Climate4you update October 2013

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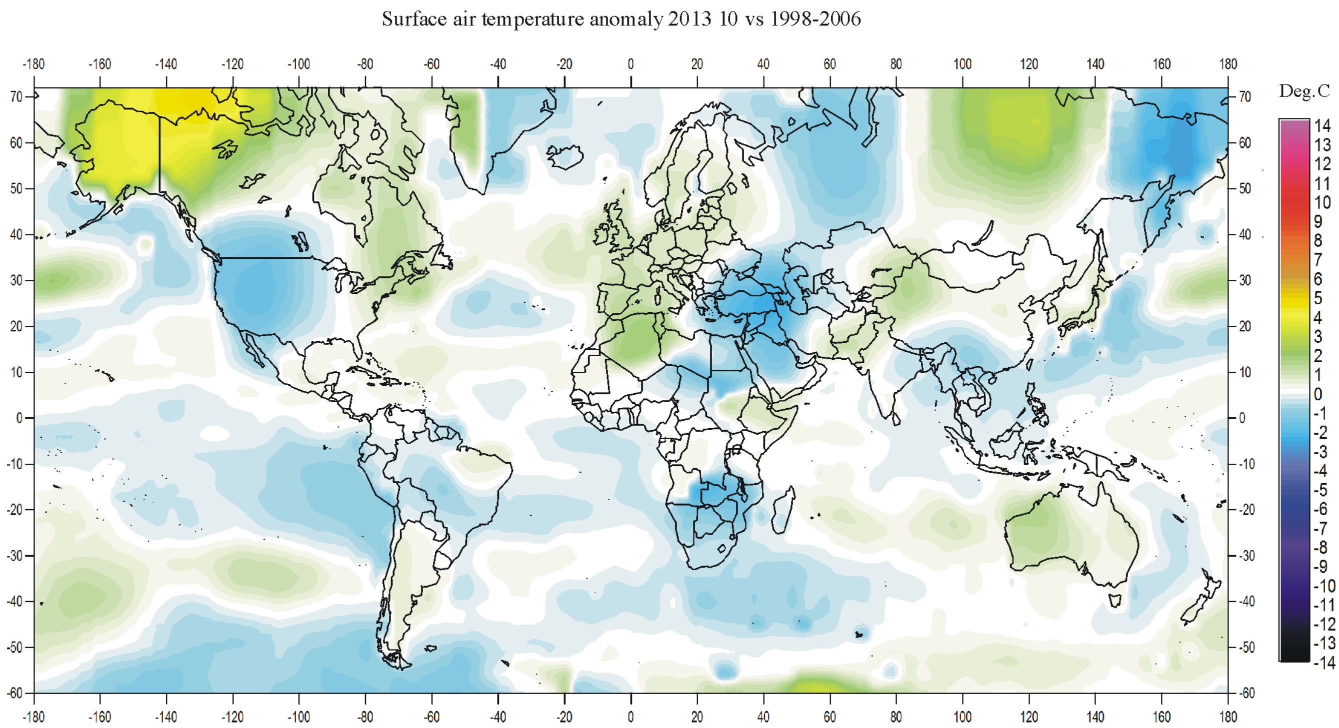
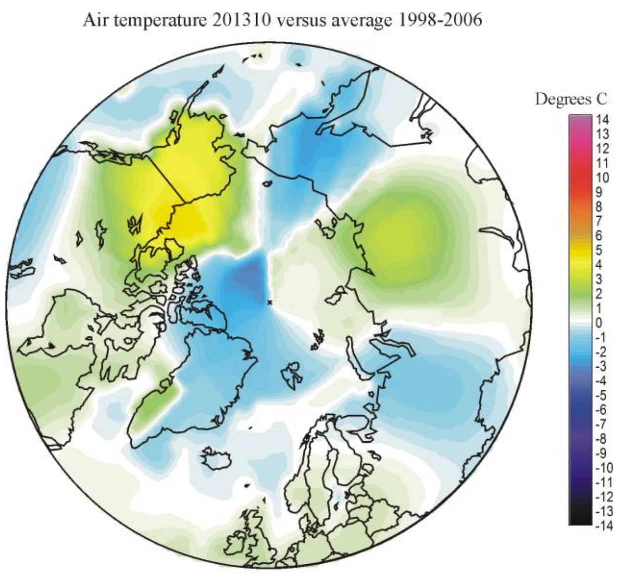
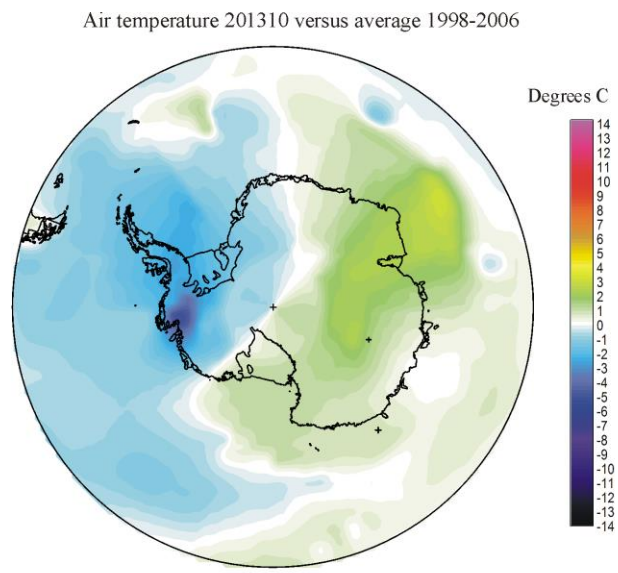
All diagrams in this newsletter as well as links to the original data are available on www.climate4you.com

October 2013 global surface air temperature overview







October 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 October 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 'normal' period, and therefore not suitable as reference using GISS data.

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.

October 2013 global surface air temperatures

General: In general, global air temperatures were near the 1998-2006 average. All three surface air temperature records continue to show negative temperature trend for the last 5 and 10 years (page 8).

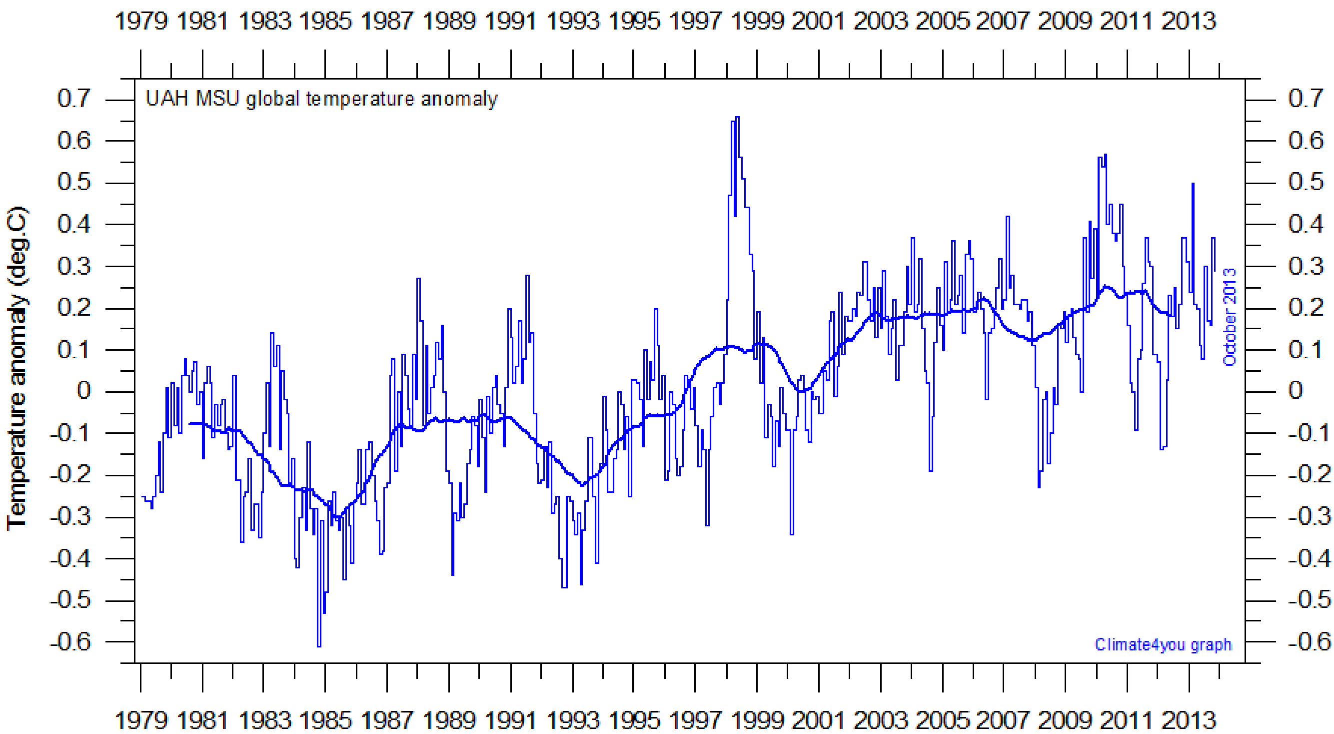
The Northern Hemisphere was characterised by regional contrasts. Alaska, NW Canada and western Siberia had above average temperatures, while USA, eastern Mediterranean and Russia had below average temperatures. In the Arctic, the NE Canada-Greenland-Svalbard sector had relatively low temperatures, while especially the Alaska sector had above temperatures.

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

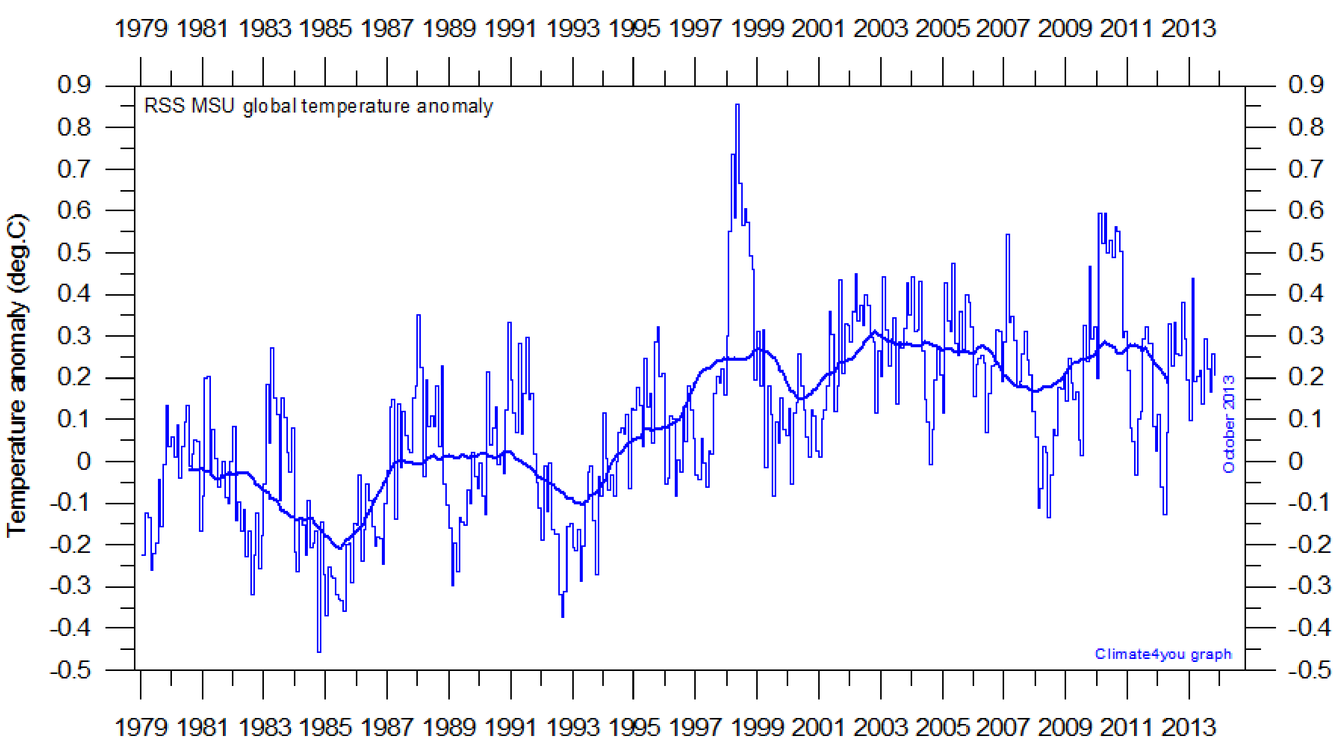
The Southern Hemisphere temperatures was mainly below or near average 1998-2006 conditions. The only major exception from this was Australia which had above average temperatures, especially in western Australia. The Antarctic continent was relatively cold in the western part, and relatively warm in the eastern part.

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 October 2013

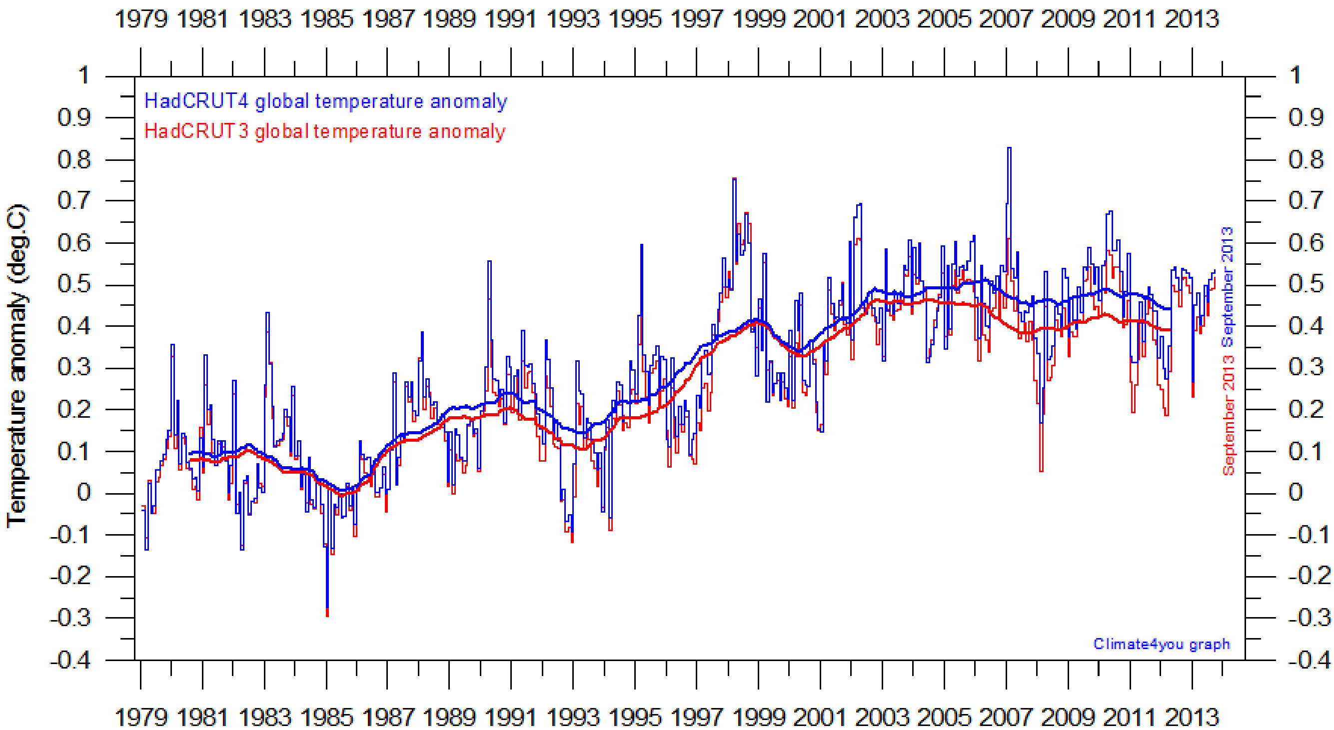


Global monthly average lower troposphere temperature (thin line) since 1979 according to University of Alabama at Huntsville, USA. The thick line is the simple running 37 month average.

