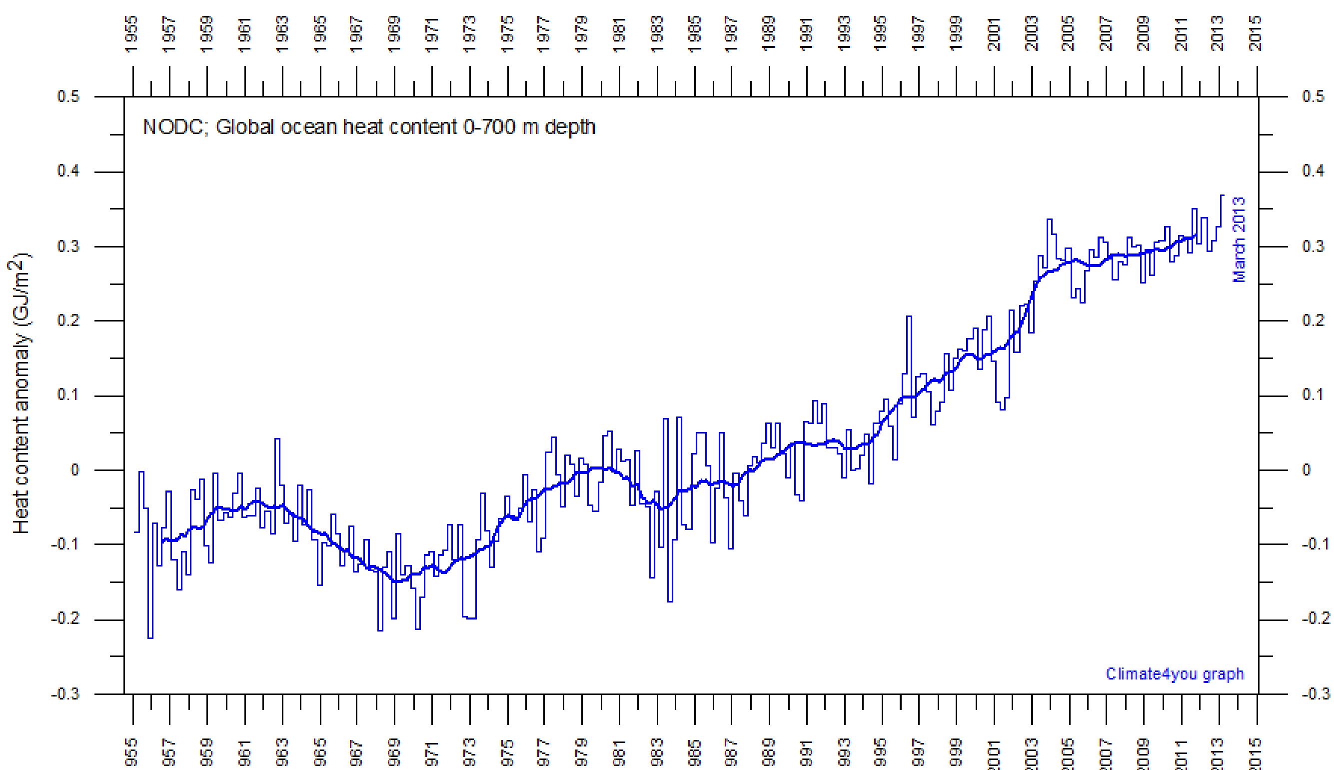


Global monthly average sea surface temperature since 1979 according to the [National Climatic Data Center](#) (NCDC), USA. Base period: 1901-2000. The thick line is the simple running 37 month average. Please note that this diagram has not yet been updated beyond June 2013.

Global ocean heat content uppermost 700 m, updated to March 2013

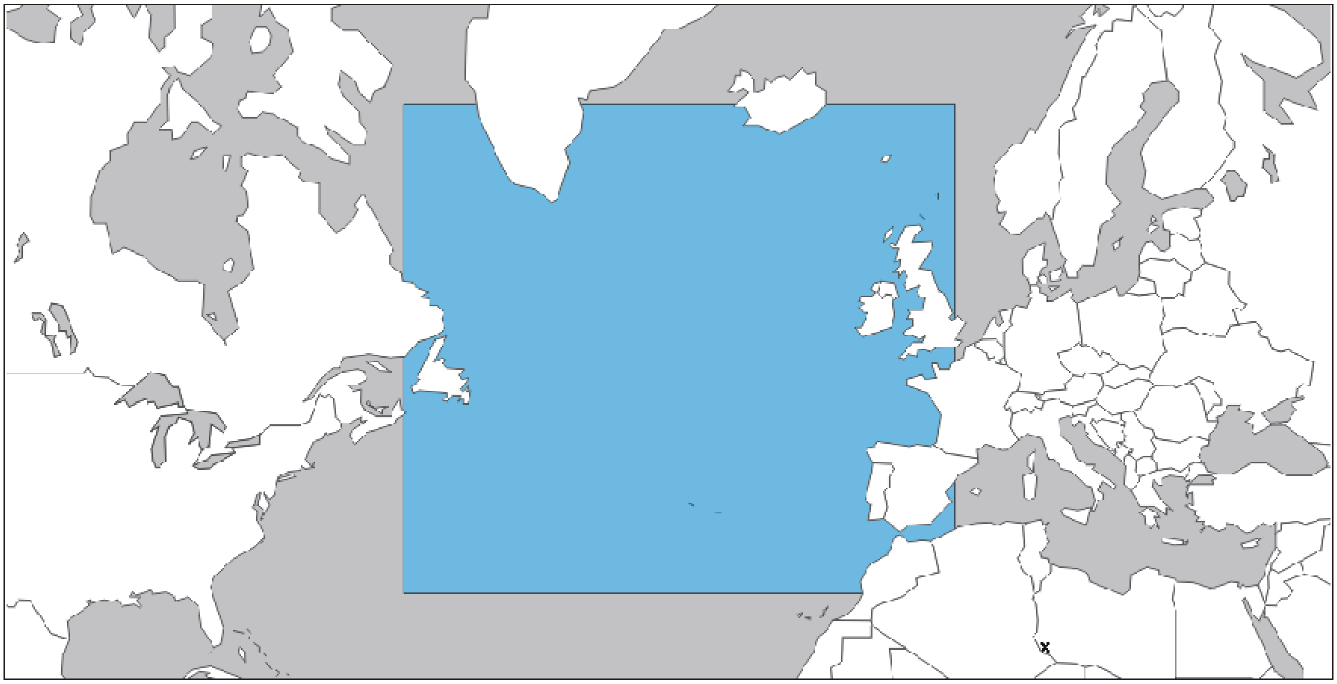


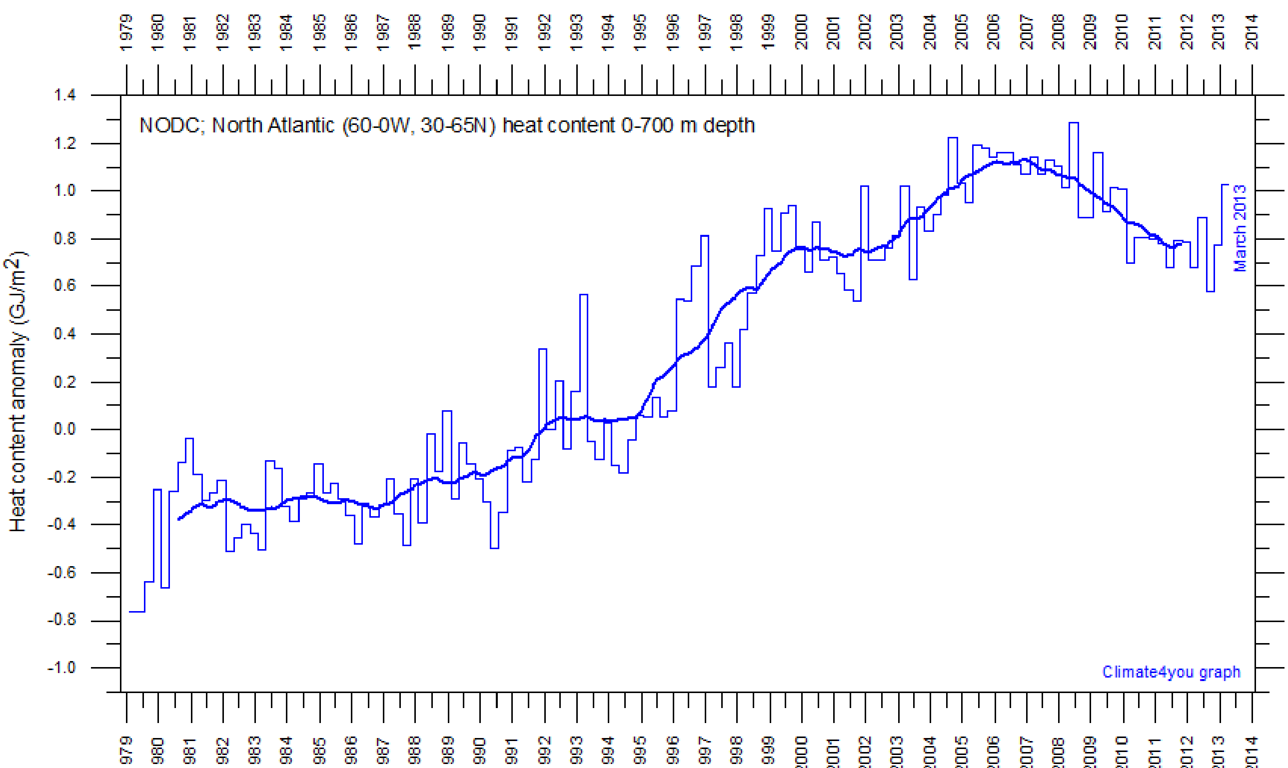
Global monthly heat content anomaly (GJ/m2) in the uppermost 700 m of the oceans since January 1979. Data source: National Oceanographic Data Center(NODC).



Global monthly heat content anomaly (GJ/m2) in the uppermost 700 m of the oceans since January 1955. Data source: National Oceanographic Data Center(NODC).