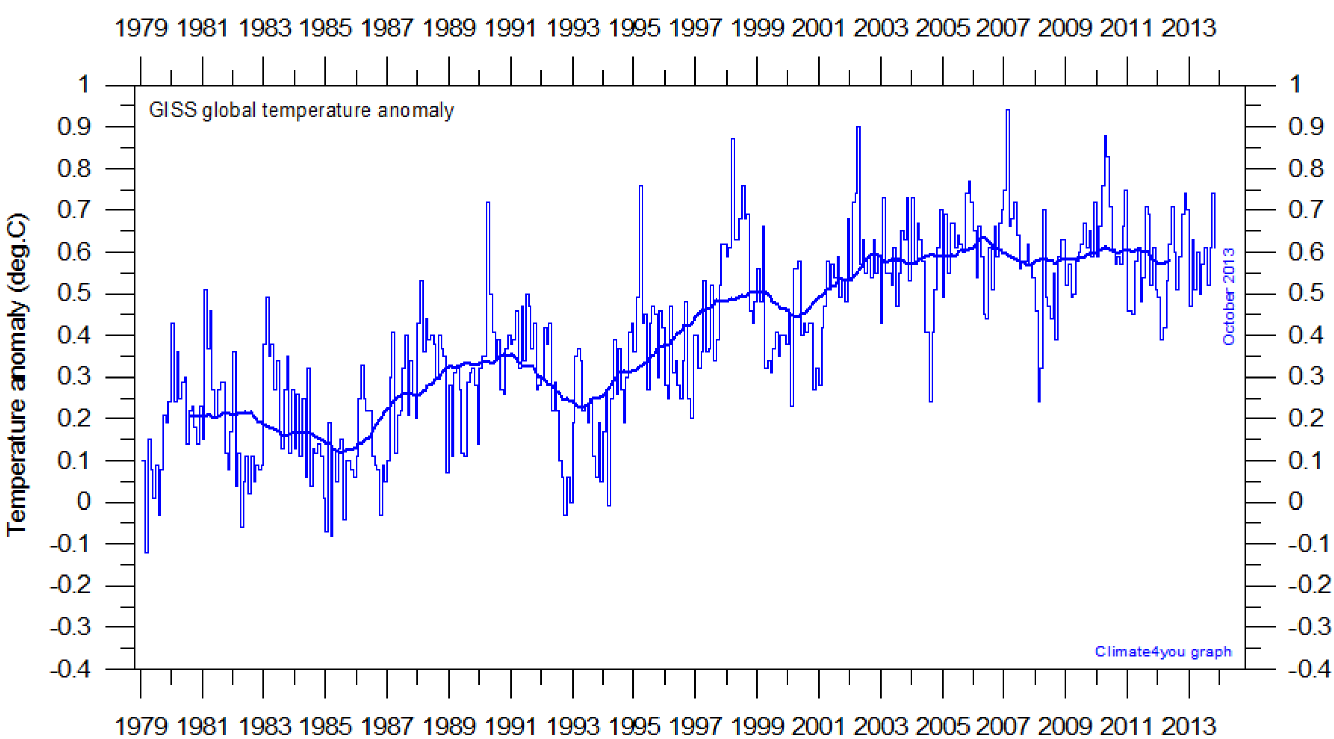


Global monthly average lower troposphere temperature (thin line) since 1979 according to according to Remote Sensing Systems (RSS), USA. The thick line is the simple running 37 month average.

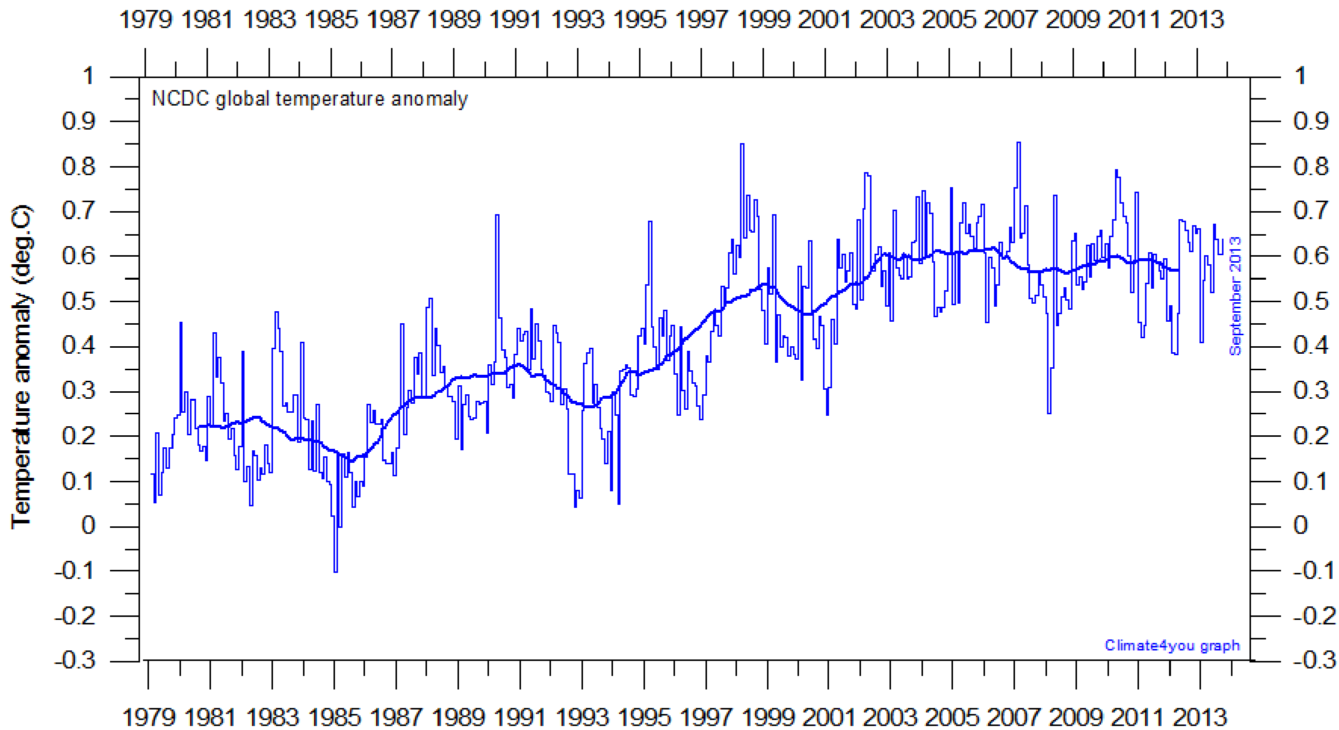
Global surface air temperature, updated to October 2013



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 is not yet updated beyond September 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 is not yet updated beyond September 2013.

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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*).

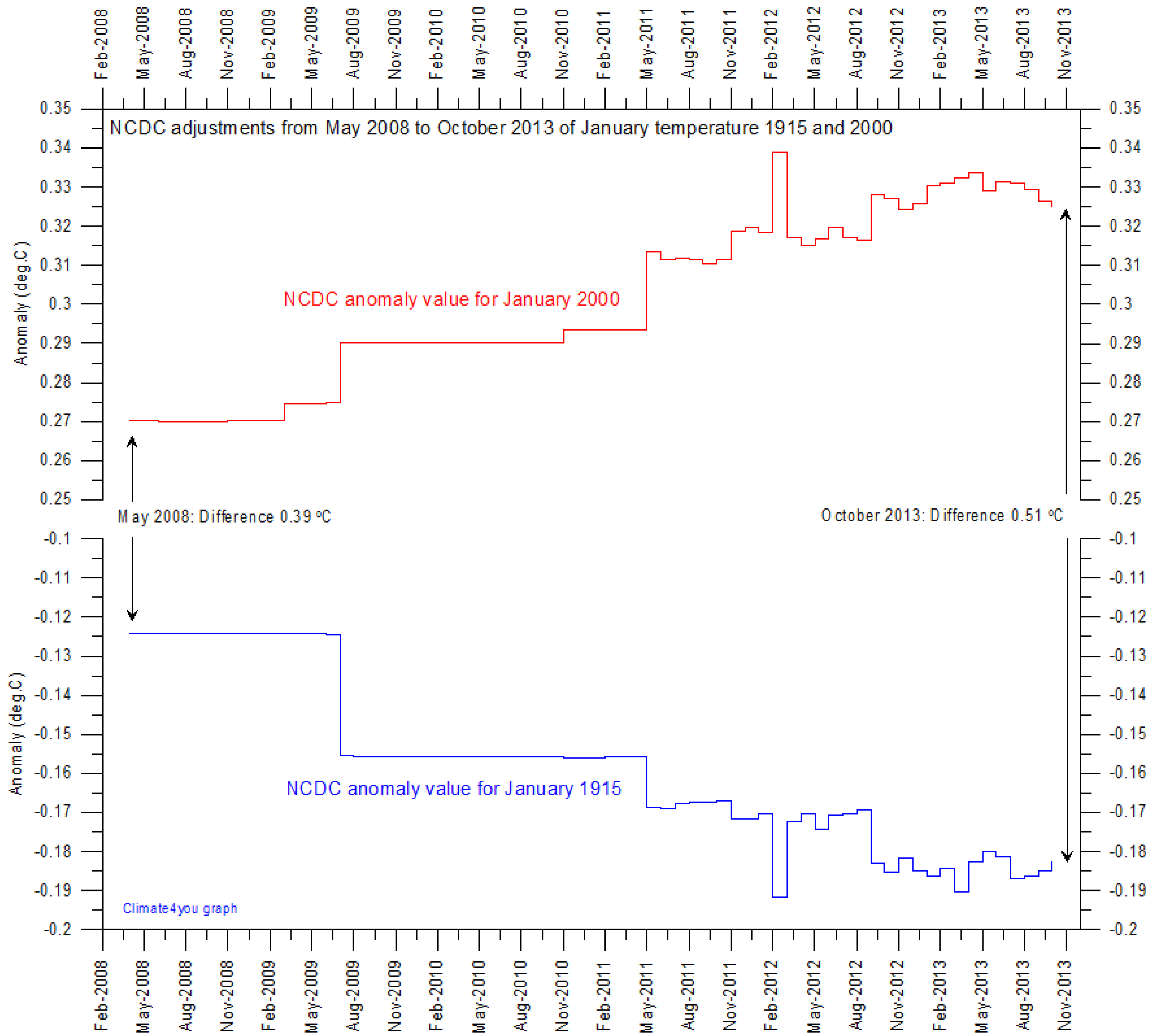

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Diagram showing the adjustment made since May 2008 by the [National Climatic Data Center](#) (NCDC) in the anomaly values for the two months January 1915 and January 2000.

<u>September 2013:</u> By administrative means the July 2013 temperature increase from January 1915 to January 2000 has increased from 0.39 to 0.51 ^{o}C, representing an about 31% increase of the original temperature increase reported in May 2008.

Global surface air temperature linear trends

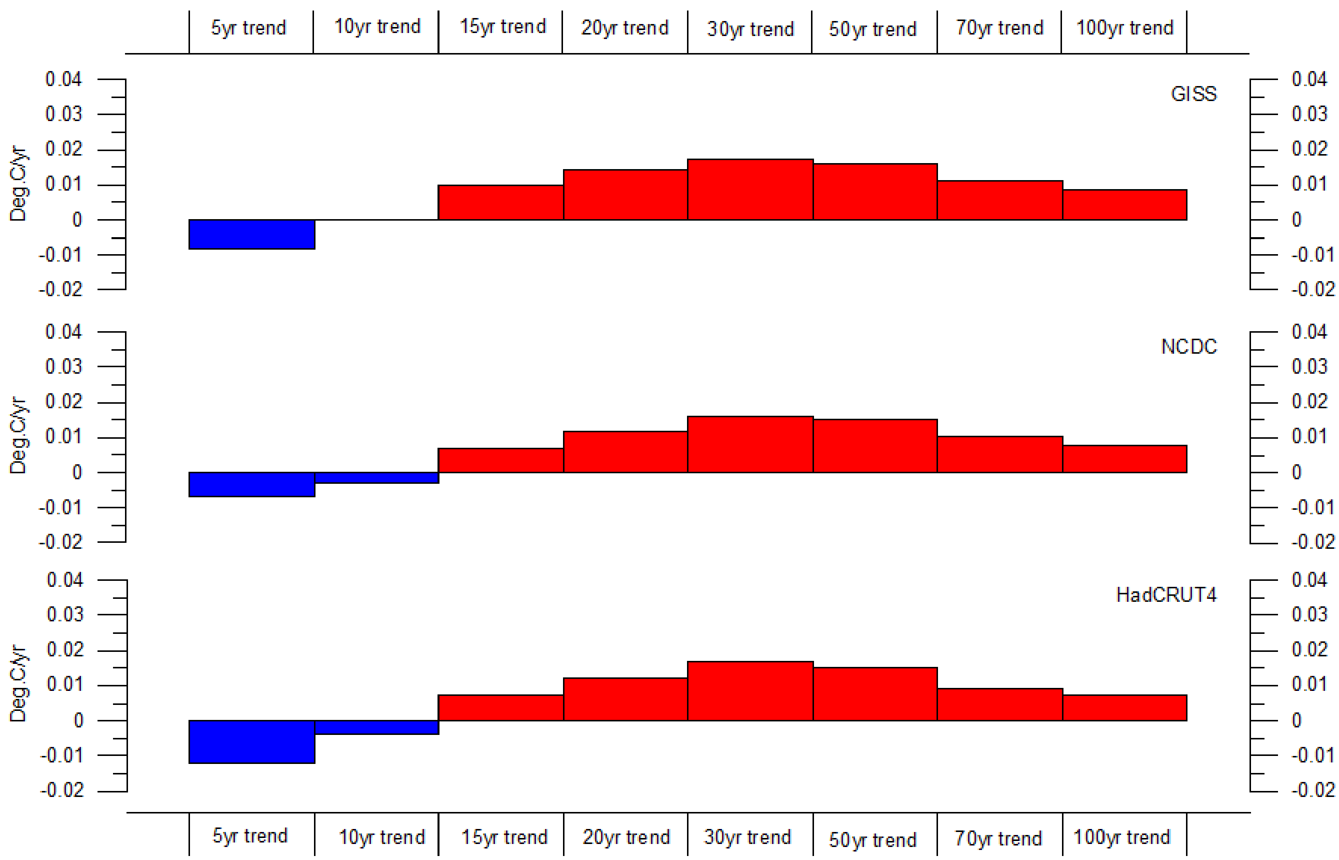
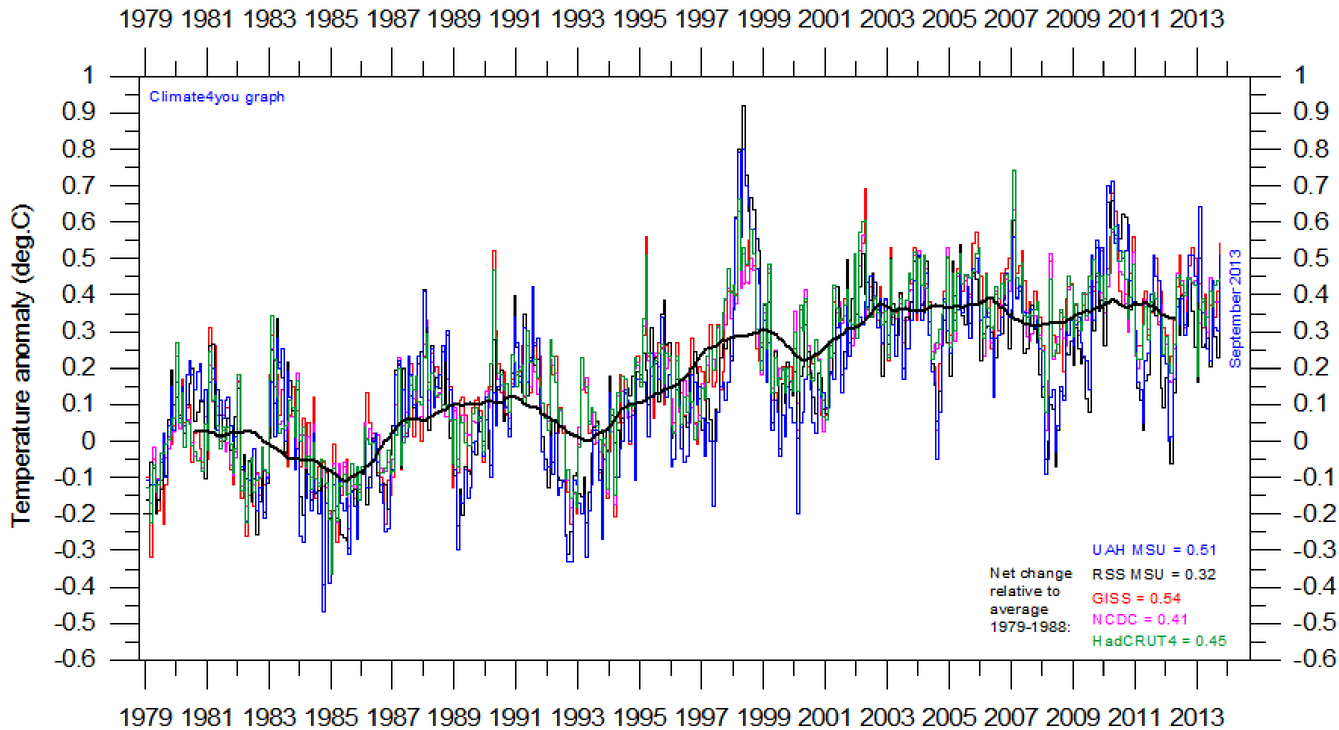


Diagram showing the latest 5, 10, 20, 30, 50, 70 and 100 year linear annual global temperature trend, calculated as the slope of the linear regression line through the data points, for three surface-based temperature estimates (GISS, NCDC and HadCRUT4). Last month included in all analyses: September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

All in one, updated to September 2013

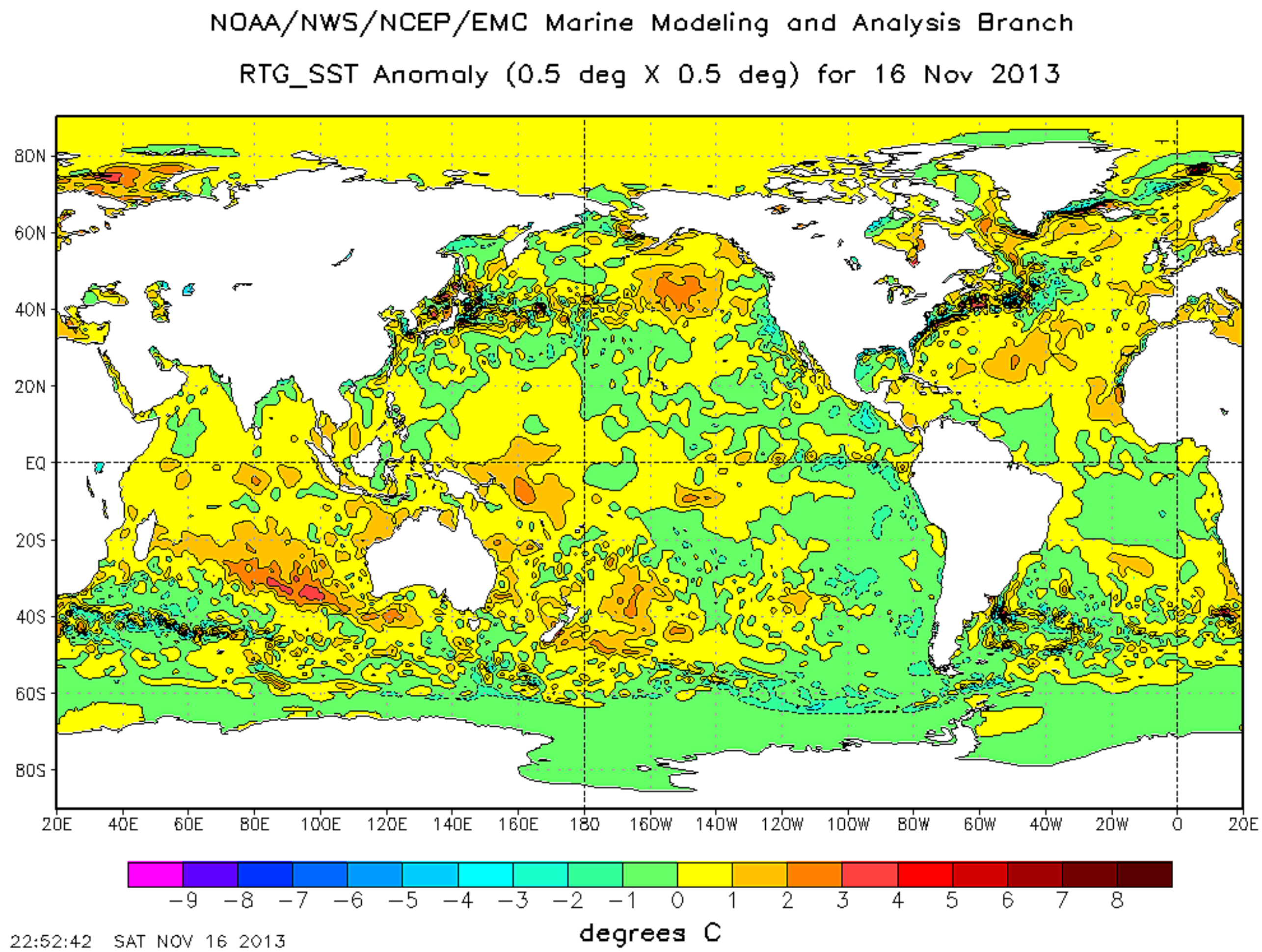


Superimposed plot of all five global monthly temperature estimates. As the base period differs for the individual temperature estimates, they have all been normalised by comparing with the average value of the initial 120 months (10 years) from January 1979 to December 1988. The heavy black line represents 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 mid November 2013



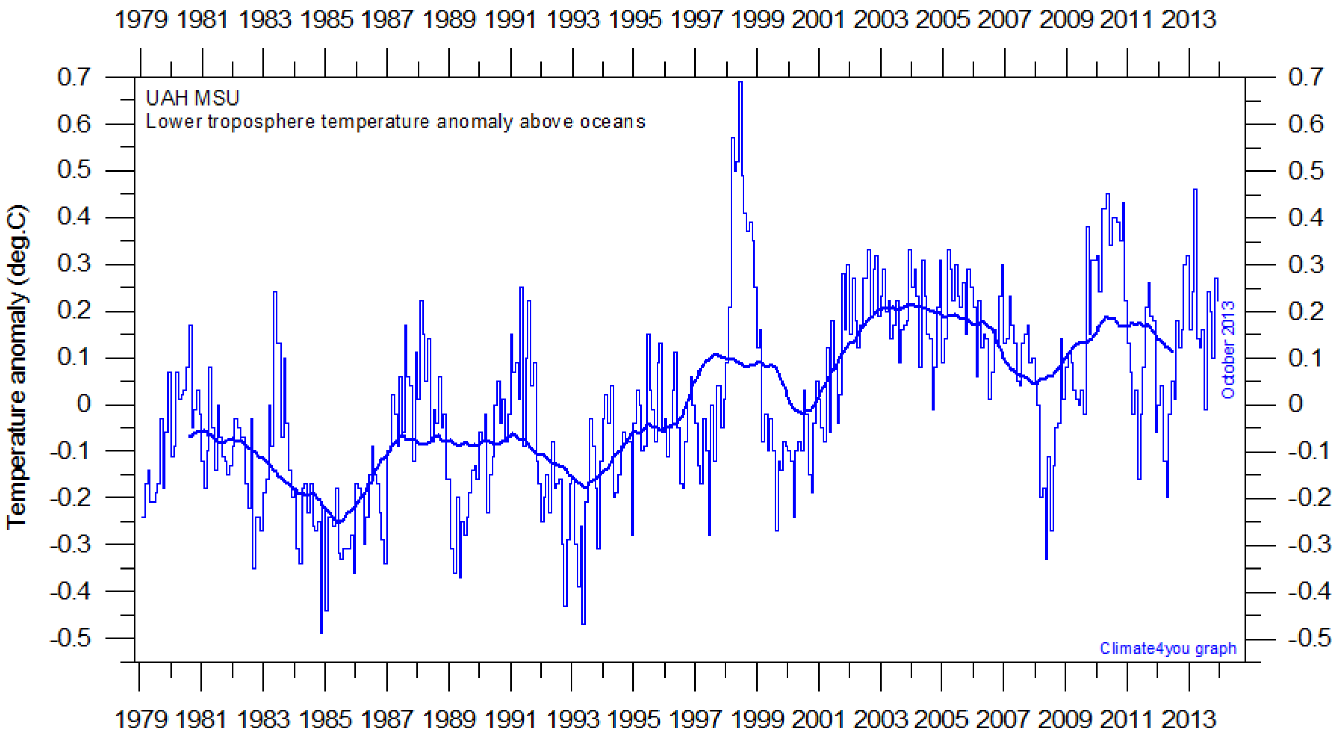
Sea surface temperature anomaly on 16 November 2013. Map source: National Centers for Environmental Prediction (NOAA).

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

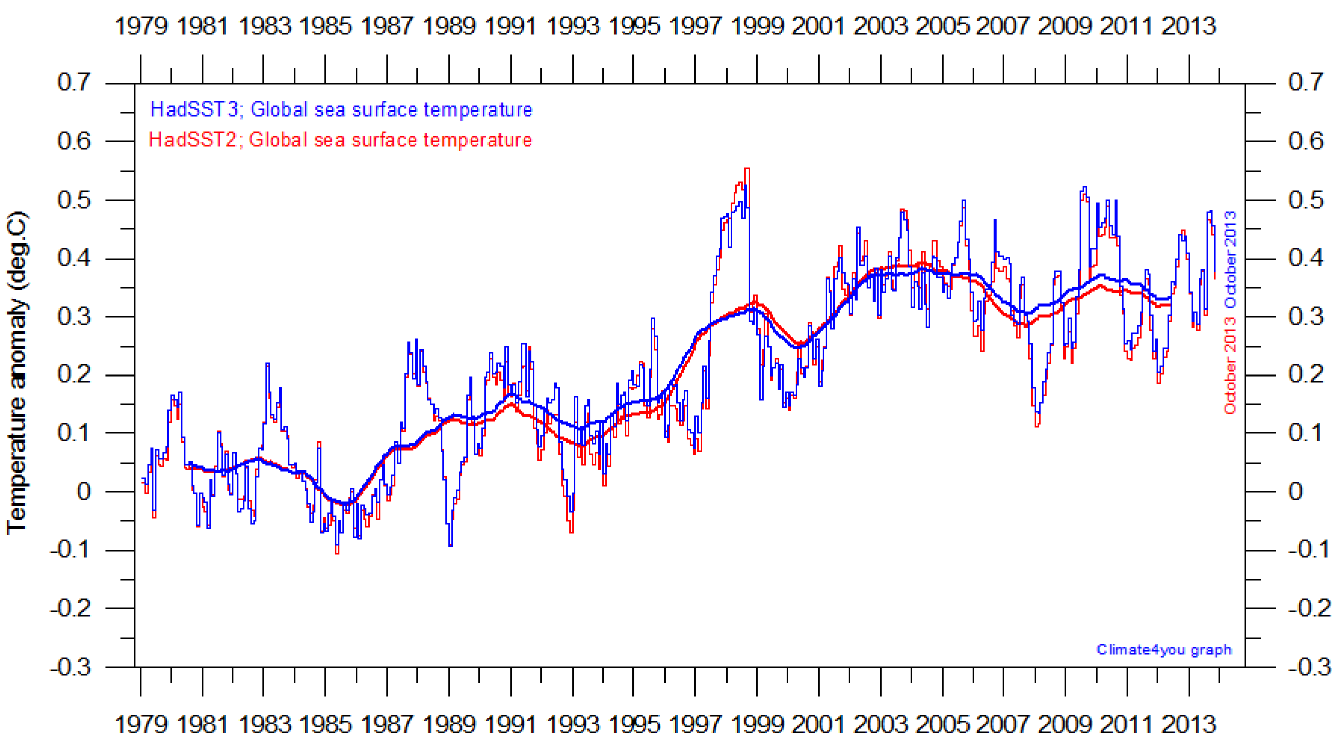
Relatively cold water is slowly spreading across the Pacific Ocean near the Equator, and may influence global air temperatures in the months to come.

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.

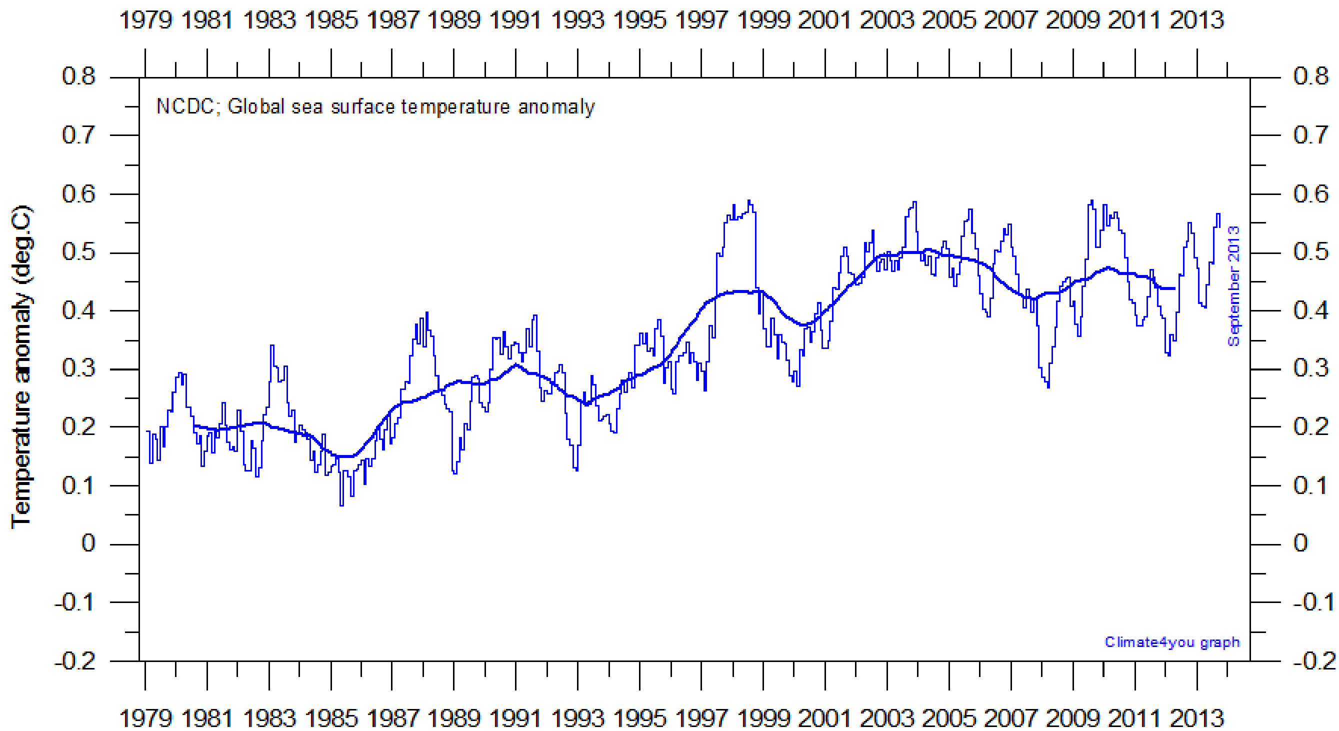
However, this does not reflect similar changes in the total heat content of the atmosphere-ocean system. In fact, global net changes can be small and such heat exchanges may mainly reflect redistribution of energy between ocean and atmosphere. What matters is the overall temperature development when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