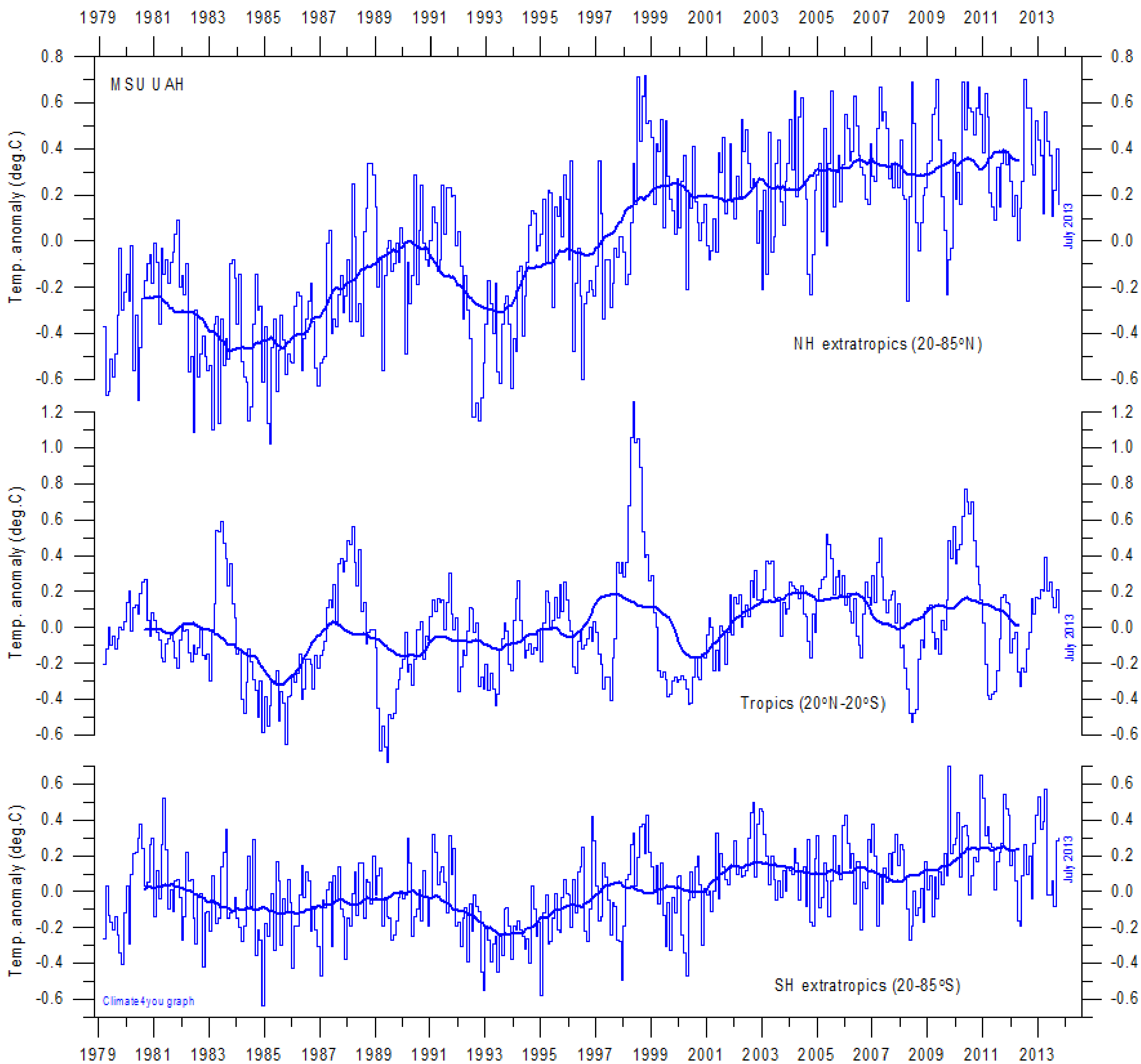
[North Atlantic heat content uppermost 700 m, updated to March 2012]





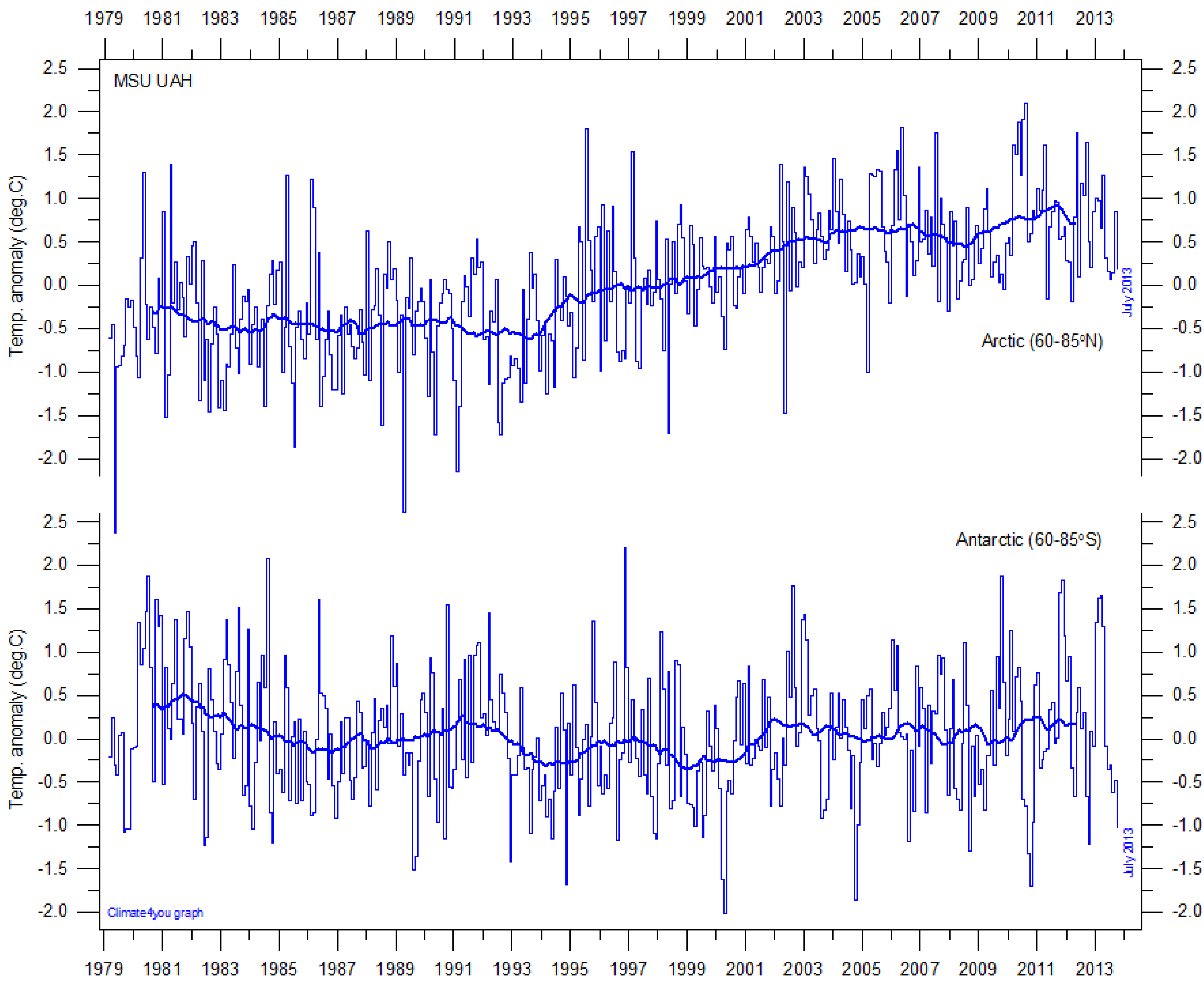
Global monthly heat content anomaly (GJ/m2) in the uppermost 700 m of the North Atlantic (60-0W, 30-65N; see map above) *ocean since January 1979. The thin line indicates monthly values, and the thick line represents the simple running 37 month (c. 3 year) average. Data source: [National Oceanographic Data Center] (NODC).*

Zonal lower troposphere temperatures from satellites, updated to July 2013



Global monthly average lower troposphere temperature since 1979 for the tropics and the northern and southern extratropics, according to [University of Alabama](#) at Huntsville, USA. Thin lines show the monthly temperature. Thick lines represent the simple running 37 month average, nearly corresponding to a running 3 yr average. Reference period 1981-2010.

Arctic and Antarctic lower troposphere temperature, updated to July 2013



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). Thin lines show the monthly temperature. 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 2013

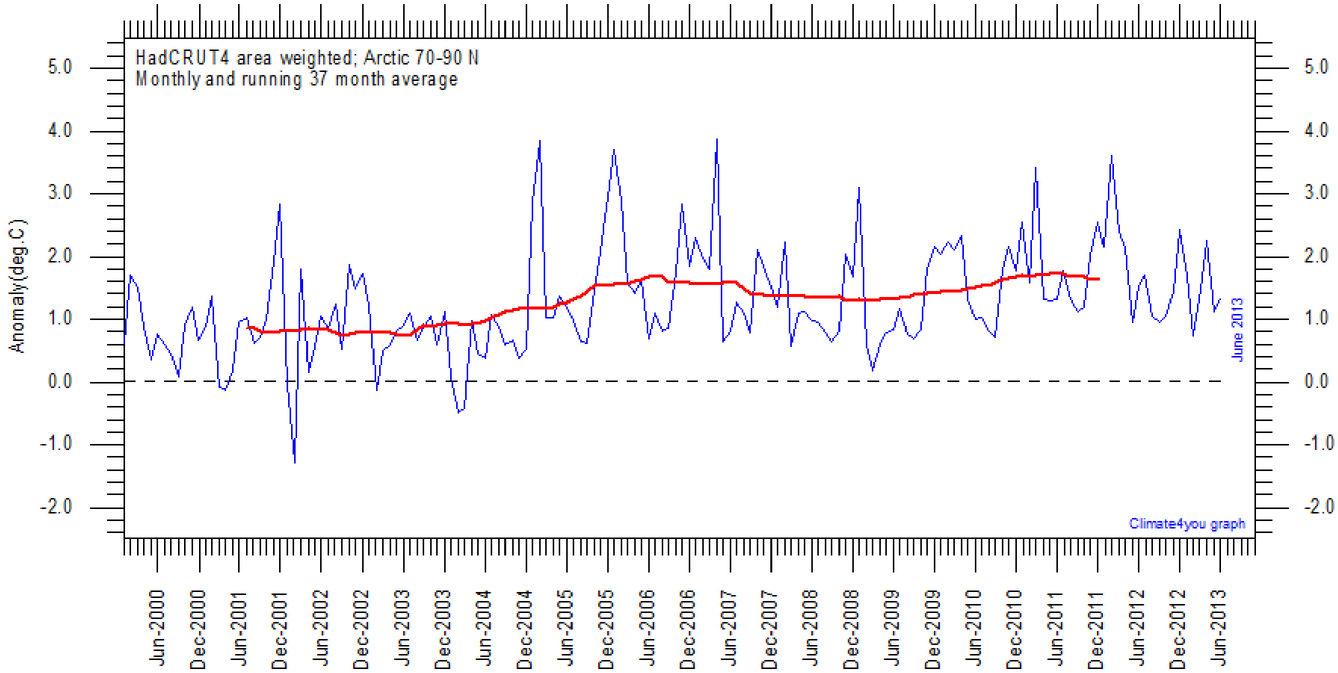


Diagram showing area weighted Arctic (70-90°N) monthly surface air temperature anomalies (HadCRUT4) since January 2000, in relation to the WMO normal period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average.

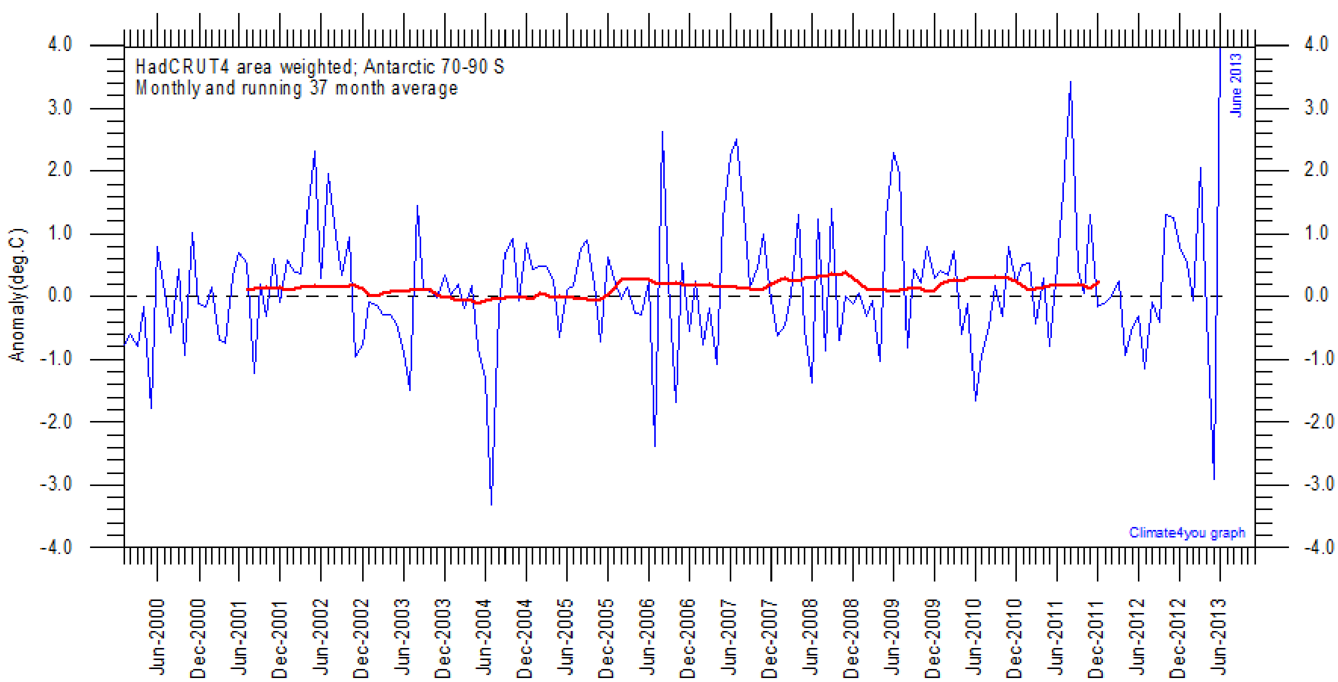


Diagram showing area weighted Antarctic (70-90°N) monthly surface air temperature anomalies (HadCRUT4) since January 2000, in relation to the WMO normal period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average.

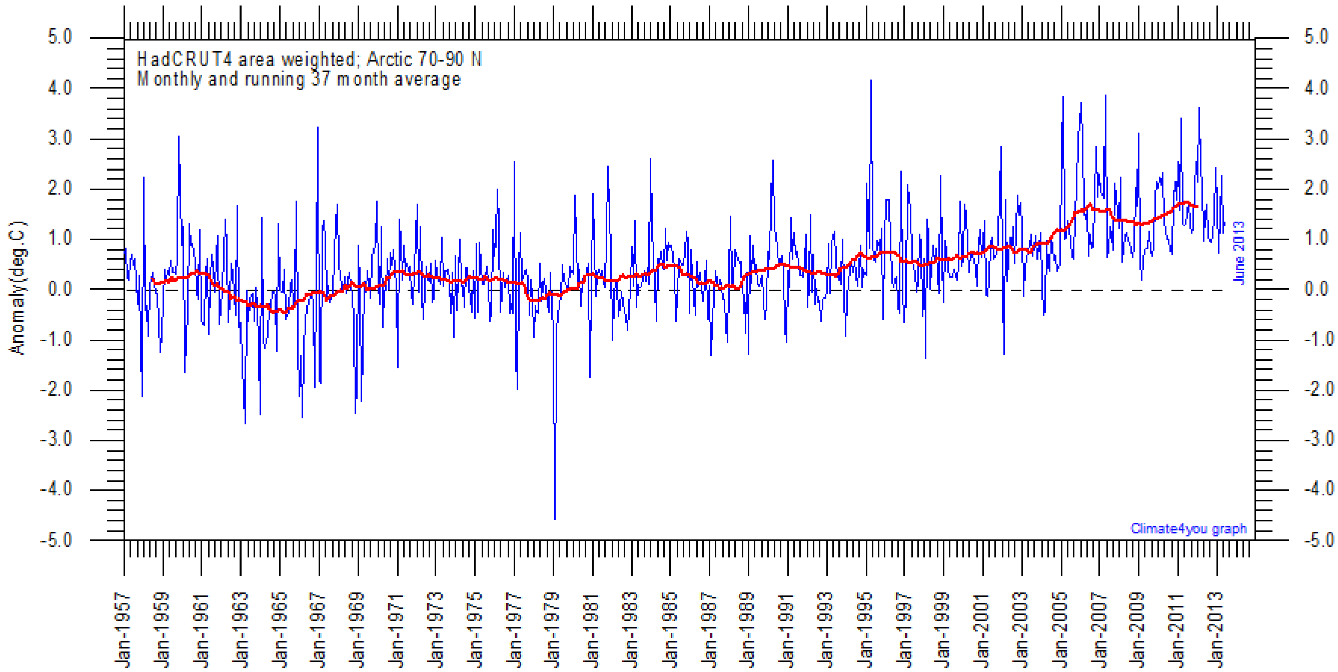


Diagram showing area weighted Arctic (70-90°N) monthly surface air temperature anomalies ([HadCRUT4]) since January 1957, in relation to the WMO [normal period] 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average.

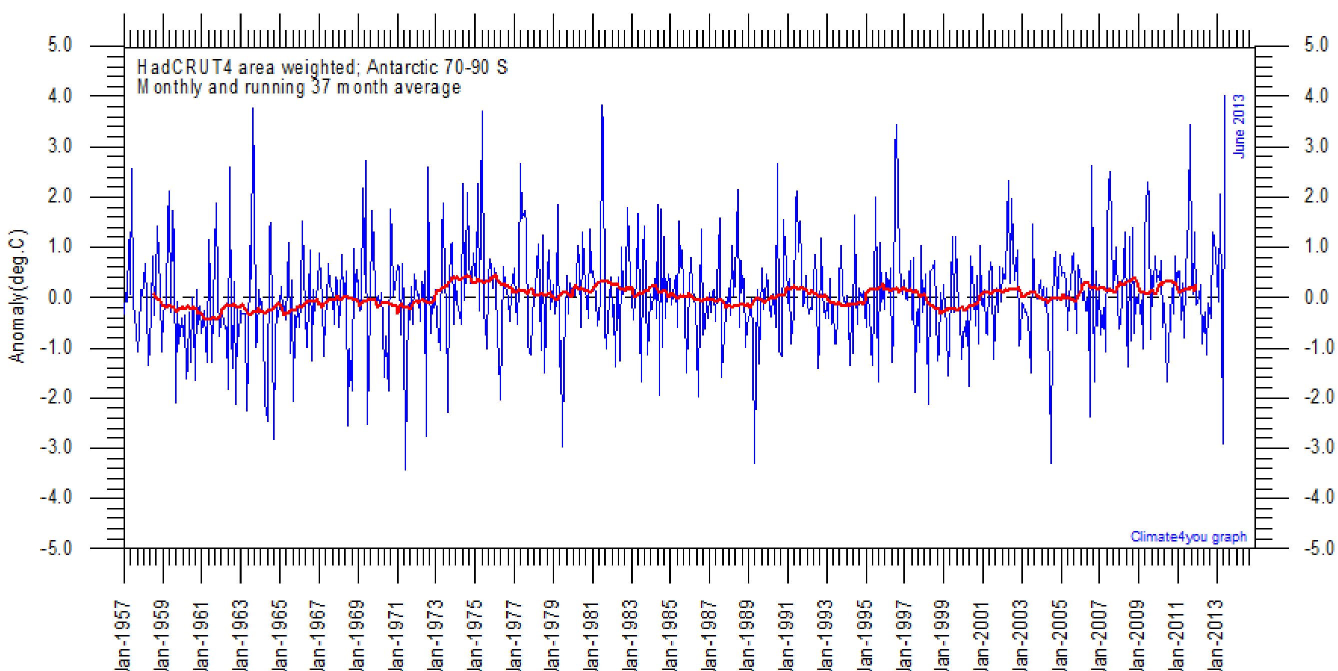


Diagram showing area weighted Antarctic (70-90°N) monthly surface air temperature anomalies ([HadCRUT4]) since January 1957, in relation to the WMO [normal period] 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average.

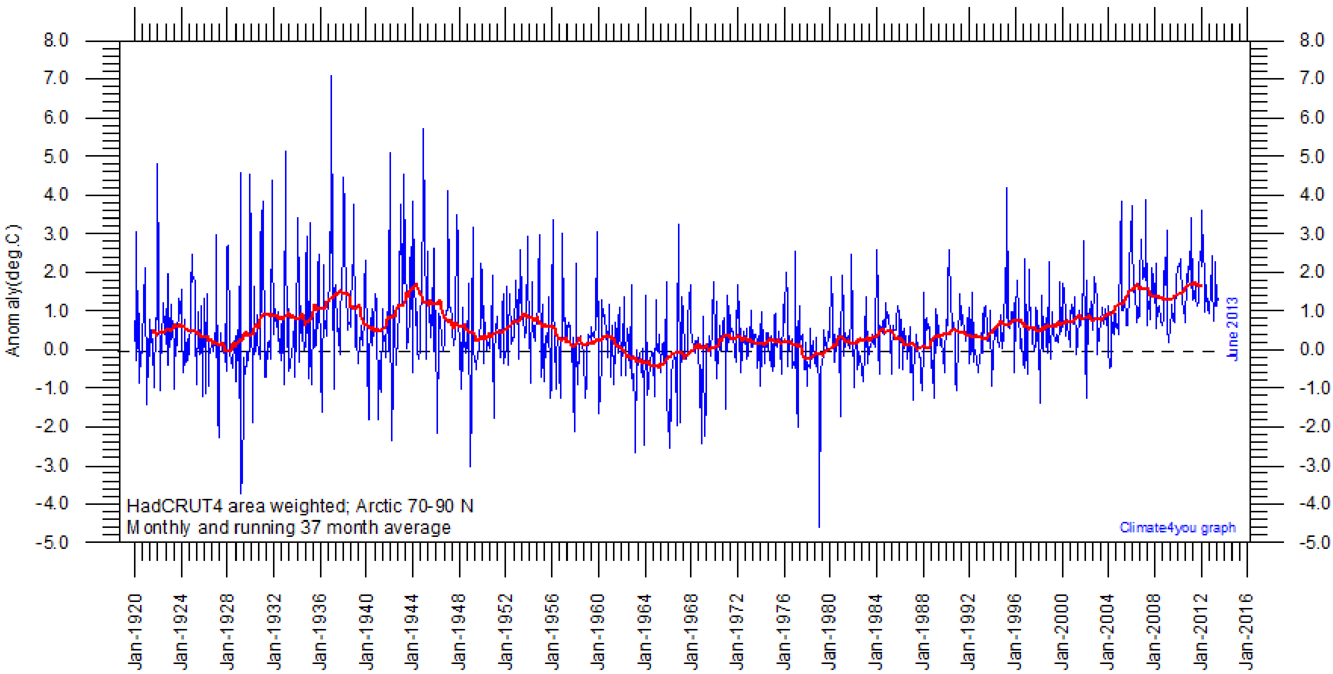


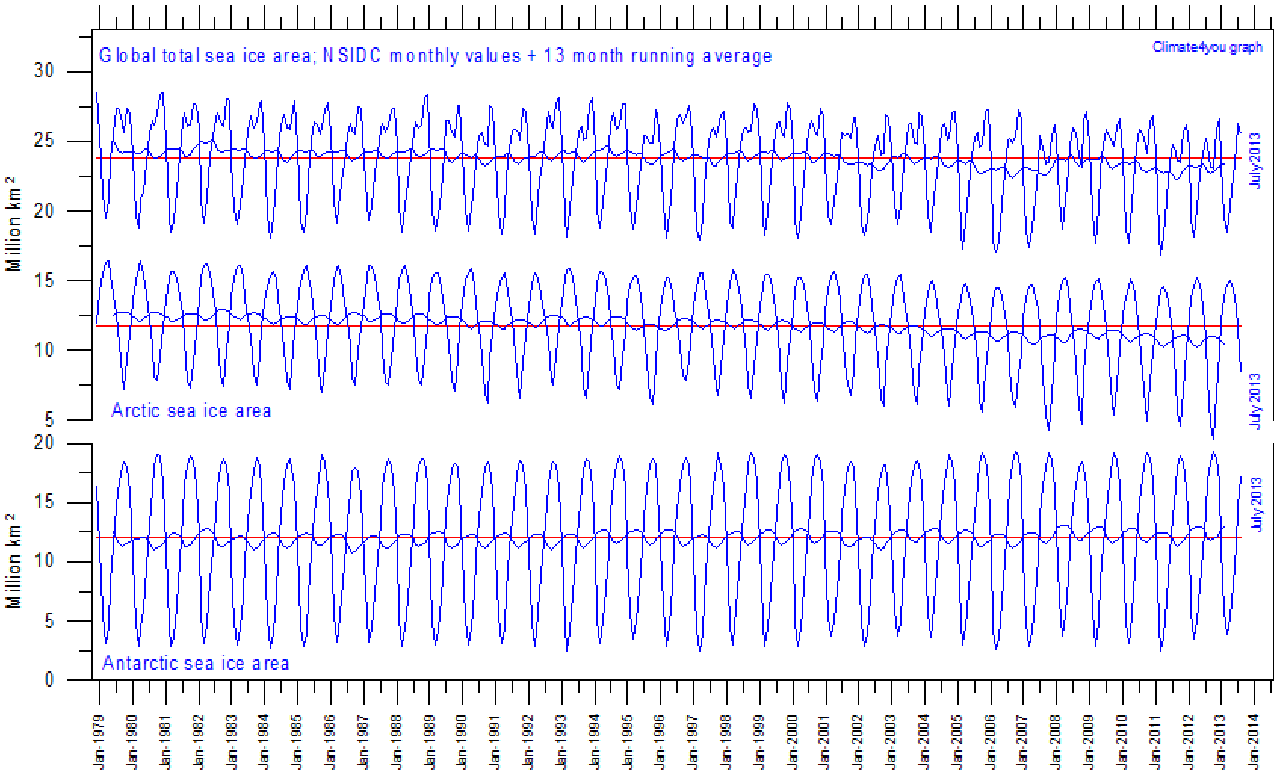
Diagram showing area weighted Arctic (70-90°N) monthly surface air temperature anomalies ([HadCRUT4]) since January 1920, in relation to the WMO [normal period] 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average. Because of the relatively small number of Arctic stations before 1930, month-to-month variations in the early part of the temperature record are larger than later. 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. The period since 2000 is warm, about as warm as the period 1930-1940.