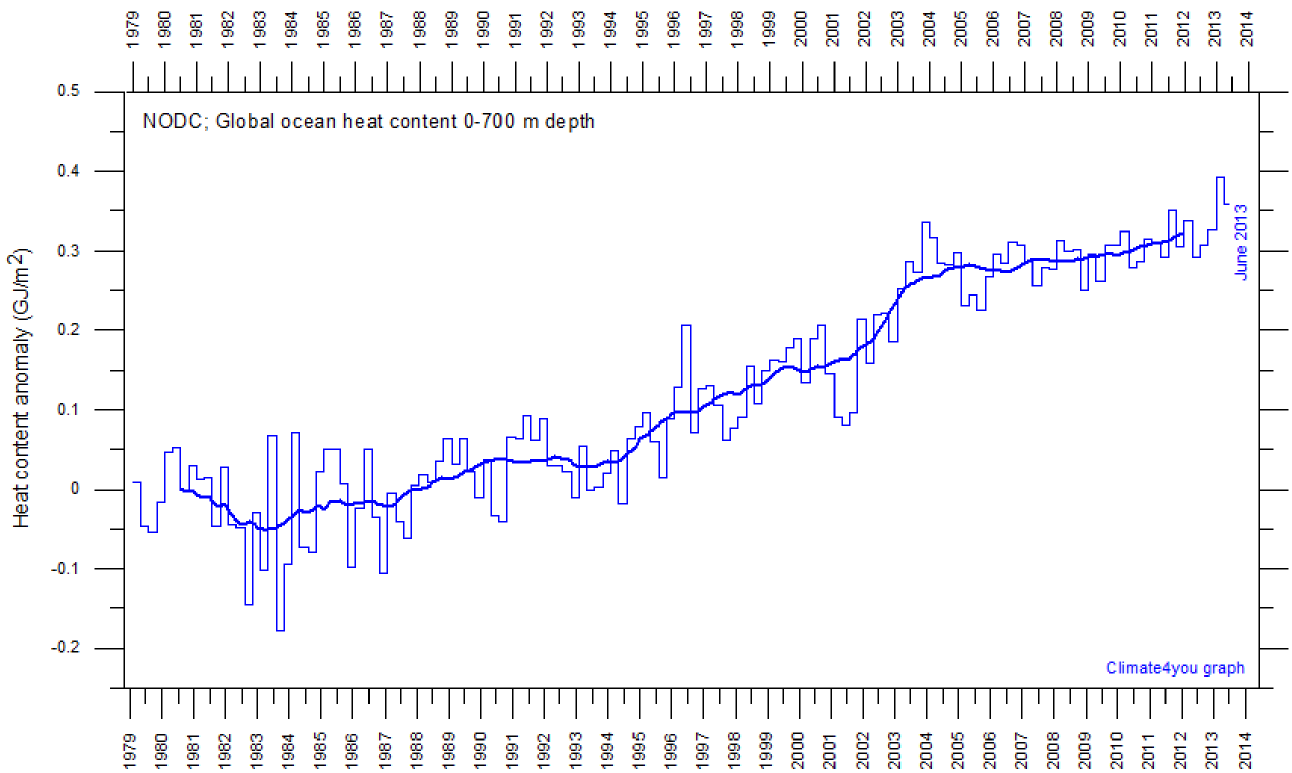


Global monthly average sea surface temperature since 1979 according to University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK. Base period: 1961-1990. The thick line is the simple running 37 month average.

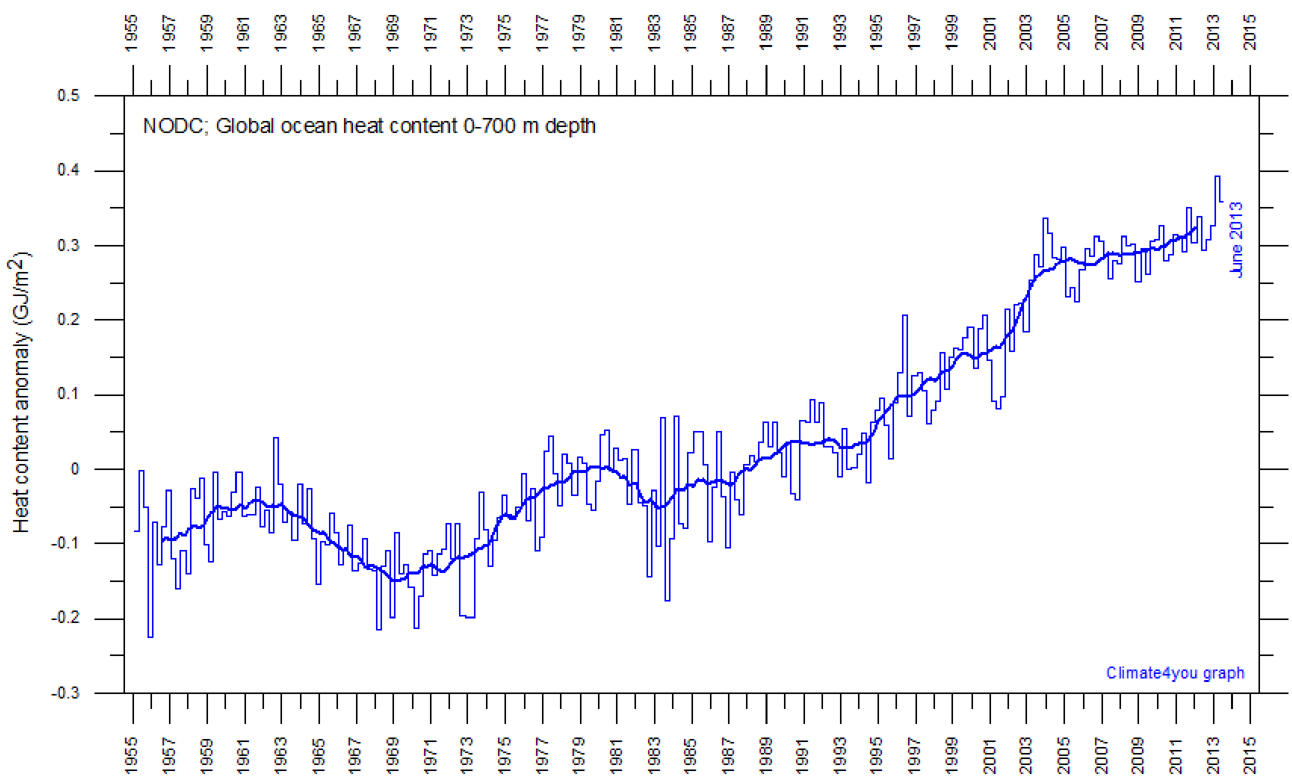


Global monthly average sea surface temperature since 1979 according to the [National Climatic Data Center](#) (NCDC), USA. Base period: 1901-2000. The thick line is the simple running 37 month average. Please note that this diagram is not yet updated beyond September 2013.

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

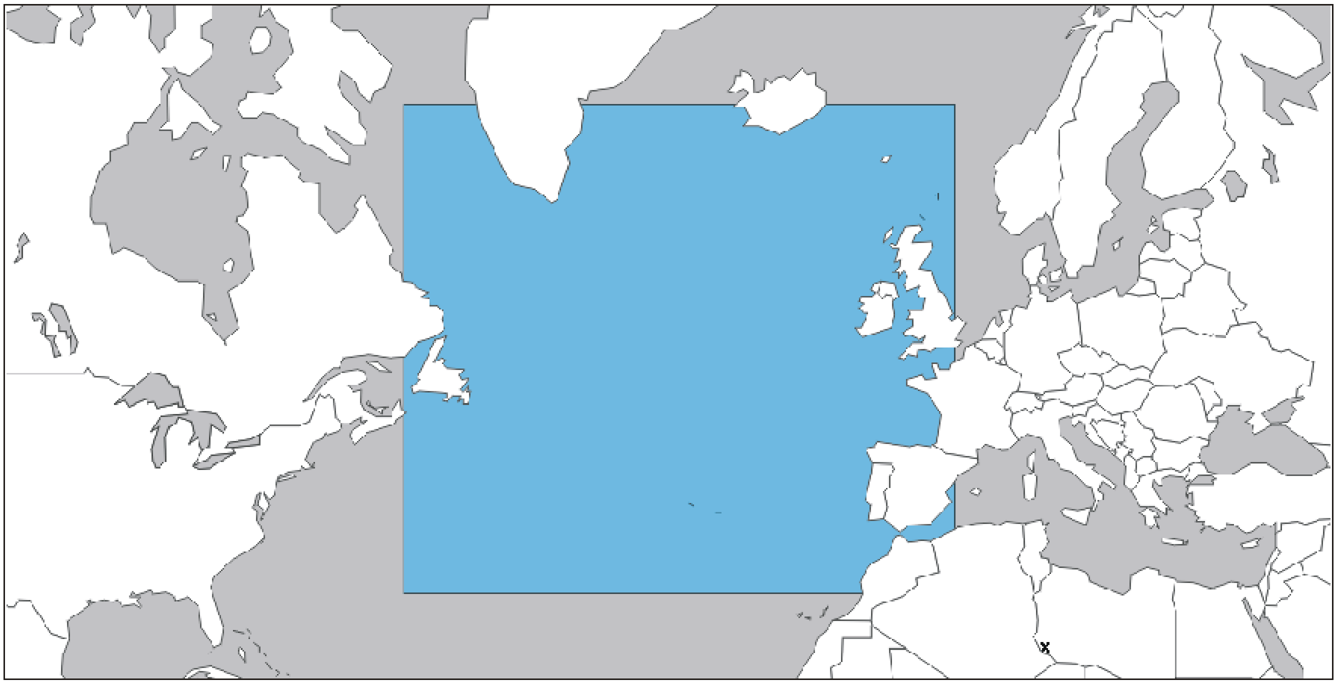


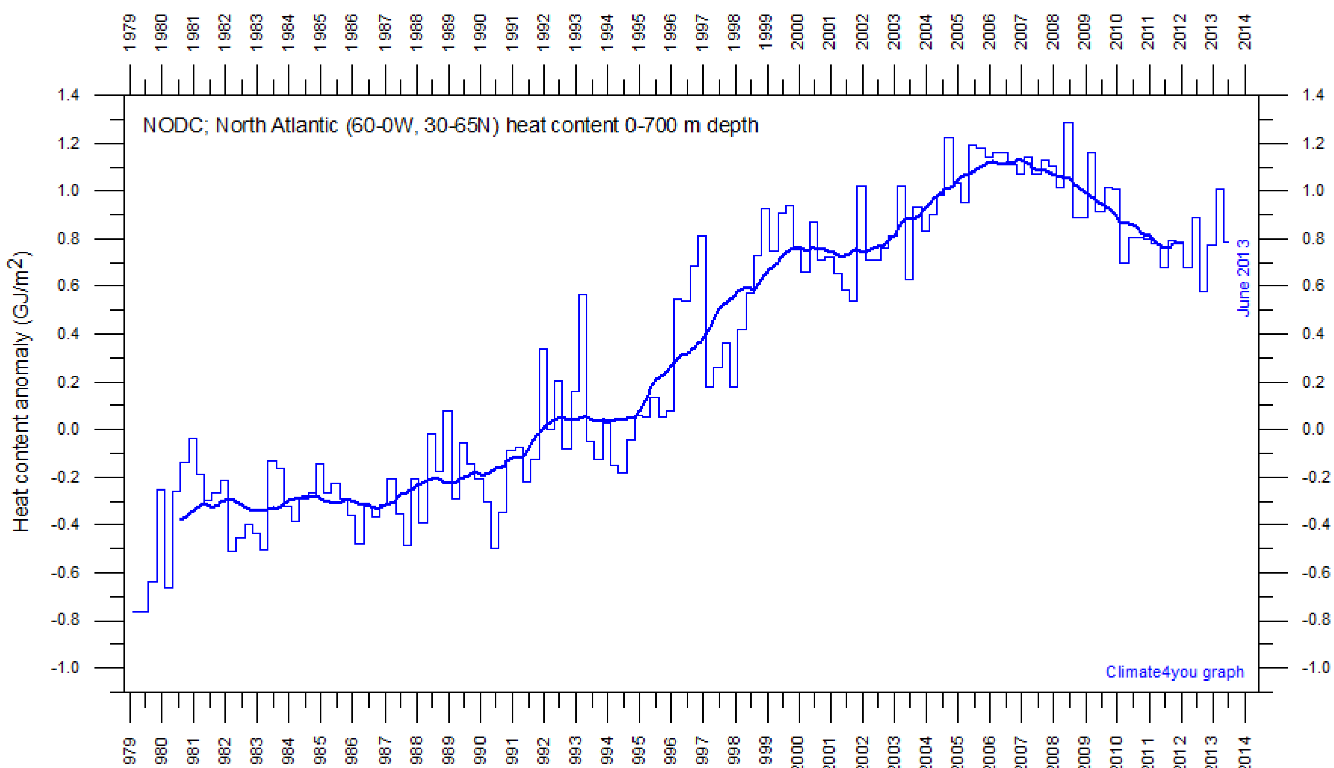
Global monthly heat content anomaly (GJ/m2) in the uppermost 700 m of the oceans since January 1979. Data source: National Oceanographic Data Center(NODC).



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).

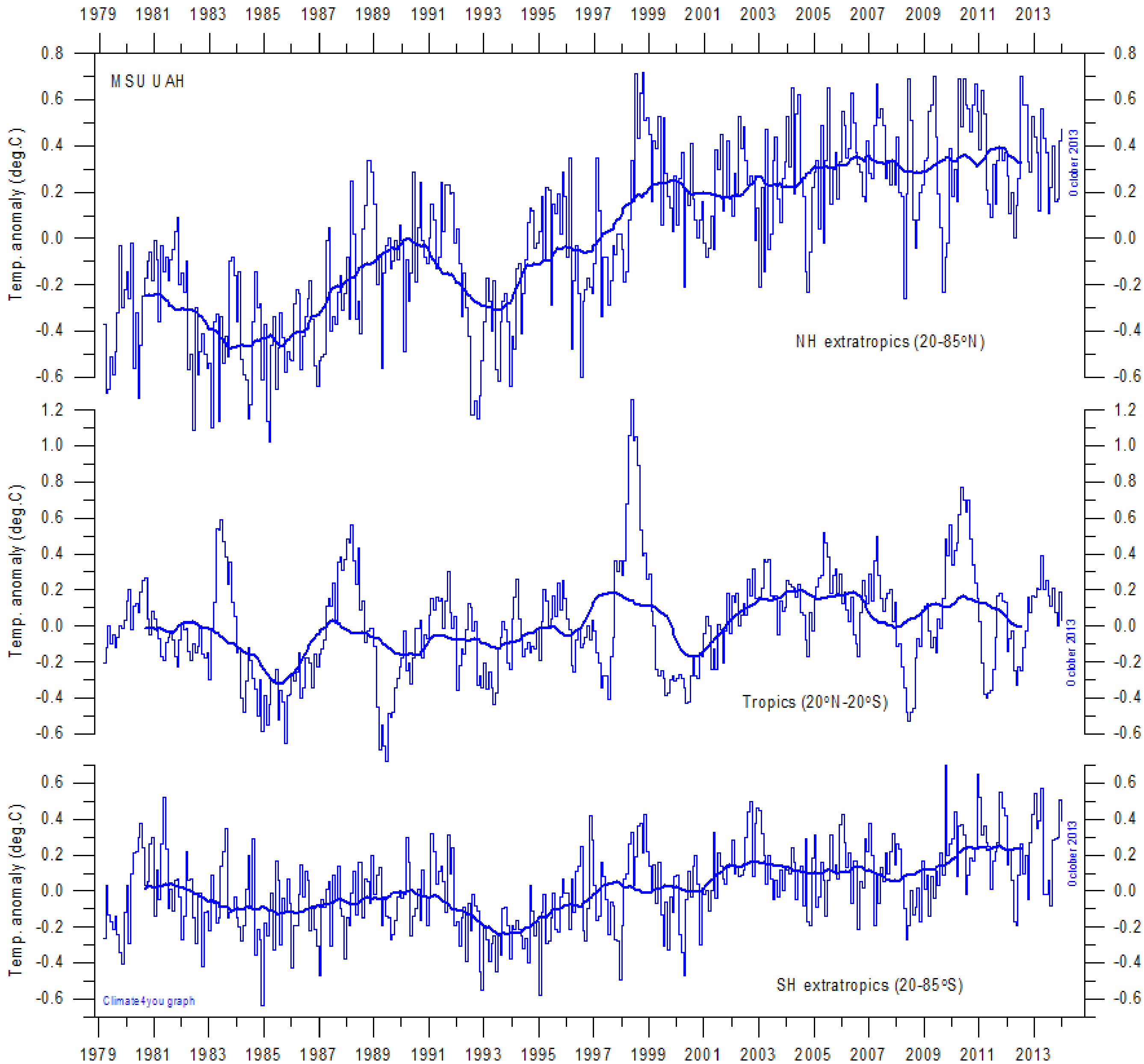
North Atlantic heat content uppermost 700 m, updated to June 2012





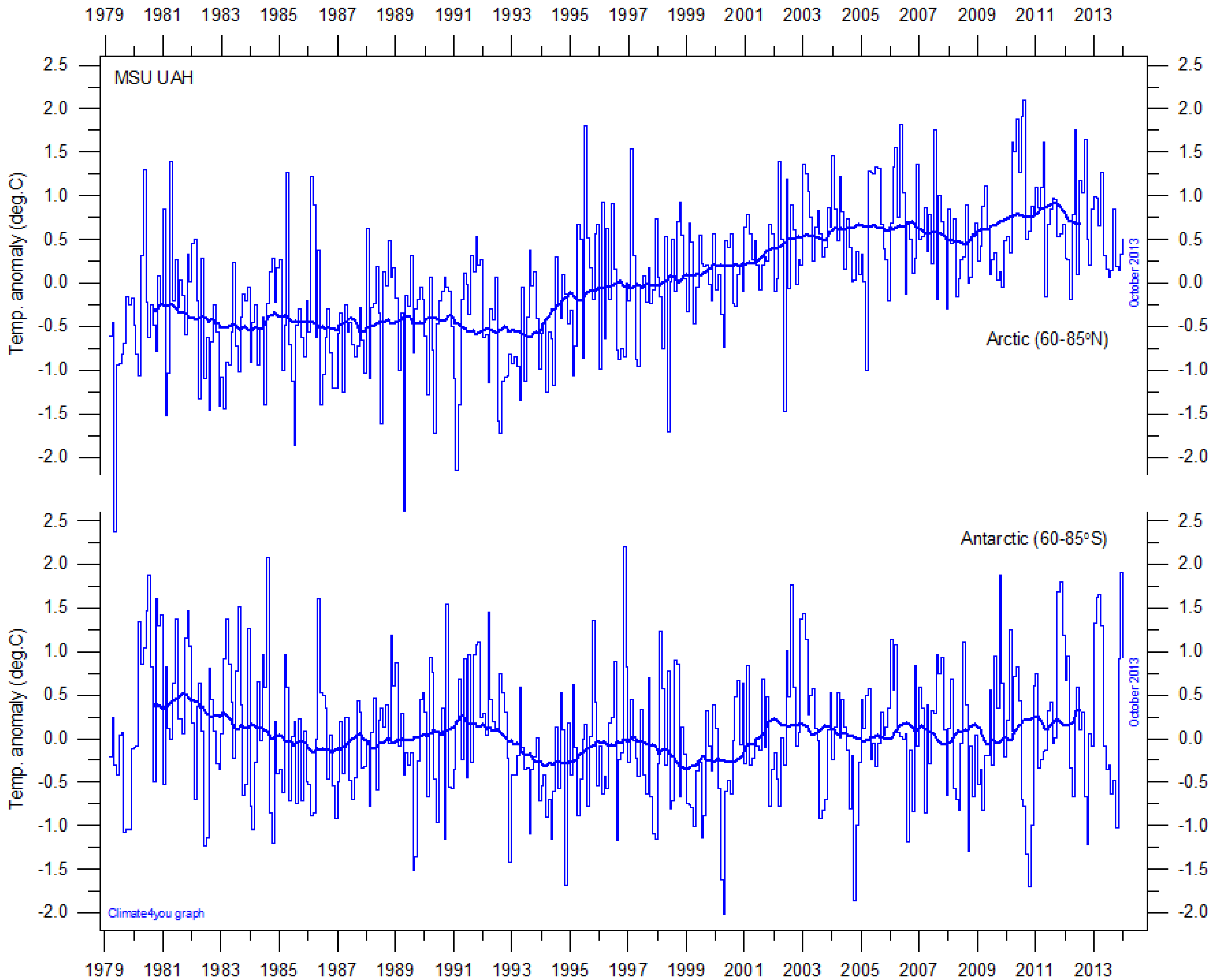
Global monthly heat content anomaly (GJ/m2) in the uppermost 700 m of the North Atlantic (60-0W, 30-65N; see map above) *ocean since January 1979. The thin line indicates monthly values, and the thick line represents the simple running 37 month (c. 3 year) average. Data source: National Oceanographic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

Zonal lower troposphere temperatures from satellites, updated to October 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 October 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 September 2013

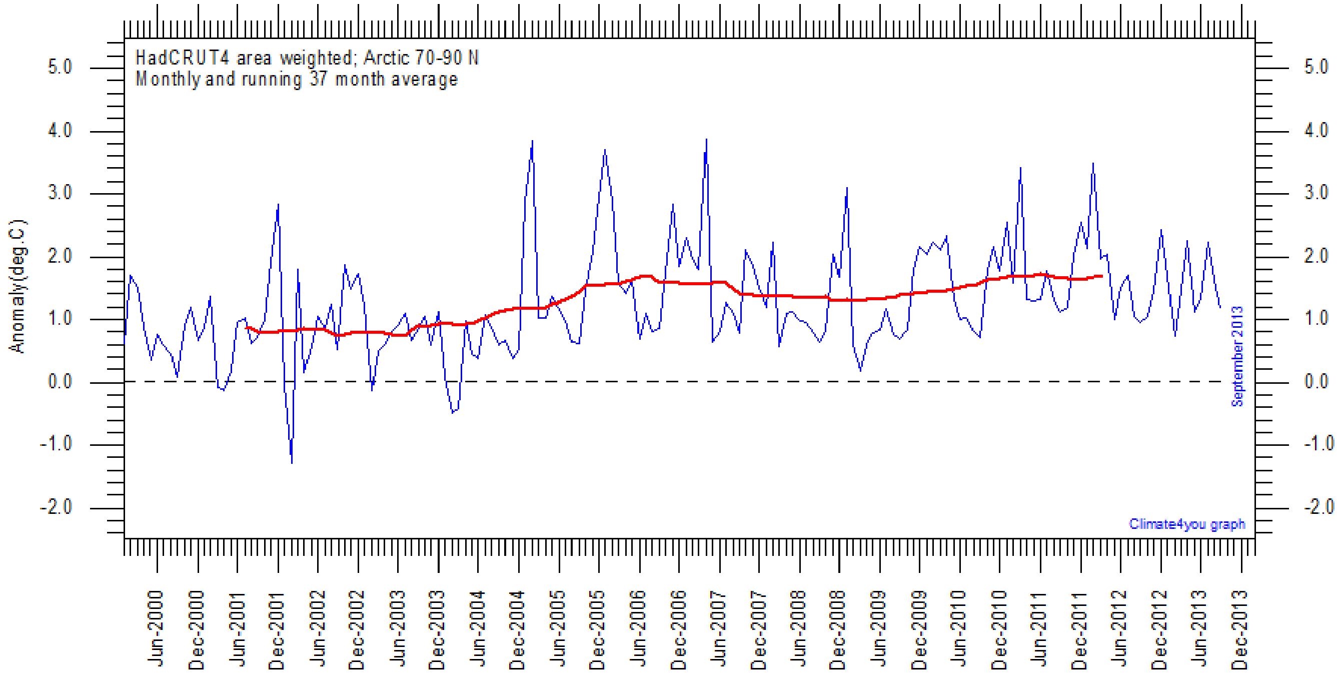


Diagram showing area weighted Arctic (70-90°N) monthly surface air temperature anomalies ([HadCRUT4](#)) since January 2000, in relation to the WMO [normal period](#) 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average.

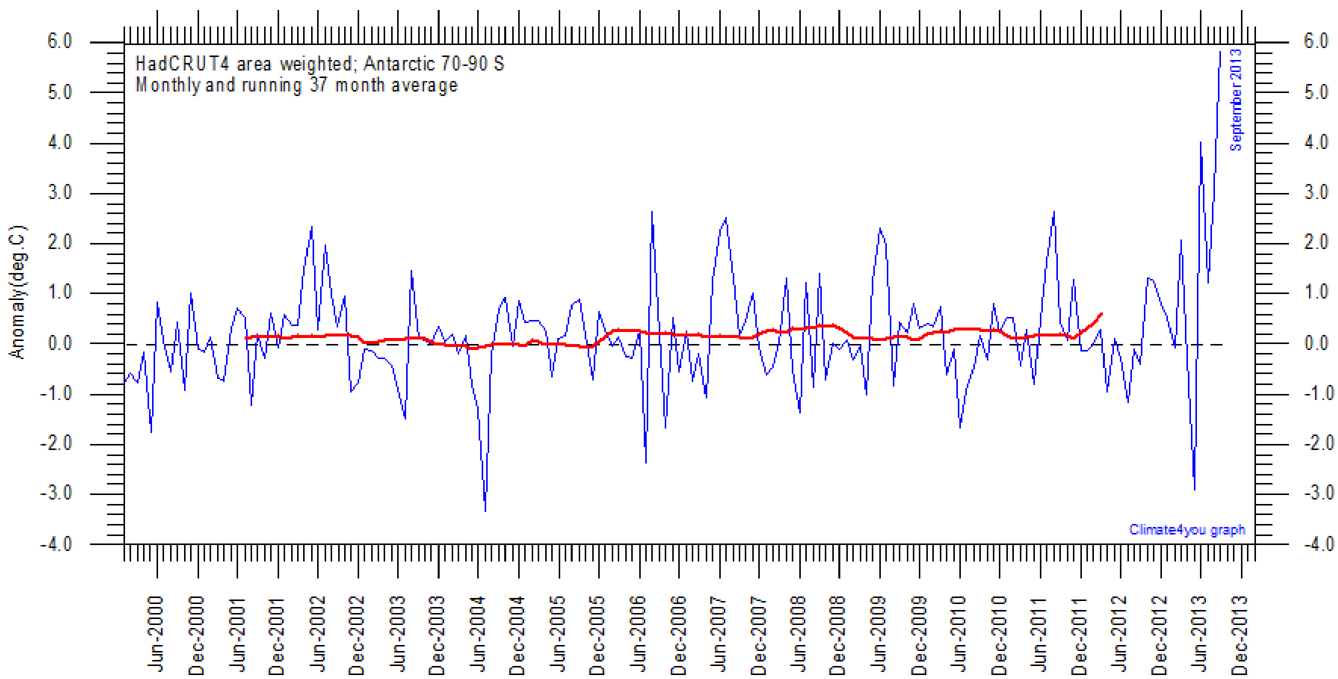


Diagram showing area weighted Antarctic (70-90°N) monthly surface air temperature anomalies ([HadCRUT4](#)) since January 2000, in relation to the WMO [normal period](#) 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr)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

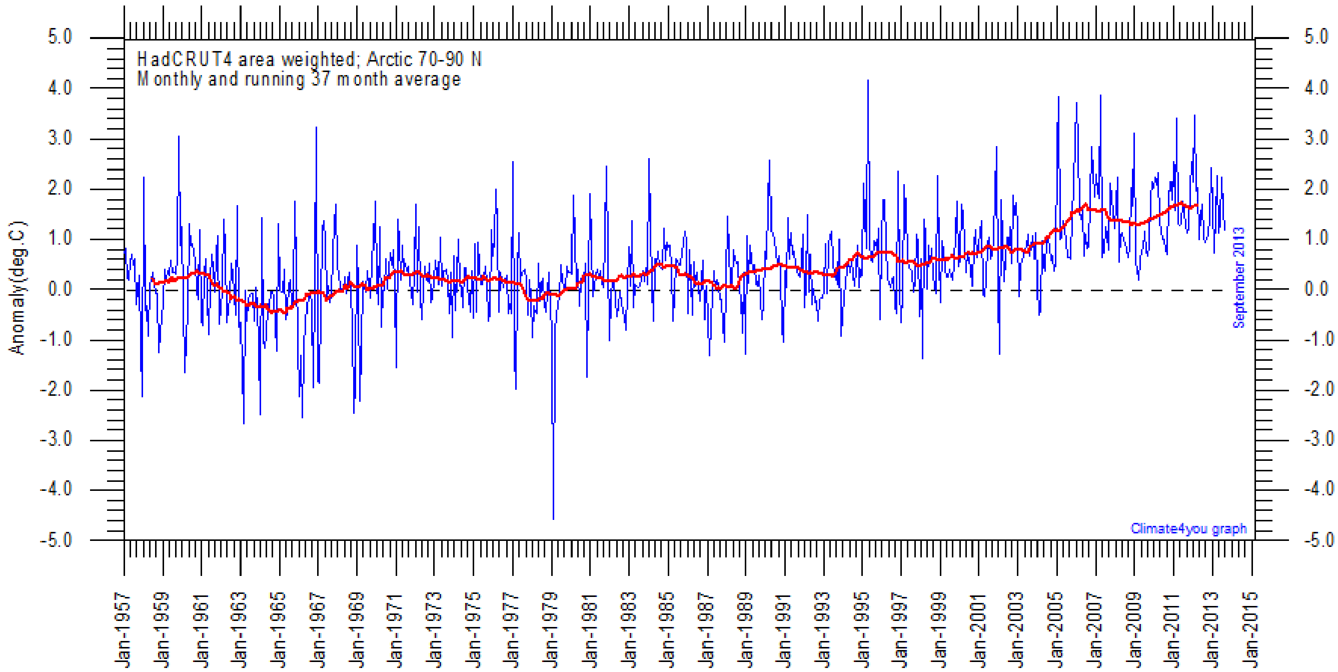


Diagram showing area weighted Arctic (70-90^{o}N) monthly surface air temperature anomalies ([HadCRUT4]) since January 1957, in relation to the WMO [normal period] 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average.