As the HadCRUT4 data series has improved high latitude coverage data coverage (compared to the HadCRUT3 series) the individual 5°x5° grid cells has been weighted according to their surface area. This is in contrast to Gillet et al. 2008 which calculated a simple average, with no consideration to the surface area represented by the individual 5°x5° grid cells.

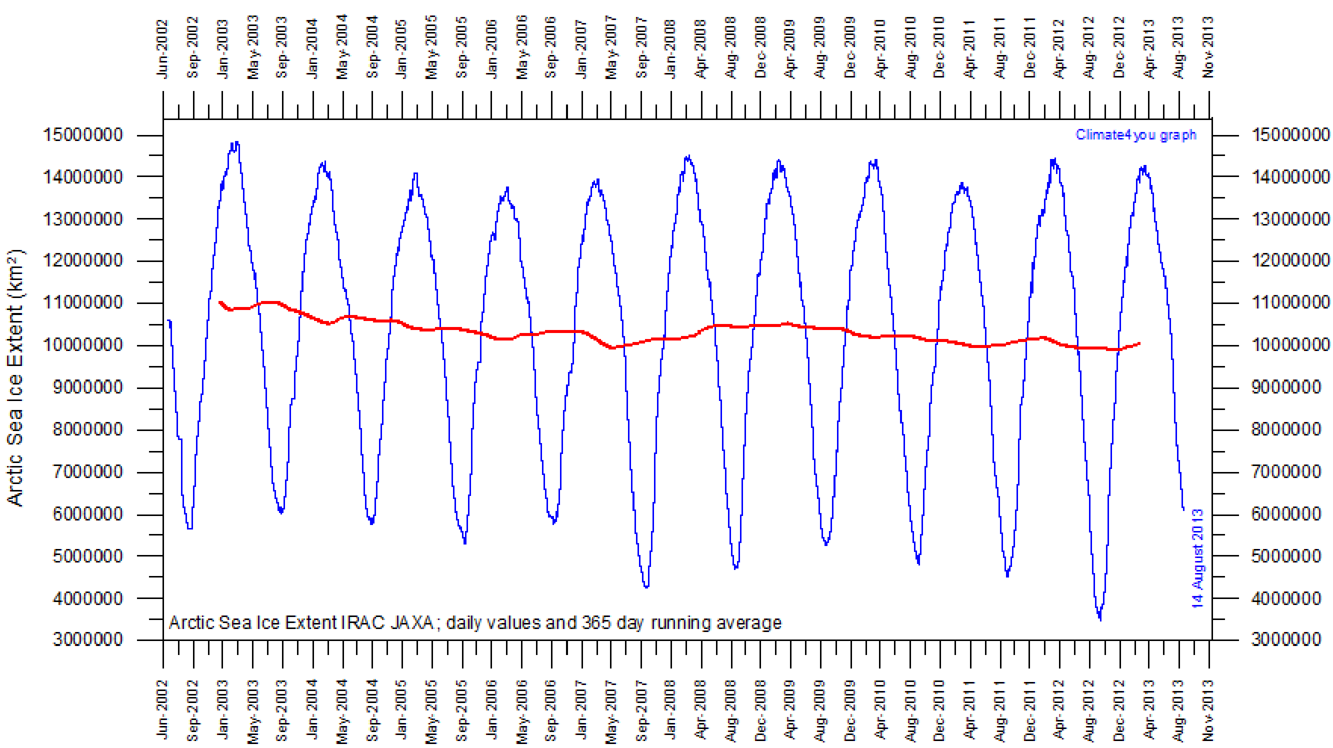
Literature:

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.

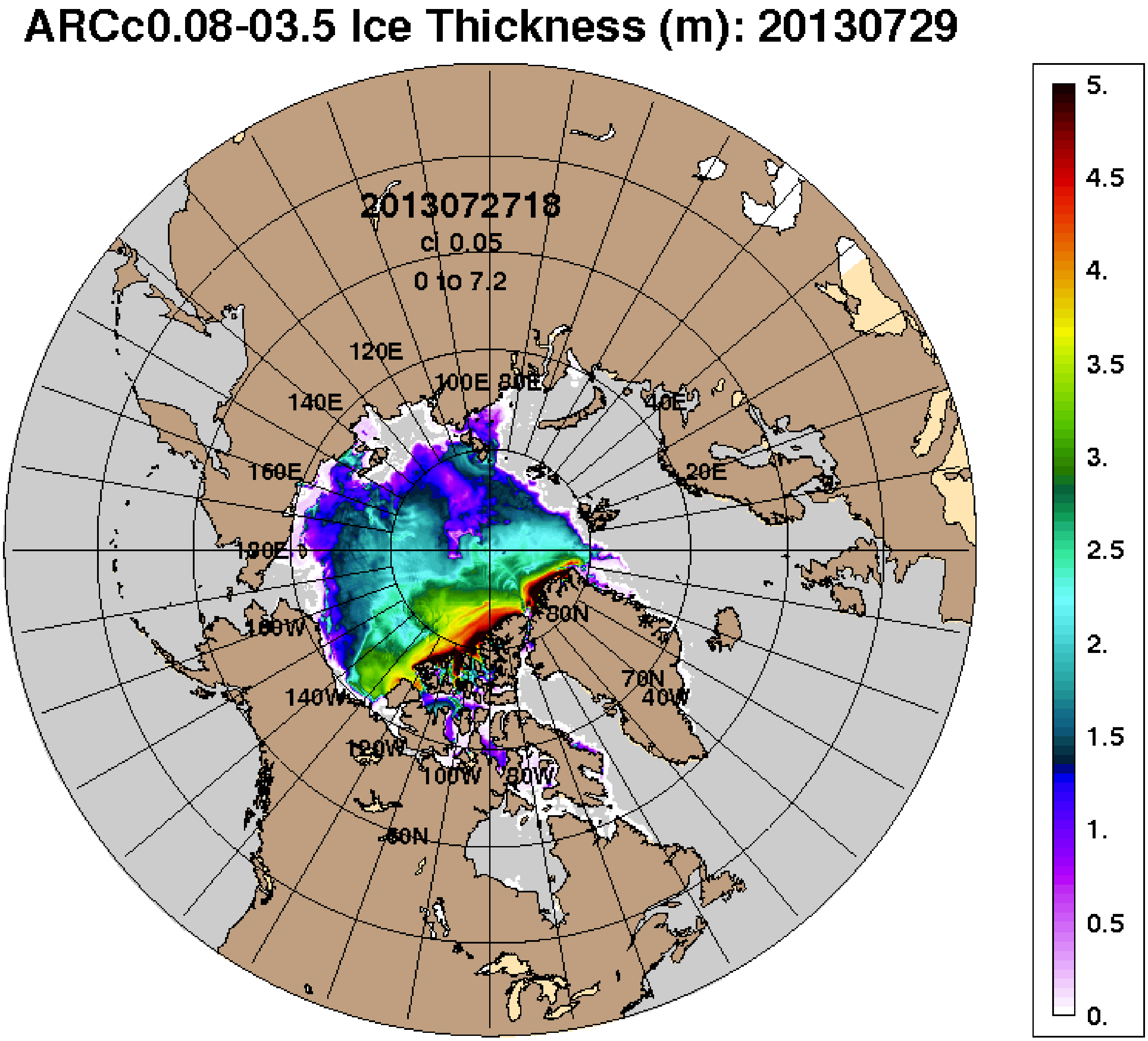
[Arctic and Antarctic sea ice, updated to July 2013](#)



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

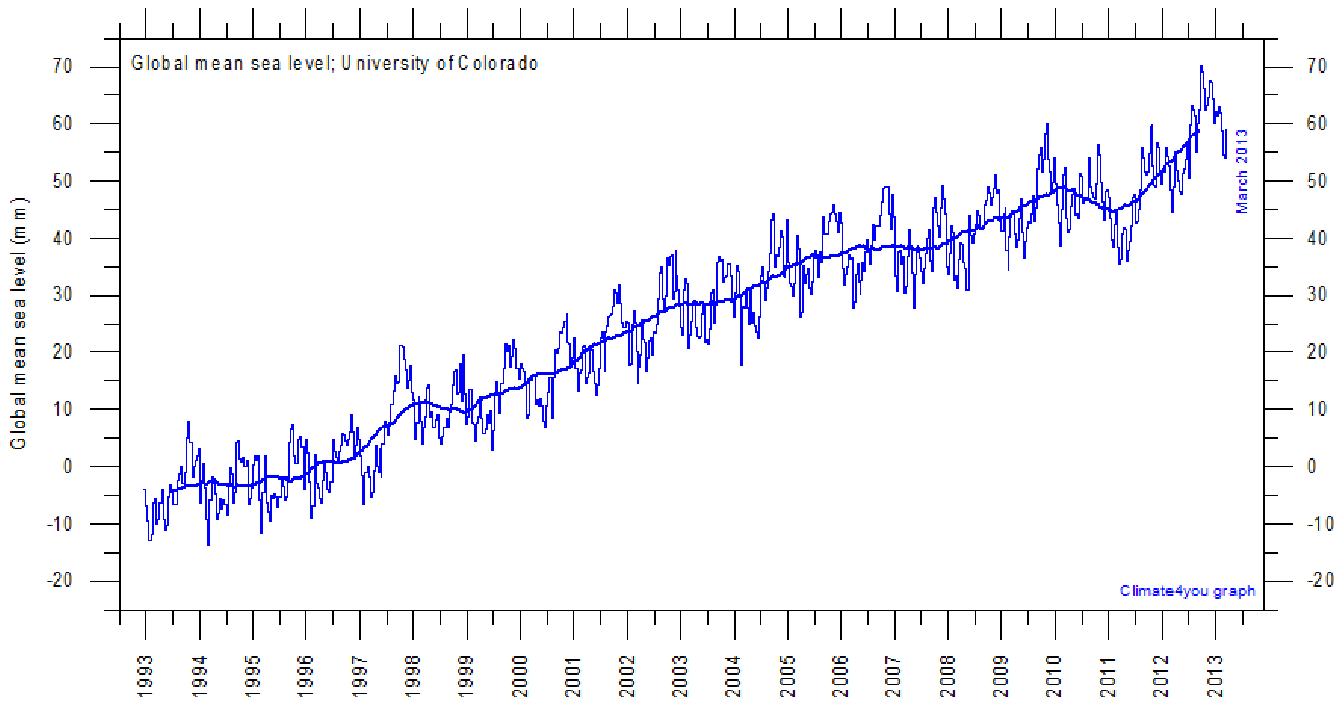


Graph showing daily Arctic sea ice extent since June 2002, to August 14, 2013, by courtesy of [Japan Aerospace Exploration Agency](#) (JAXA).

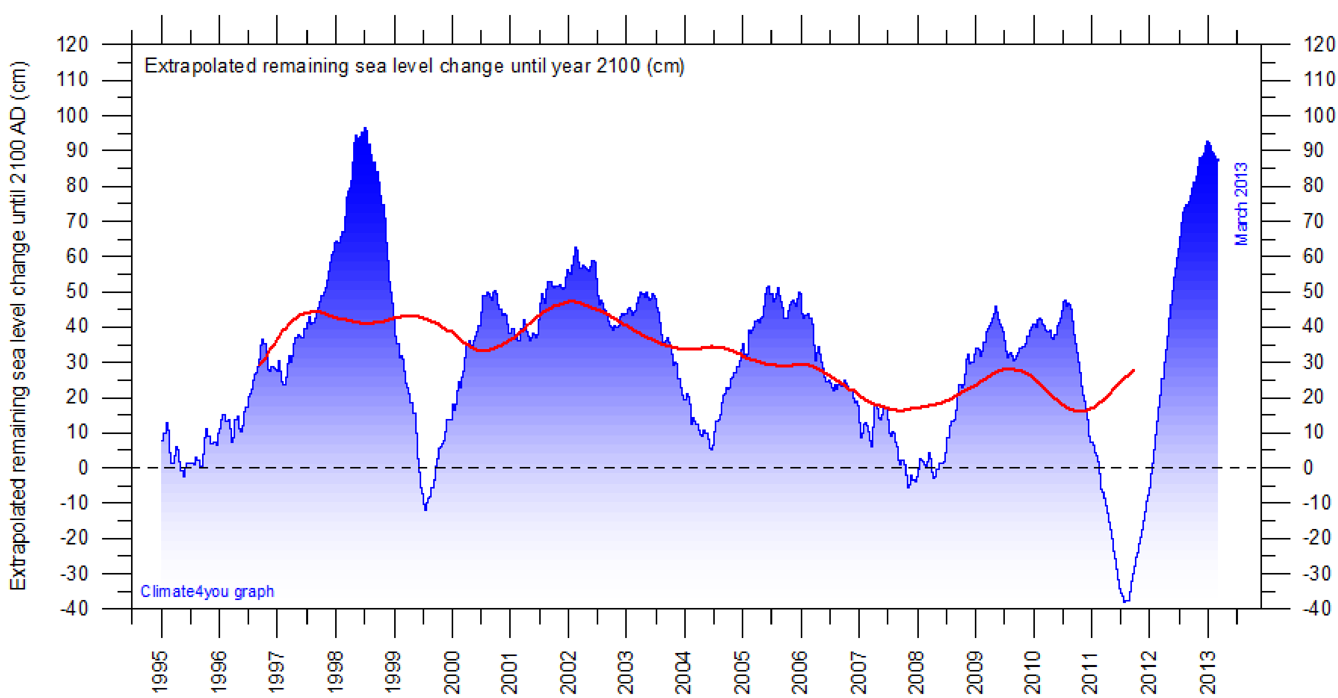


Northern hemisphere sea ice extension and thickness on 29 July 2013 according to the [Arctic Cap Nowcast/Forecast System](#) (ACNFS), US Naval Research Laboratory. Thickness scale (m) is shown to the right.

Global sea level, updated to March 2013

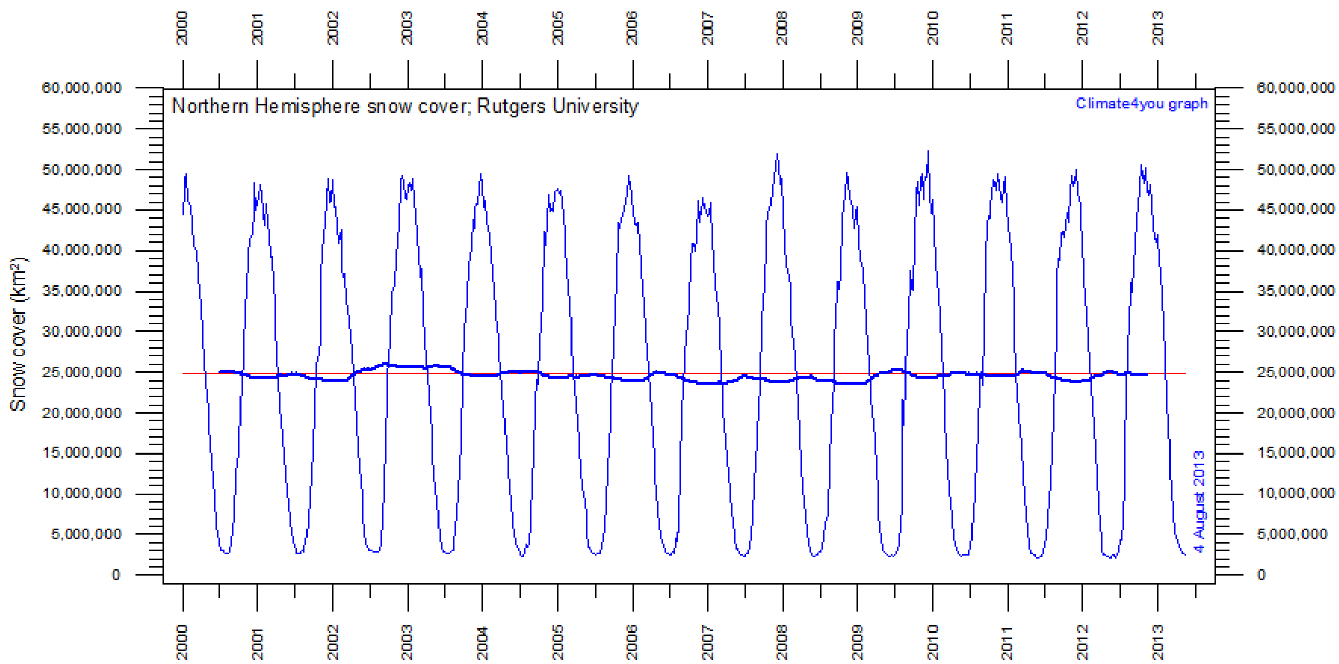


Globa lmonthly sea level since late 1992 according to the Colorado Center for Astrodynamics Research at [University of Colorado at Boulder](), USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.

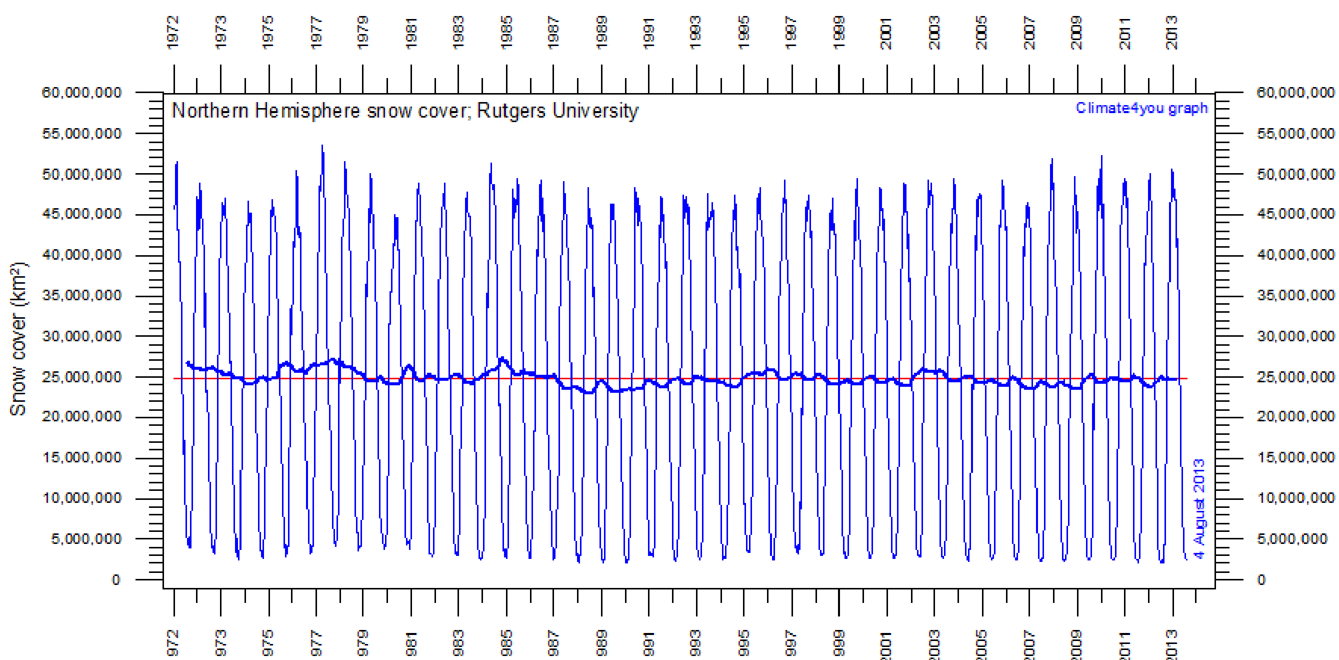


Forecasted change of global sea level until year 2100, based on simple extrapolation of measurements done by the Colorado Center for Astrodynamics Research at [University of Colorado at Boulder](), USA. The thick line is the simple running 3 yr average forecast for sea level change until year 2100. Based on this (thick line), the present simple empirical forecast of sea level change until 2100 is about +29 cm.