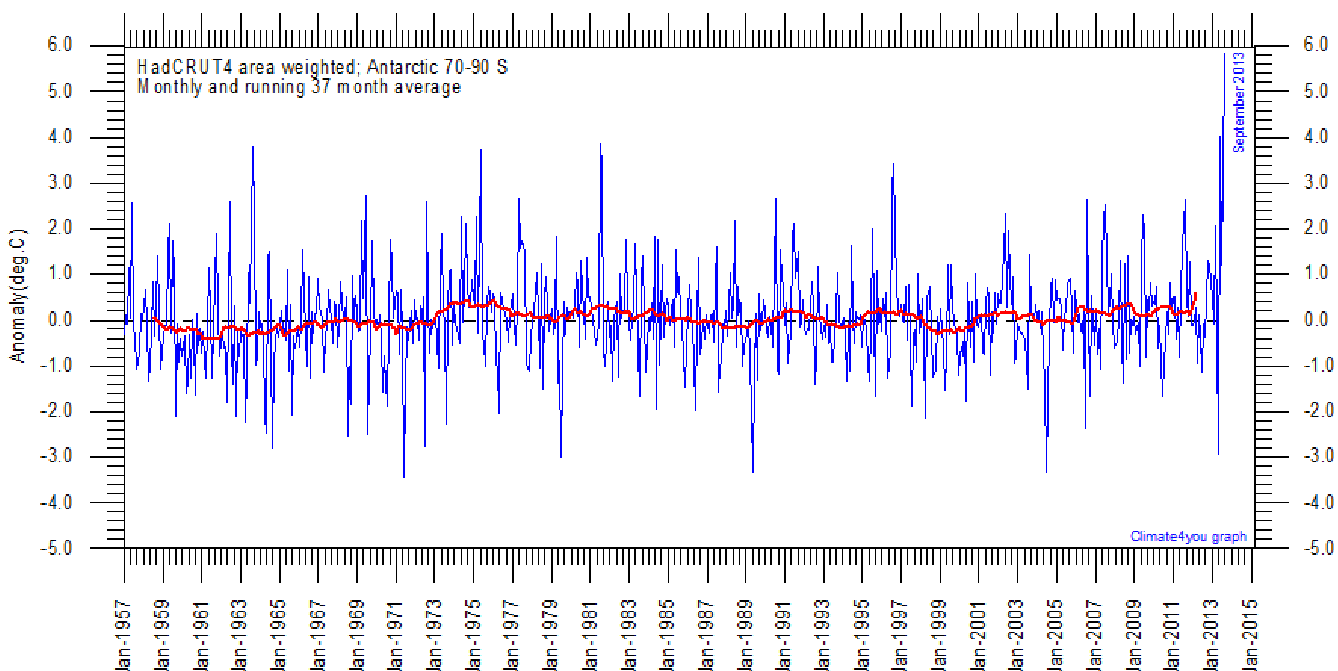


Diagram showing area weighted Antarctic (70-90^{o}N) monthly surface air temperature anomalies ([HadCRUT4]) since January 1957, in relation to the WMO [normal period] 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average.

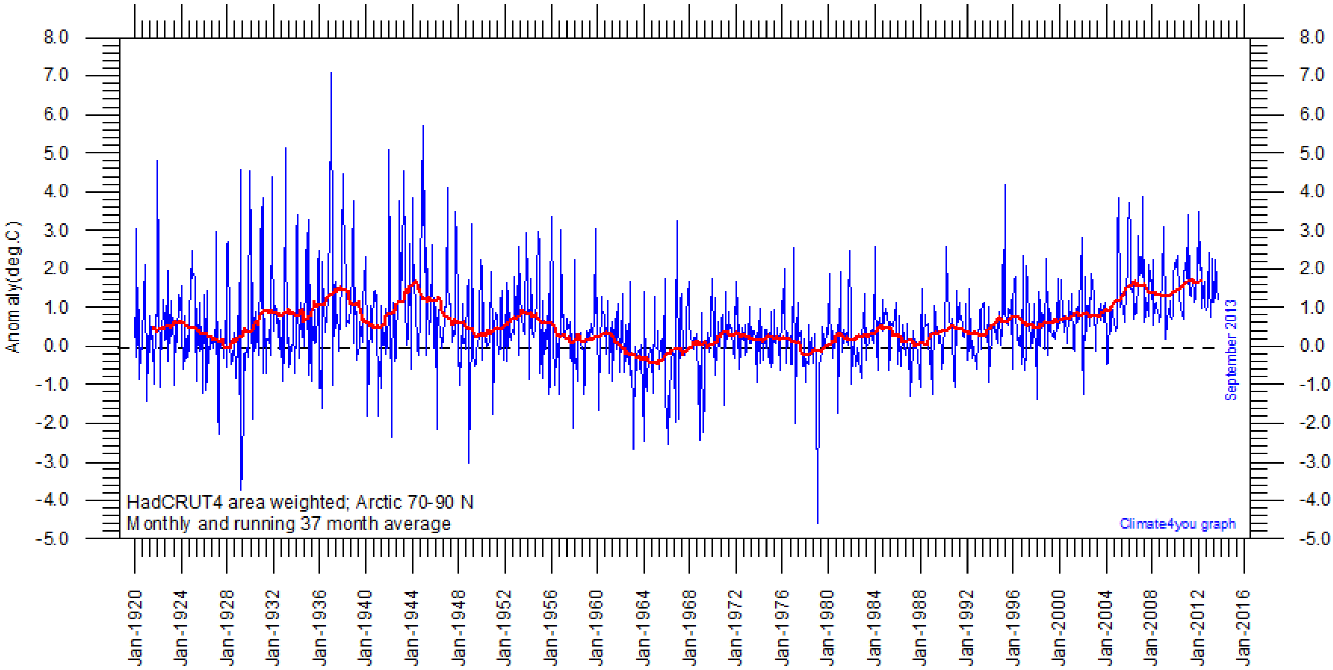


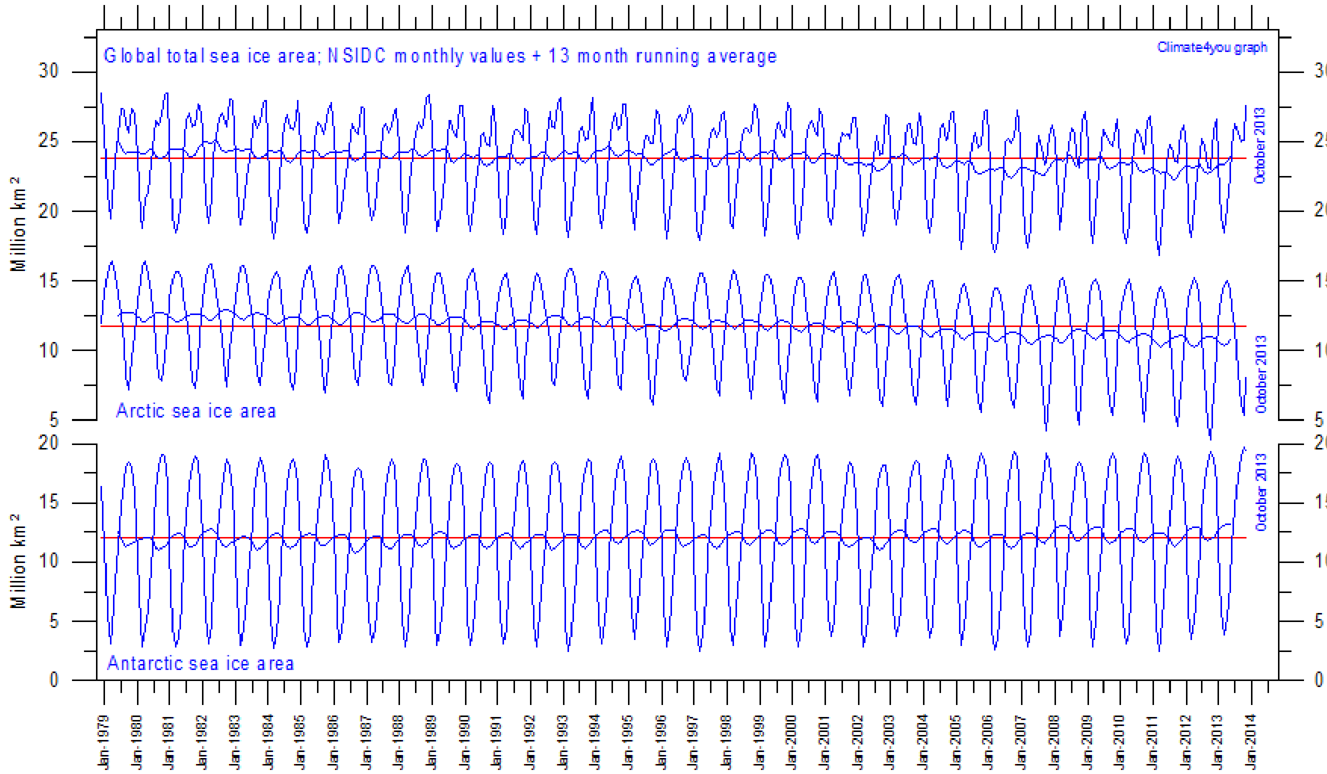
Diagram showing area weighted Arctic (70-90°N) monthly surface air temperature anomalies ([HadCRUT4]) since January 1920, in relation to the WMO [normal period] 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 37 month (c.3 yr) average. 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.

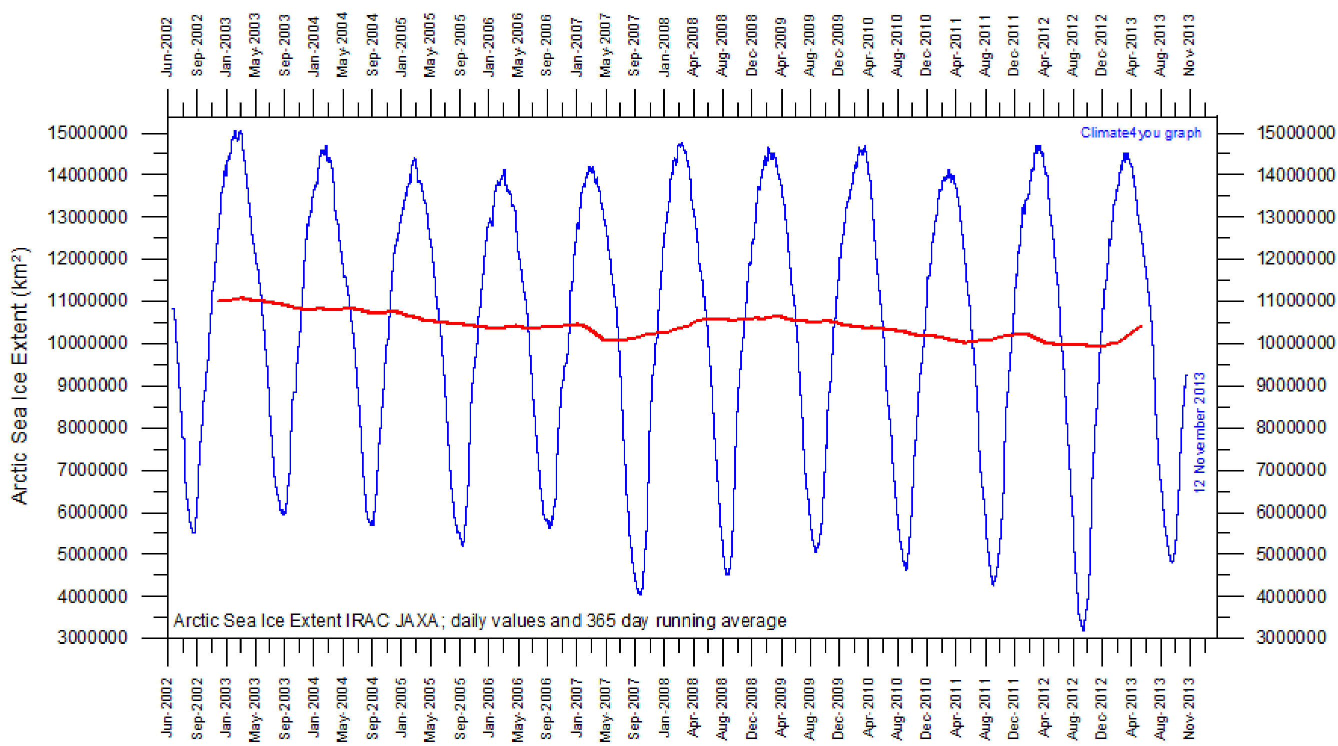
Literature:

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.

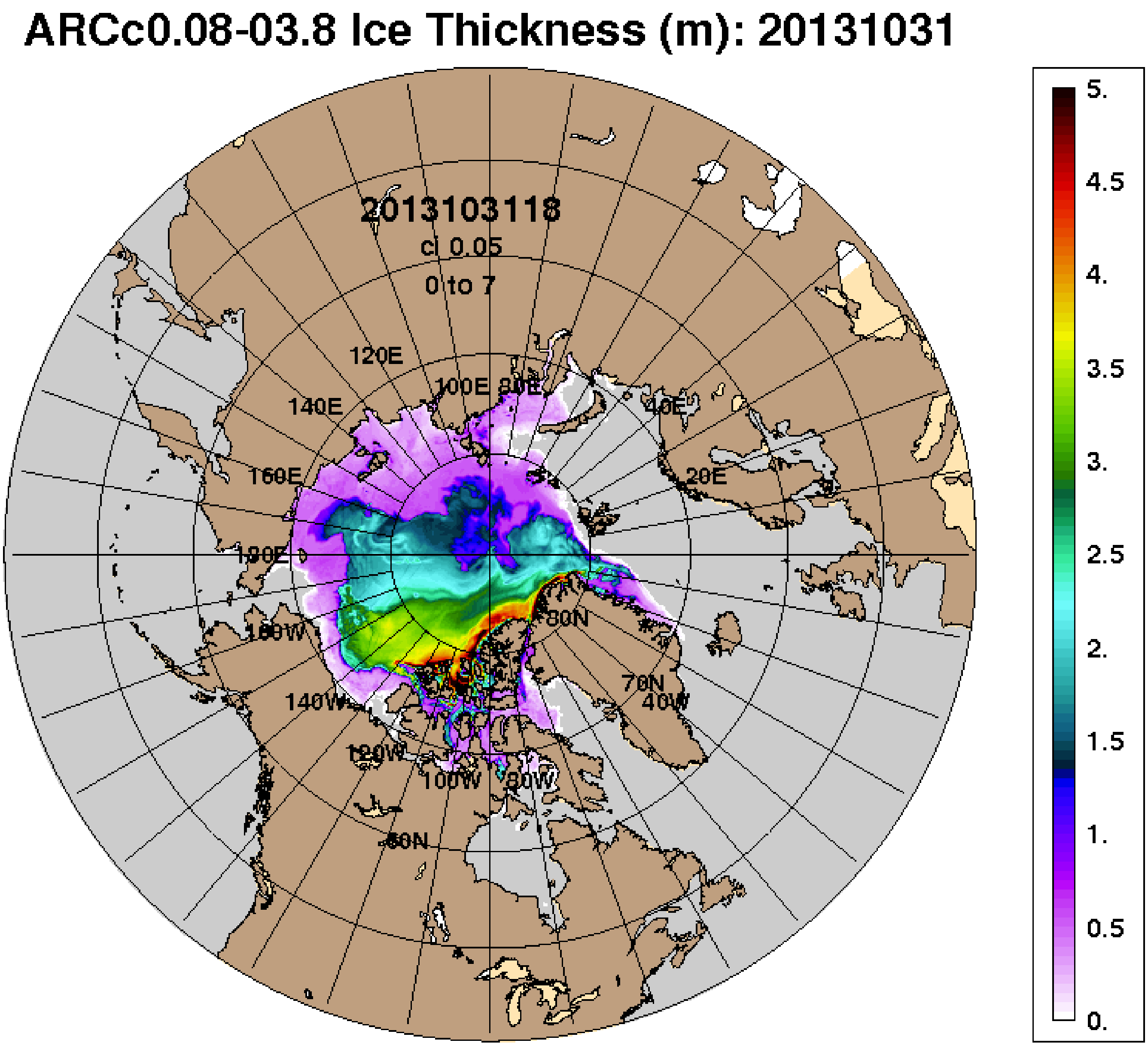
Arctic and Antarctic sea ice, updated to October 2013



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

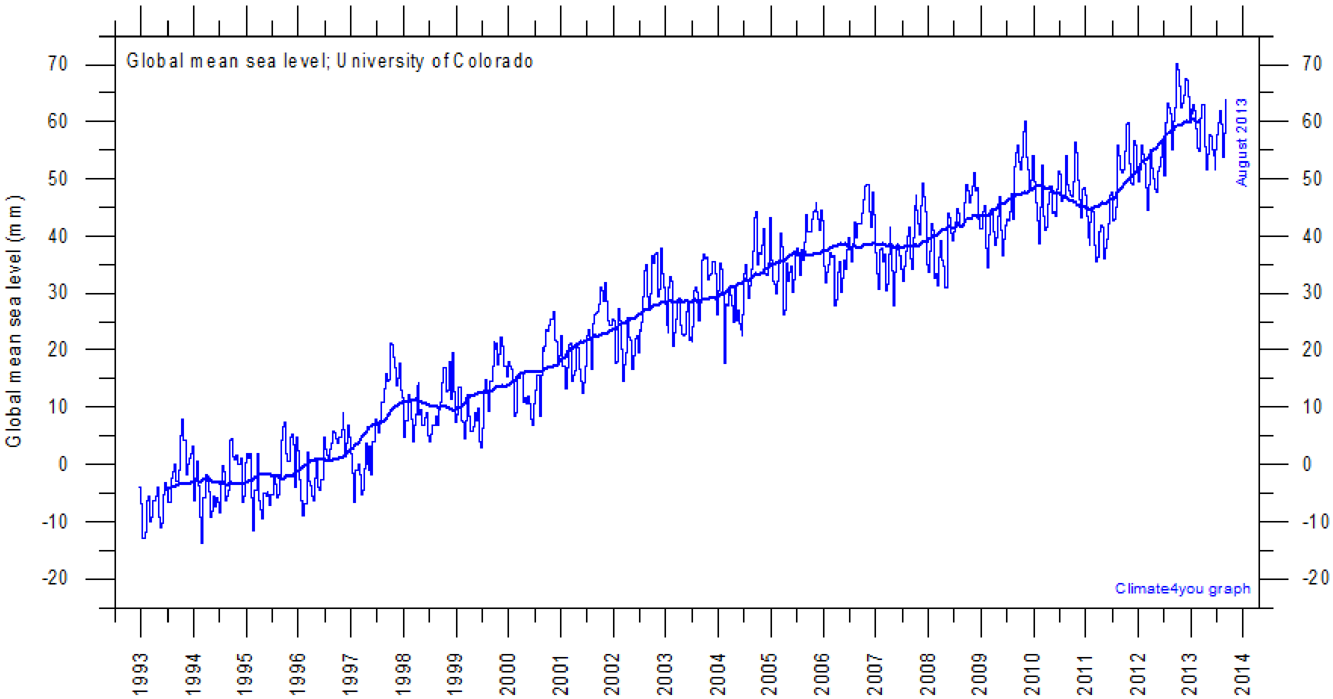


Graph showing daily Arctic sea ice extent since June 2002, to 12 November 2013, by courtesy of [Japan Aerospace Exploration Agency](#) (JAXA).

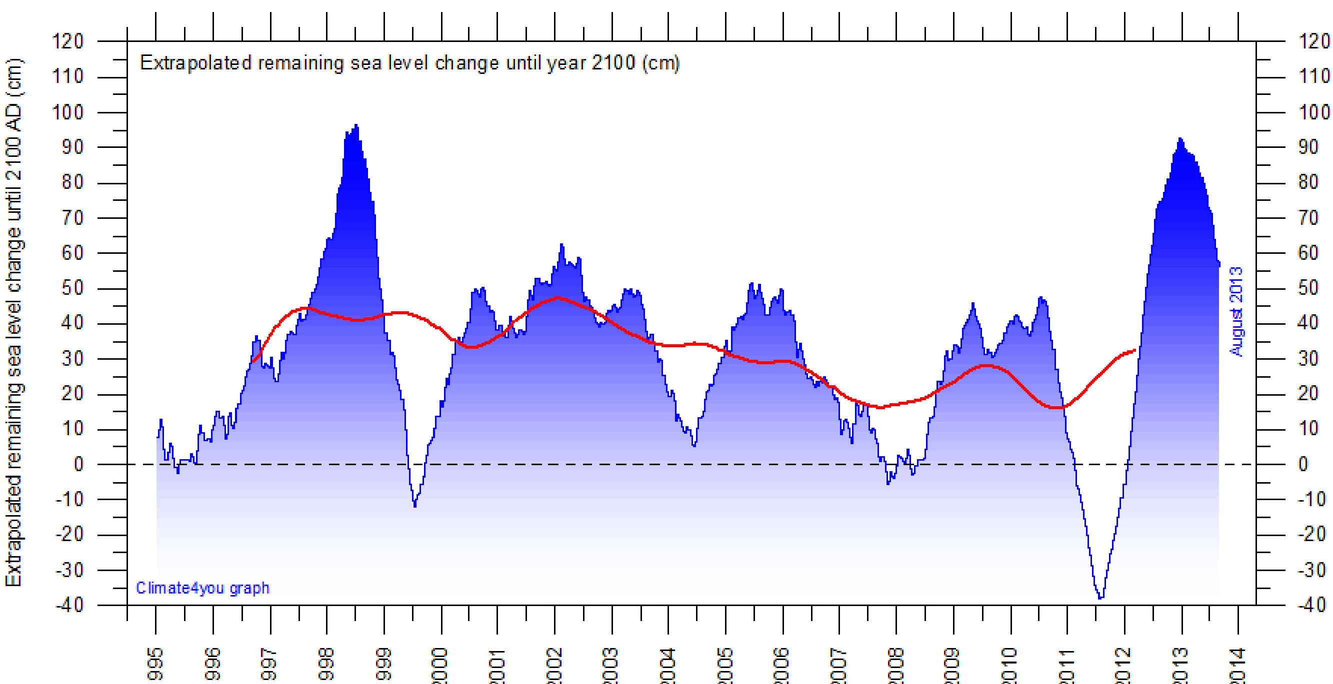


Northern hemisphere sea ice extension and thickness on 31 October 2013 according to the [Arctic Cap Nowcast/Forecast System](#) (ACNFS), US Naval Research Laboratory. Thickness scale (m) is shown to the right.

[Global sea level, updated to August 2013]

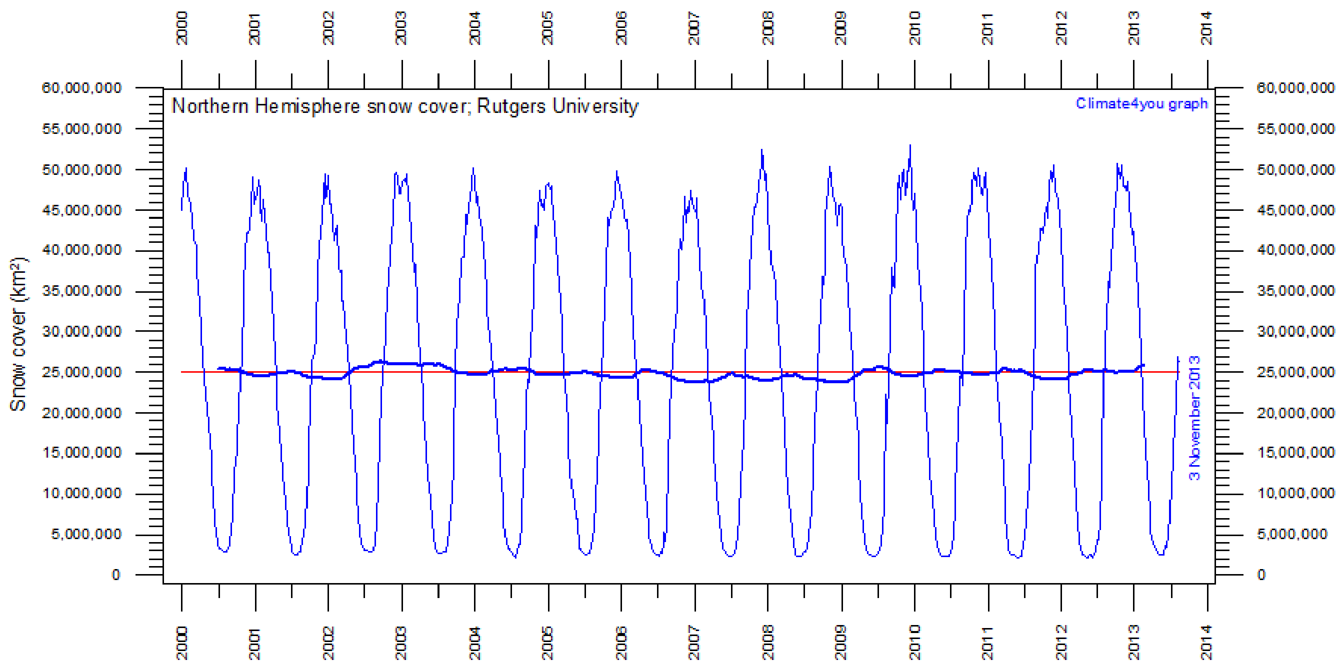


Globa lmonthly sea level since late 1992 according to the Colorado Center for Astrodynamics Research at [University of Colorado at Boulder], USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.

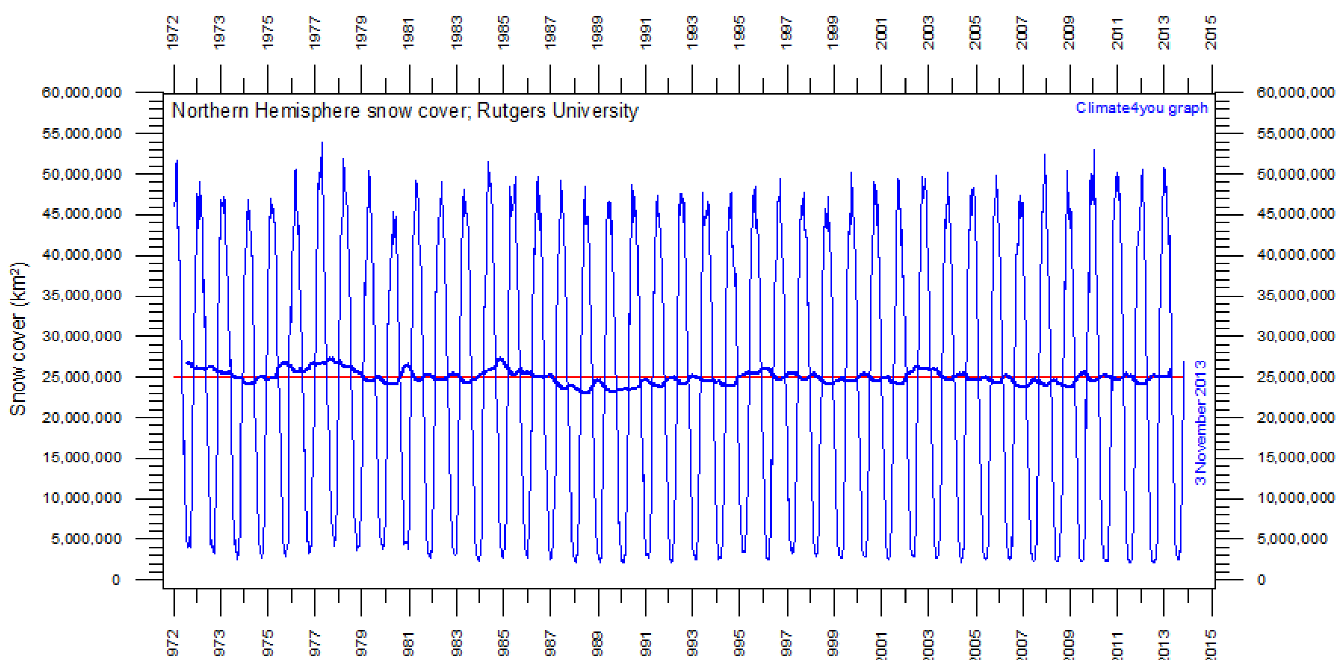


Forecasted change of global sea level until year 2100, based on simple extrapolation of measurements done by the Colorado Center for Astrodynamics Research at [University of Colorado at Boulder], USA. The thick line is the simple running 3 yr average forecast for sea level change until year 2100. Based on this (thick line), the present simple empirical forecast of sea level change until 2100 is about +31 cm.