Northern Hemisphere weekly snow cover, updated to early August 2013

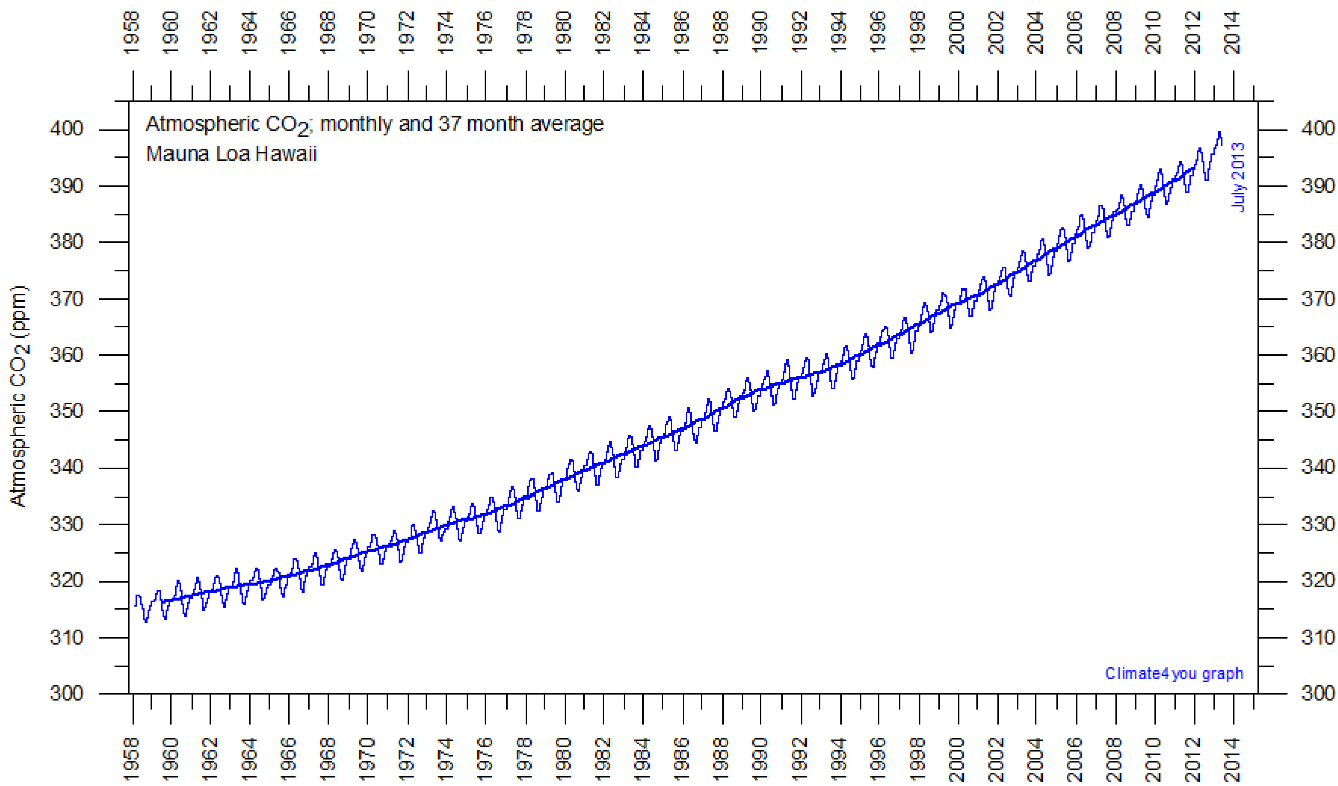


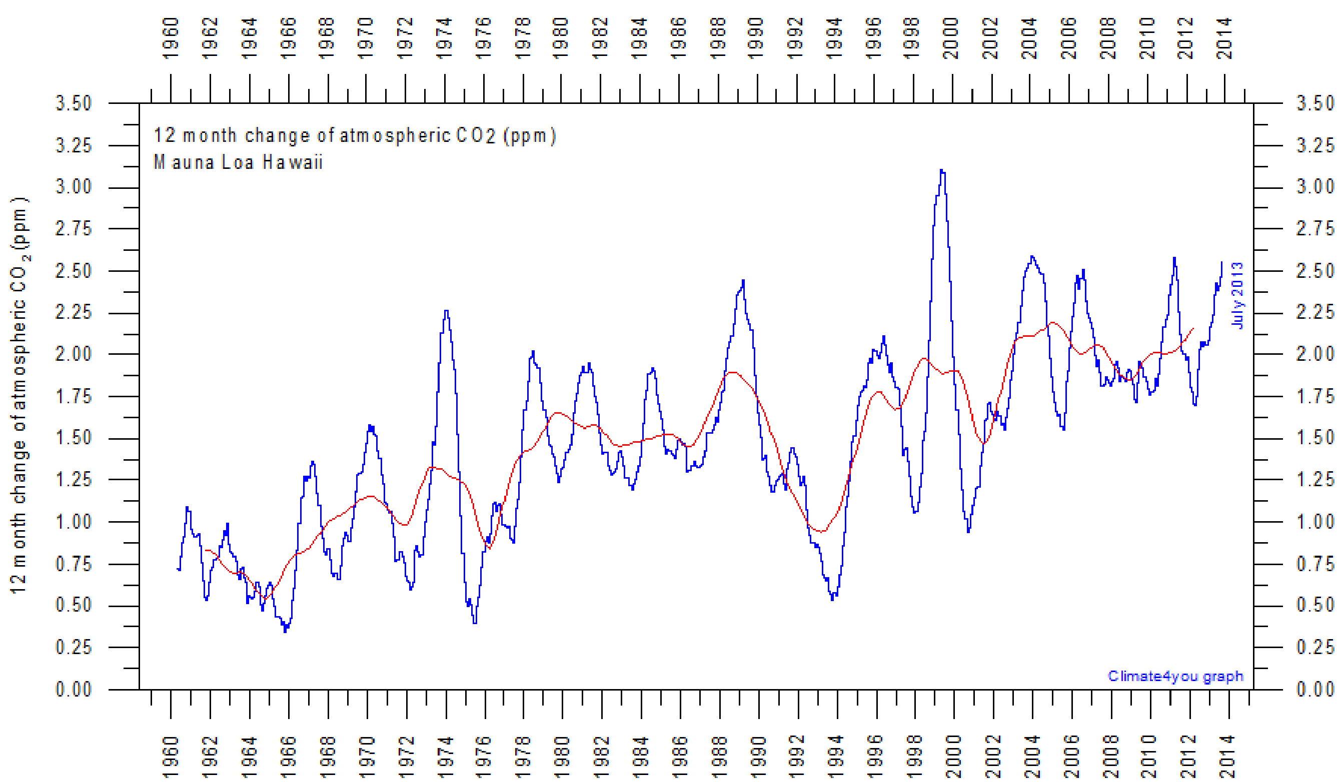
Northern hemisphere weekly snow cover since January 2000 according to Rutgers University Global Snow Laboratory. The thin blue line is the weekly data, and the thick blue line is the running 53 week average (approximately 1 year). The horizontal red line is the 1972-2012 average.



Northern hemisphere weekly snow cover since January 1972 according to Rutgers University Global Snow Laboratory. The thin blue line is the weekly data, and the thick blue line is the running 53 week average (approximately 1 year). The horizontal red line is the 1972-2012 average.

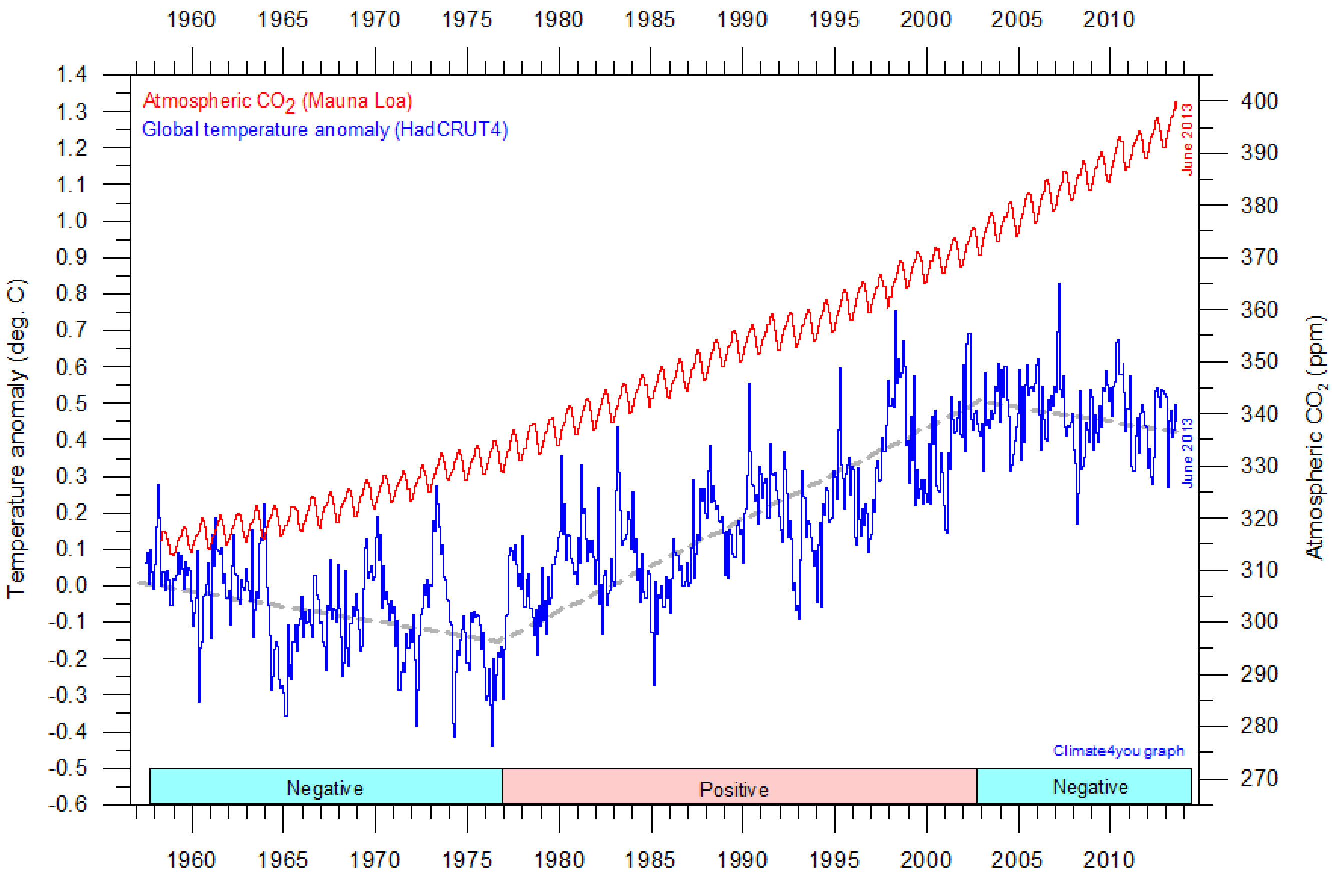
Atmospheric CO_2, updated to July 2013

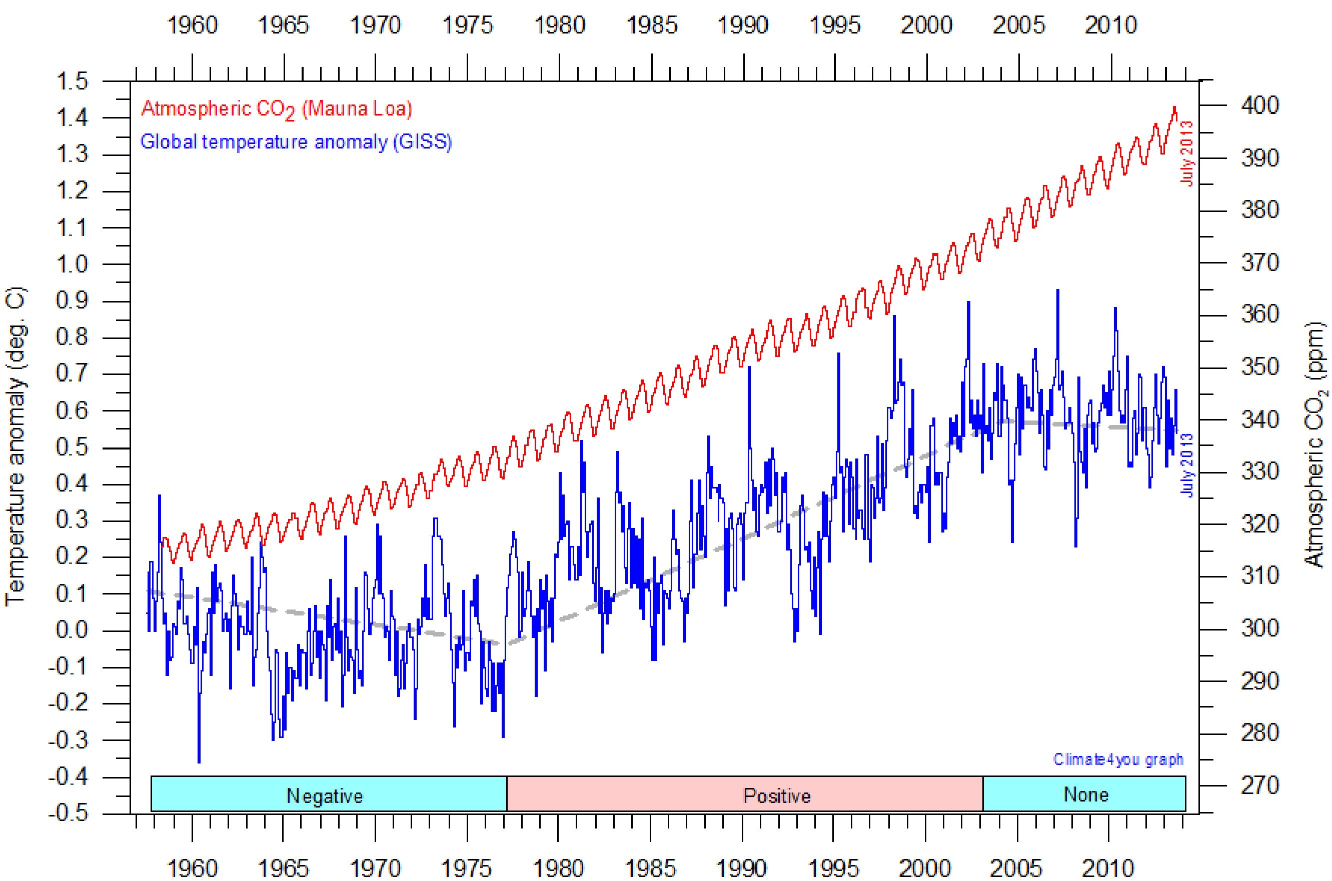


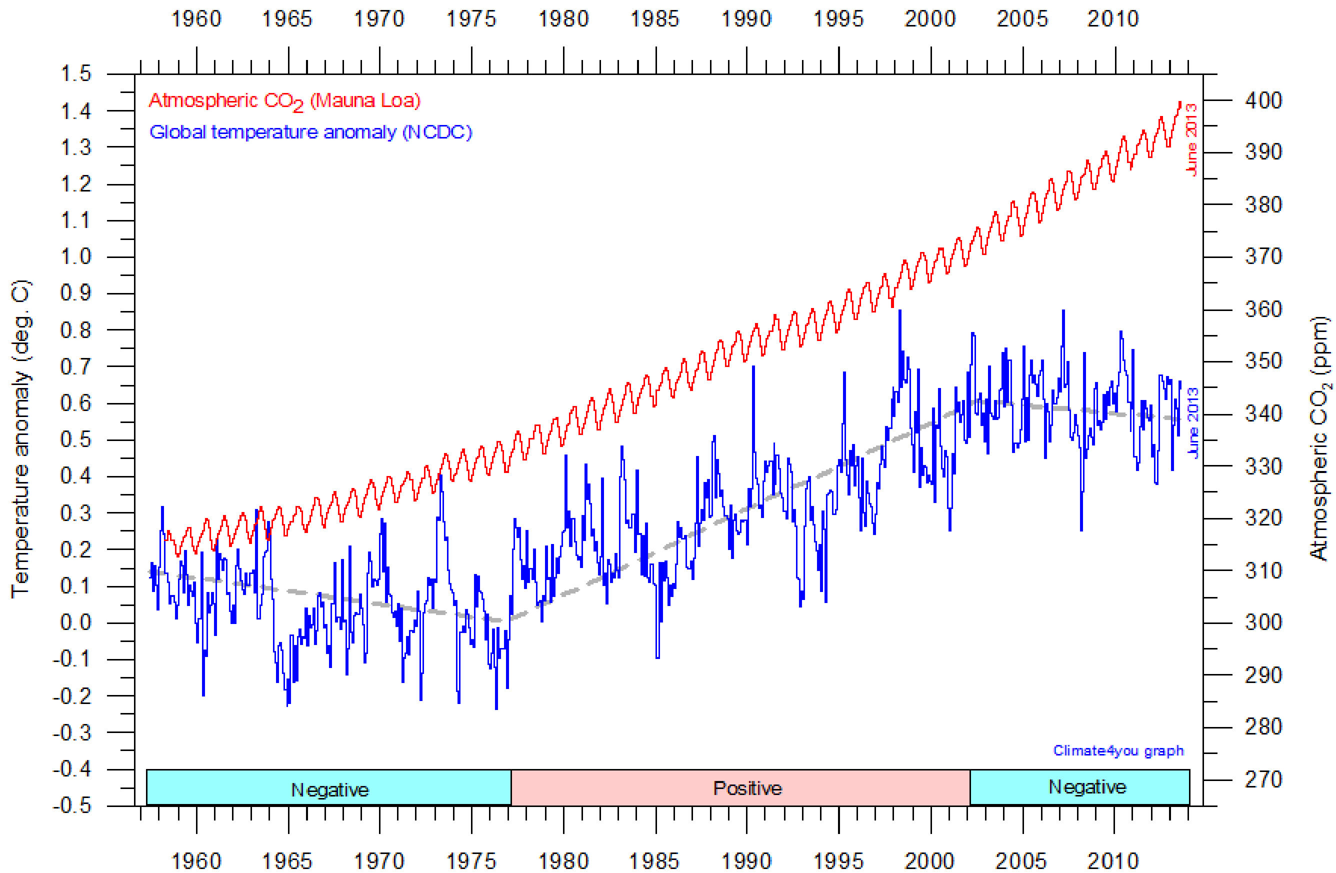


Monthly amount of atmospheric CO_2 (upper diagram) and annual growth rate (lower diagram); average last 12 months minus average preceding 12 months, blue line) of atmospheric CO_2 since 1959, according to data provided by the [Mauna Loa Observatory](), Hawaii, USA. The red line is the simple running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

Global surface air temperature and atmospheric CO_2, updated to July 2013







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 direct 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 HadCRUT4 and the NCDC diagrams have not been updated beyond June 2013.

Most climate models assume the greenhouse gas carbon dioxide CO_2 to influence significantly upon global temperature. It is therefore relevant to compare different 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, 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.

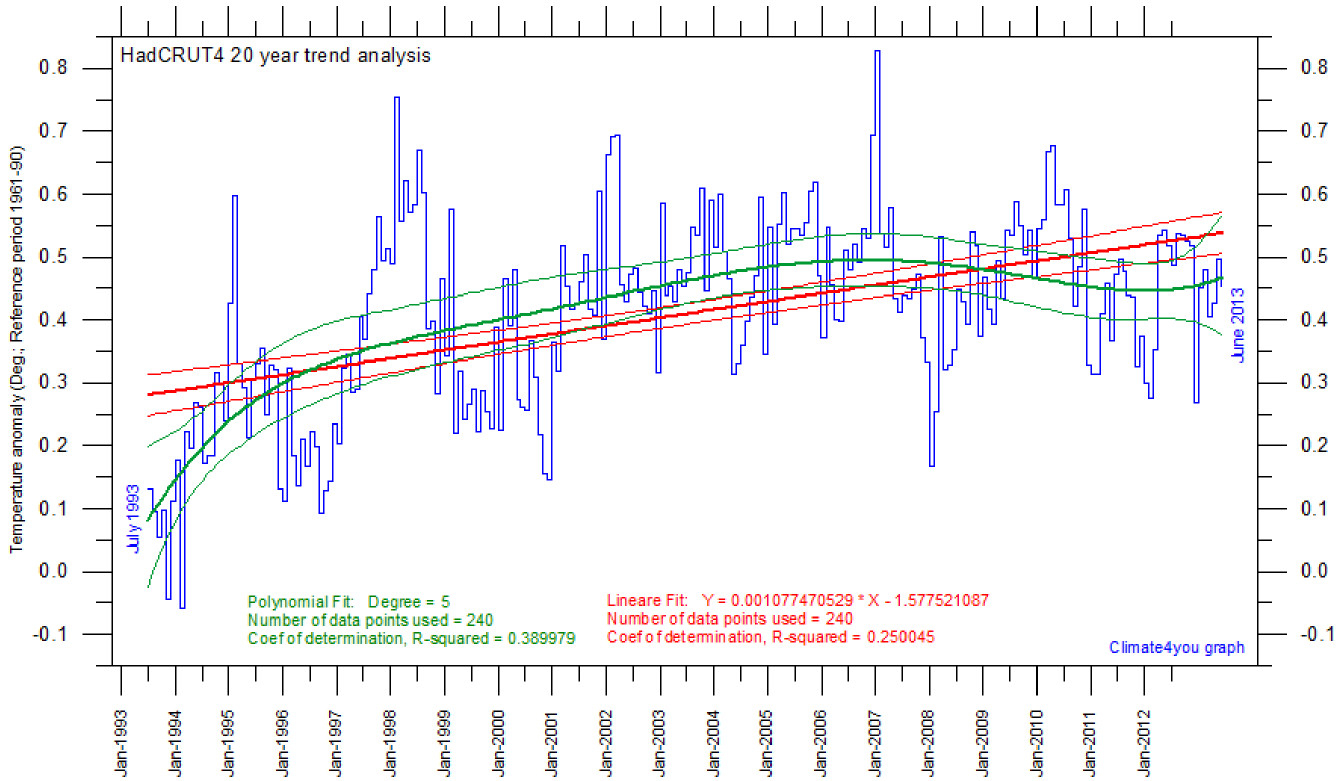
What exactly defines the critical length of a relevant time period to consider for evaluating the alleged importance of CO_2 remains elusive, and is still a topic for discussion. However, the critical period length must be inversely proportional to the temperature sensitivity of CO_2, including feedback effects. If the net temperature effect of atmospheric CO_2 is strong, the critical time period will be short, and vice versa.

However, past climate research history provides some clues as to what has traditionally been considered the relevant length of period over which to compare temperature and atmospheric CO_2. After about 10 years of concurrent global temperature- and CO_2-increase, IPCC was established in 1988. 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, politic support for the hypothesis would have been difficult to obtain.

Based on the previous 10 years of concurrent temperature- and CO_2-increase, many climate scientists in 1988 presumably felt that their understanding of climate dynamics was sufficient to conclude about the importance of CO_2 for global temperature changes. From this it may safely be concluded that 10 years was considered a period long enough to demonstrate the effect of increasing atmospheric CO_2 on global temperatures.

Adopting this approach as to critical time length (at least 10 years), the varying relation (positive or negative) between global temperature and atmospheric CO2 has been indicated in the lower panels of the diagrams above.

[Last 20 year monthly surface air temperature changes, updated to June 2012]()



Last 20 years global monthly average surface air temperature according to Hadley CRUT, a cooperative effort between the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK. The thin blue line represents the monthly values. The thick red line is the linear fit, with 95% confidence intervals indicated by the two thin red lines. The thick green line represents a 5-degree polynomial fit, with 95% confidence intervals indicated by the two thin green lines. A few key statistics is given in the lower part of the diagram (note that the linear trend is the monthly trend).

It is quite often debated if the global surface temperature still increases, or if the temperature has levelled out during the last 10-15 years. The above diagram may be useful in this context, and demonstrates the differences between two often used statistical approaches to determine recent temperature trends. Please also note that such fits only attempt to describe the past, and usually have limited predictive power.

Climate and history; one example among many

Year 1300-1600: Rise and decline of royal Gjetsør Gård in SE Denmark

For several thousand years following the termination of the Weichselian glaciation the present sea area connecting The North sea and Kattegat with the Baltic in Southern Denmark was dry land, but the gradual melting of the remaining ice sheets in North America, Greenland and Antarctic brought about a transgression of the former land area between Denmark and Germany about 6-7000 years ago Falster (see Climate4You June 2013 Report).

Figure 1. Denmark seen from SSW, with southern Sweden in the distance (upper left), and northern Germany to the right. The location major fortifications along the southern border of Denmark around 1180 AD is indicated by orange circles. New border fortifications around 1370 AD is shown by yellow circles. The islands Falster and Lolland is indicated. The peninsula Jutland in the foreground measures about 400 km from south to north. Original picture source: Google Earth.

In Falster, one of the southeastermost Danish Islands (Fig. 1) only a north-south trending terminal moraine dating to the Weichselian deglaciation escaped submersion during the general Holocene transgression, and formed a curved peninsula. During the Little Ice Age (ca. 1300-1900 AD) an increased frequency of strong storms resulted in both coastal erosion in the area as well as the accumulation of barrier islands and marine forelands consisting of beach ridges along the coastline, depending on the local depth, sediment and wind conditions.

In the early days of the state of Denmark 1000 years ago the south-eastern islands Lolland and Falster was considered a border region hard to control, being exposed to different political influence originating from land areas around the southern Baltic Sea. For that reason, Lolland and Falster at that time did not represent an undisputed part of the Danish kingdom. Danish southern fortifications under King Valdemar den Store (Valdemar the Great; 1131-1182 AD) were therefore constructed along a line north of Lolland and Falster, at Dannevirke, Sprogø, Korsør and Vordingborg, respectively (Fig. 1).

In the following centuries the military and political power changed in Danish favour in northern Europe, with both Lolland and Falster becoming a secure part of the Danish Kingdom. Especially King Valdemar Atterdag (1320-1375 AD) made this development possible, and the new southern national frontier was secured with fortifications at Ravnsborg and Ålholm on Lolland, and by the construction of an impressive Gjetsør Gård near the southern tip of Falster. The first reference to the initial Gjetsør Gård is, however, already from 1231 AD.

Gjetsø Gård was constructed at the shore of a fine natural harbour, and almost closed embayment open towards west, about 1 km north of the SW corner of southernmost Falster (Fig.2). The buildings at Gjetsør Gård were protected by the construction of a deap moat surrounding the entire site.

Figure 2. The southern end of Falster seen from NW. To the right the modern town Gedser with ist harbour is seen. The former location of Gjetsør Gård is shown by the yellow square, and the former natural harbour is indicated by blue colour (today land). The yellow area show the extension of a marine foreland consisting of a complex of beach ridges, accumulated especially during the Little Ice Age. Original picture source: Google Earth.

The detailed architecture of buildings at Gjetsør Gård is not known, and presumably the number of buildings and their visual appearance may have changed over time. However, a reconstruction based on written evidence from the mid-16th century suggests the presence of a rather large building complex at that time (Fig. 3).

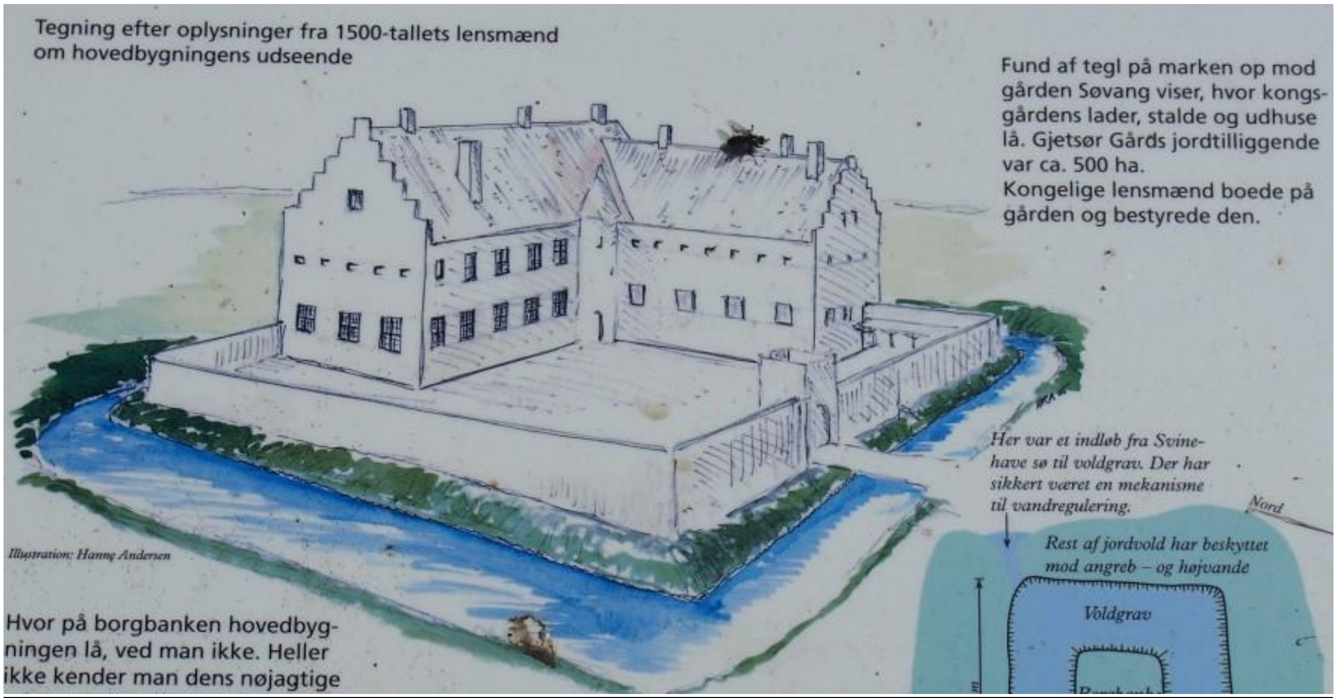


Figure 3. Reconstruction of Gjetsør Gård in the 16th century, showing the site as seen from SE. Photograph of information plate at the site of former Gjetsø Gård.

The location of Gjetsør Gård proved to be a good one, at least in the beginning. The natural harbour was one obvious reason, and the easy access from north following the crest of the old Weichselian terminal moraine extending throughout southern Falser was another reason. In contrast to harbours in southern Lolland further to the west, this road remained dry and stable even in autumn and winter, while the roads on Lolland often turned into deep mud. As trade with Germany to the south gained in importance natural harbours in southern Falster (including Rostocker Harbour; see June 2013 Climate4You Report) therefore increased in importance. Often members of the royal Danish family would stay at Gjetsør Gård en route to Germany, while waiting for good sailing conditions. At that time, the crossing to Germany (Rostock) presumably took 6-8 hours in fair weather. Often the travellers had to wait at Gjetsør Gård for 3-4 days before conditions were satisfactory for the crossing, and respectable housing facilities were clearly essential.

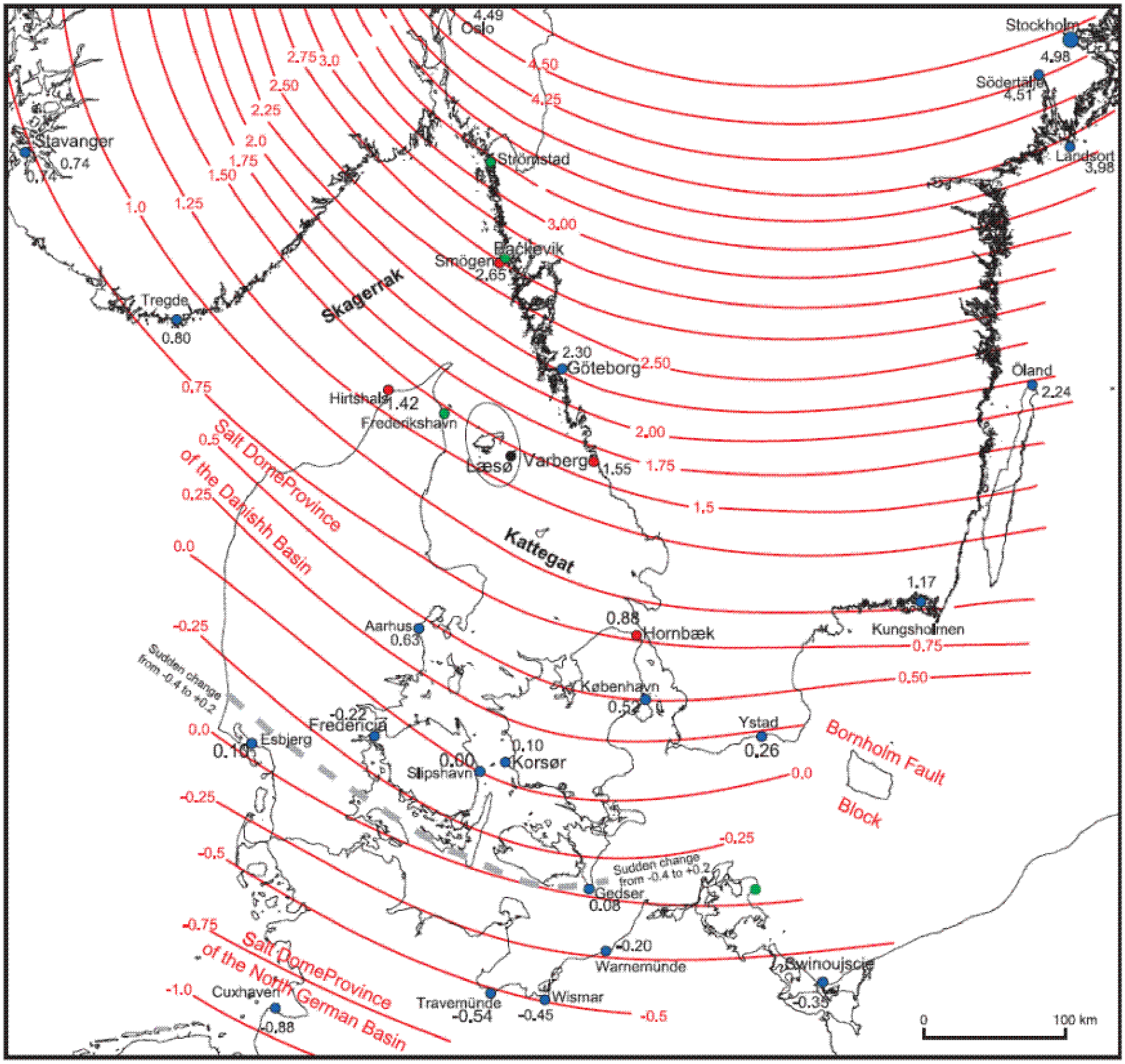


Figure 4. Present isostatic uplift rates (mm/yr) of Denmark and surrounding regions (Hansen et al. 2011).

While northern Denmark today still is affected by isostatic uplift following the Weichselian deglaciation, the southern part of Falster is situated within an area of little or no modern isostatic uplift (Fig. 4). In Denmark north of Lolland-Falster several raised former coastlines are therefore today found above the present coastline, but not south of this line. This overall isostatic scheme should protect the fine natural Gjetsør harbour from the unfortunate effects of isostatic uplift, in addition to the overall slow global eustatic sea level rise, but the harbour nevertheless experienced increasing problems with sand accumulating in the harbour inlet during the 14th and 15th century, and especially during the 16th century the harbour gradually lost importance to Rostocker Harbour (see June 2013 Climate4You Report) on the east coast of Falster, only few km's NE of Gjetsør Gård.

In 1571 AD Queen Sofie to the Danish King Frederik II ordered the building of a Ferry Inn (a 'ferry kro') at Rostocker Harbour at Gedesby, to ensure proper lodgement in Gedesby for herself and her family, whenever she wanted to visit her former homeland

(Germany). Obviously, the buildings at Gjetsør Gård was now in a bad state, not appropriate for use as night quarter anymore. In 1590 one of the buildings at Gjetsør Gård is reported to be taken down, and no repair works are carried out on any of the remaining buildings.

Finally, the harbour at Gjetsør Gård had to be given up entirely, as the inlet was completely closed by beach ridges. From then on the most important connection between Falster and Germany were operated from Rostocker Harbour (at Gedesby) a few kilometres NE of Gjetsør Gård, on the east coast of Falster (see Climate4You June 2013 Report).

The reason for the closure of the natural harbour at Gjetsør Gård is therefore not isostatic uplift, but increased coastal transport of sand and gravel along western Falster during the Little Ice Age, due to the increasing frequency of storms and strong NW winds, resulting in the accumulation of a major marine foreland at the SW corner of southern Falster (Fig. 2), closing the inlet to the Gjetsør Gård harbour.

Figure 5. Remains of Gjetsør Gård seen towards NW on July 21, 2013. The eastern part of the former moat is seen in the foreground, and part of the central high where the buildings were located is seen to the left. The former natural harbour is located behind the trees to the left. Note person standing on the bridge for scale. Compare with figure 3.

The former Gjetsør Harbour is today located about 1 km inland, mainly because of Little Ice Age coastal erosion and -accumulation. The highway leading to the modern harbour at the town Gedser is located across the former inlet to the harbour (Fig. 2). The former Gjetsør Harbour itself is still below sea level, but is kept dry by pumping and represents a valuable farming area. Presumably, few people would today recognise one of Denmark's formerly political significant harbours shortly east of the highway to Gedser and its large ferries, heading for Berlin or northern Germany.

Today nothing remains of the buildings at Gjetsør Gård east of the former harbour. However, the site is still clearly seen in the landscape, with well-preserved remnants of both the former moat around the building site, as well as the entire central high, where the major buildings of Gjetsør Gård used to be standing (Fig. 5).

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All the above diagrams with supplementary information, including links to data sources and previous issues of this newsletter, are available on www.climate4you.com

Yours sincerely,

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