Northern Hemisphere weekly snow cover, updated to early November 2013

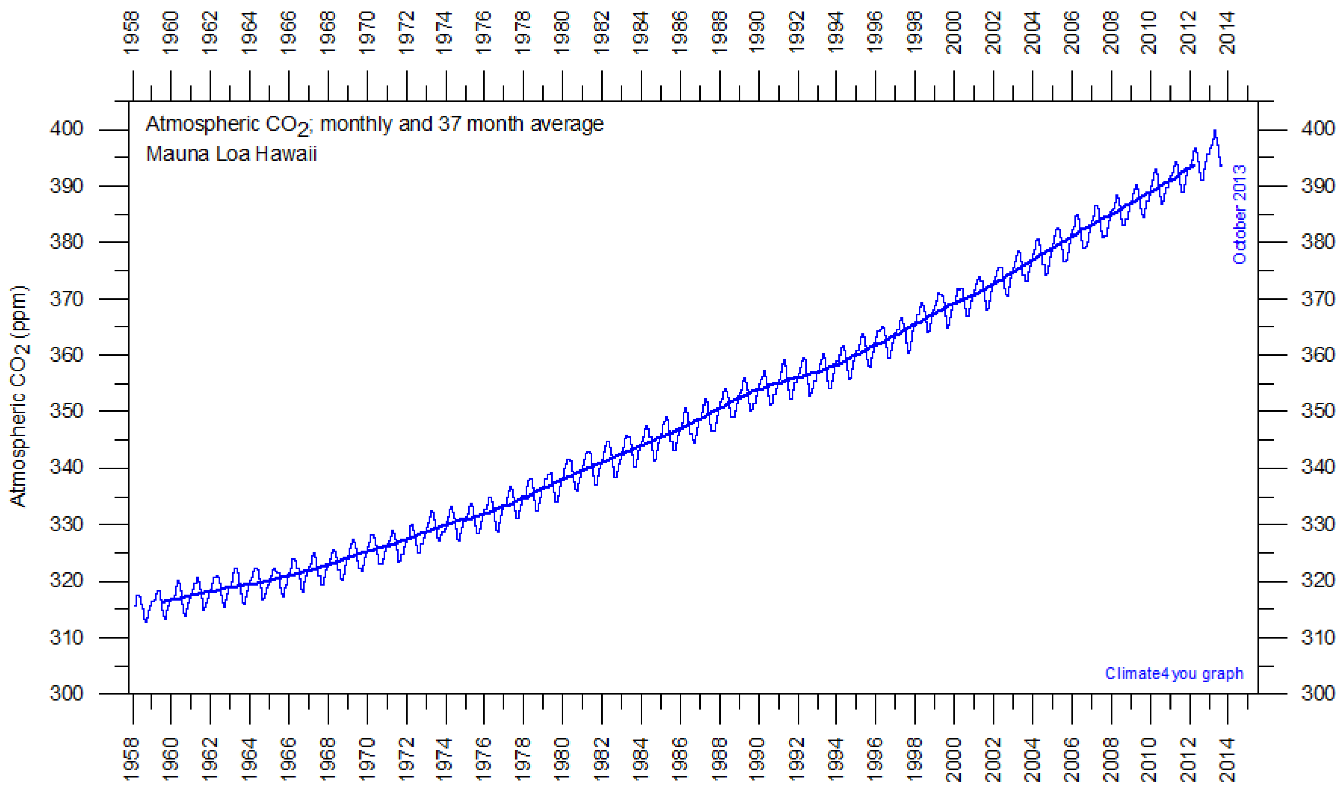


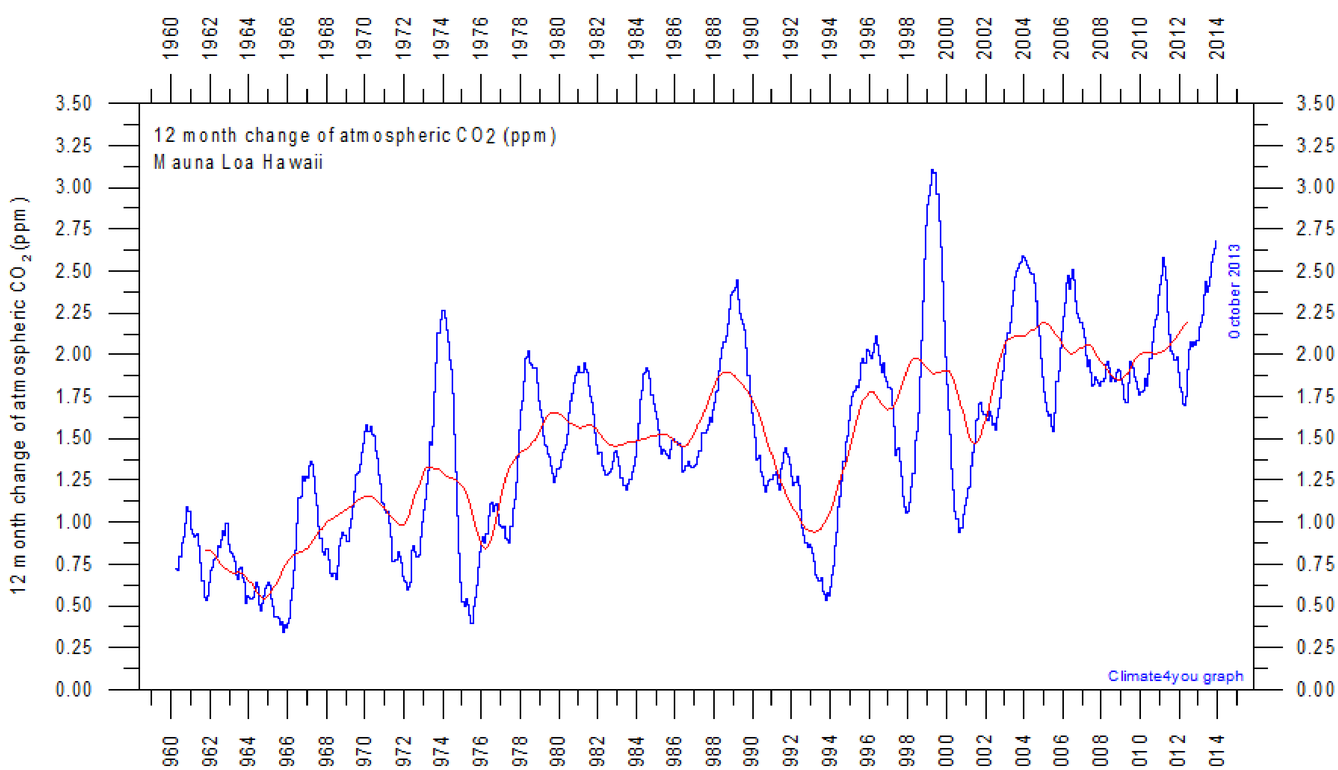
Northern hemisphere weekly snow cover since January 2000 according to Rutgers University Global Snow Laboratory. The thin blue line is the weekly data, and the thick blue line is the running 53 week average (approximately 1 year). The horizontal red line is the 1972-2012 average.



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.

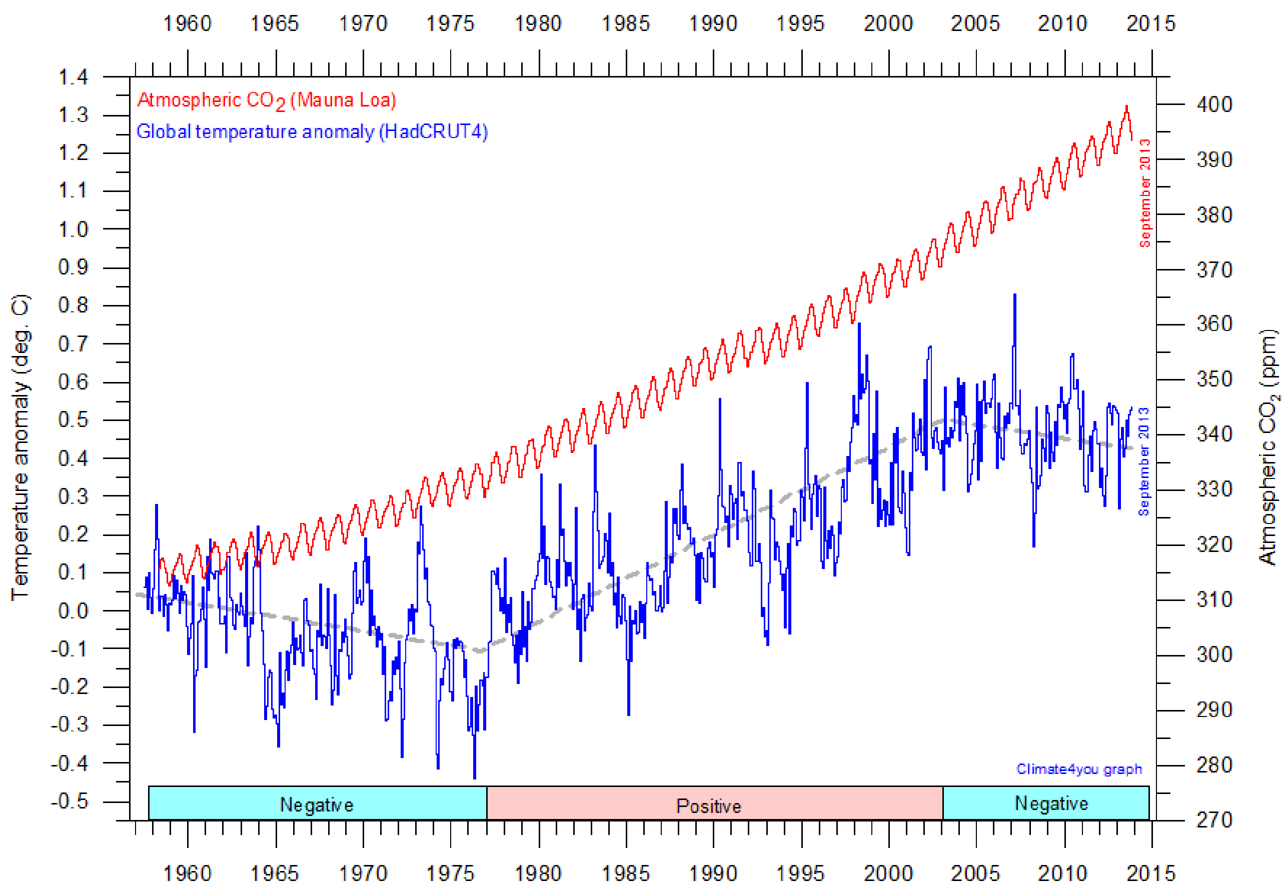
Atmospheric CO_2, updated to October 2013

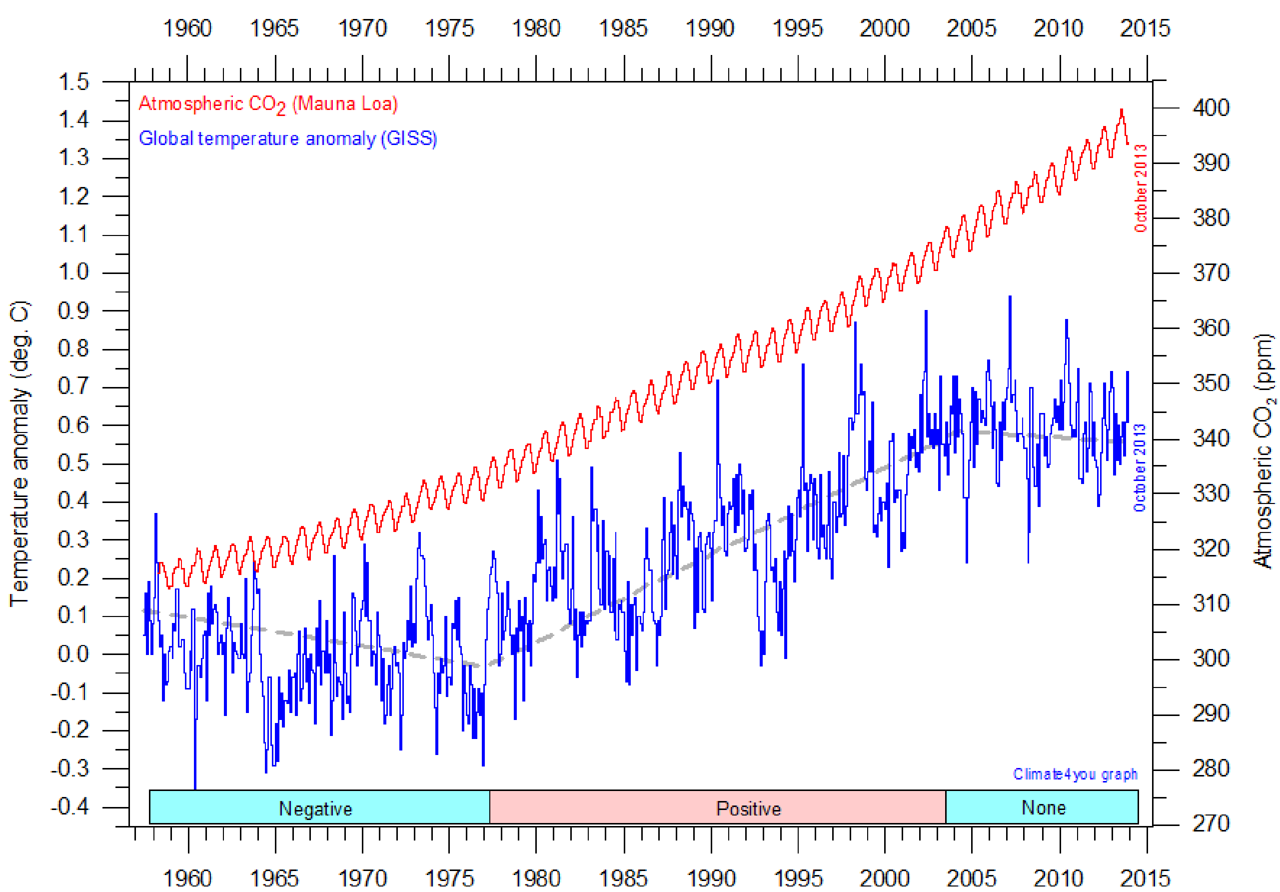


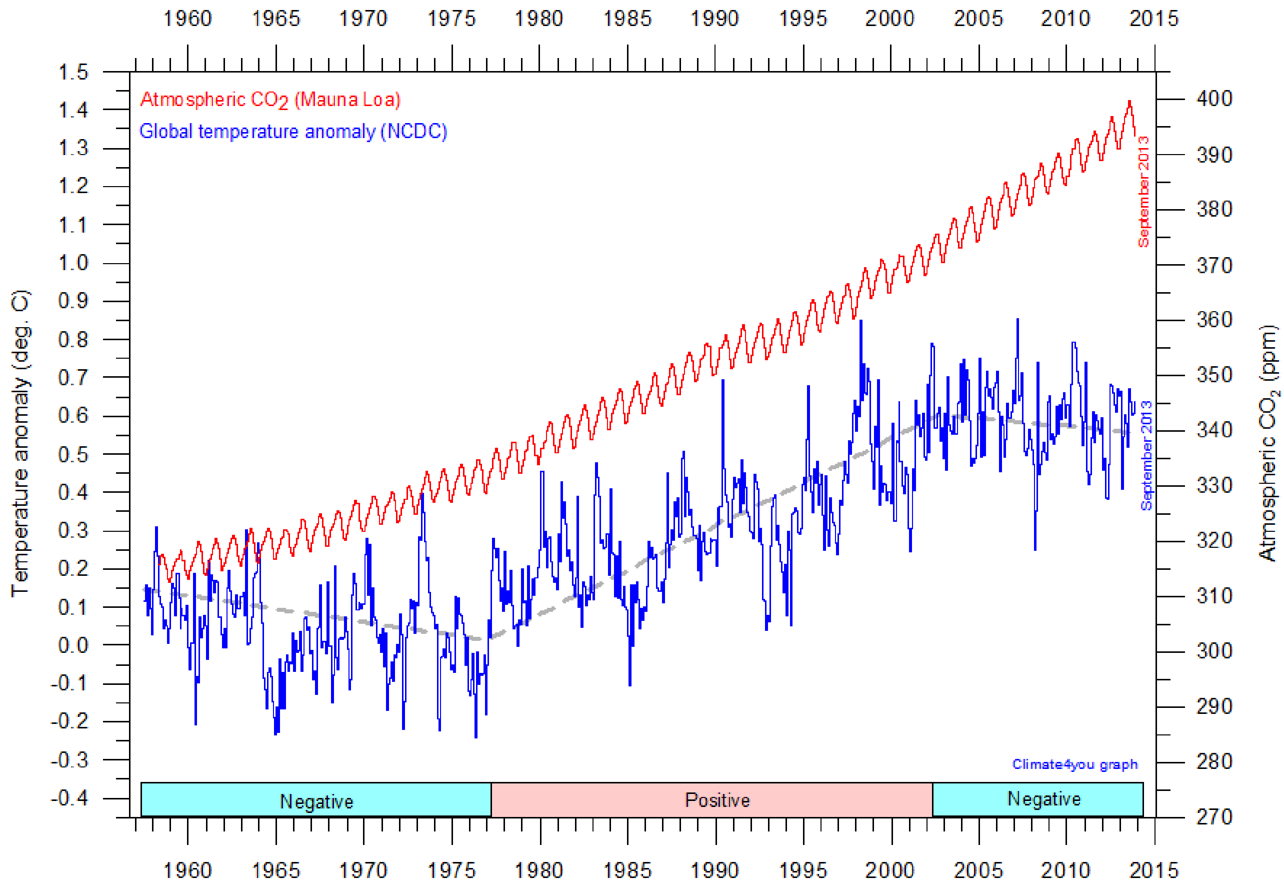


Monthly amount of atmospheric CO_2 (upper diagram) and annual growth rate (lower diagram); average last 12 months minus average preceding 12 months, blue line) of atmospheric CO_2 since 1959, according to data provided by the [Mauna Loa Observatory](), Hawaii, USA. The red line is the simple running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

Global surface air temperature and atmospheric CO_2, updated to October 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 September 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 meteorological record value may well be the result of other phenomena.

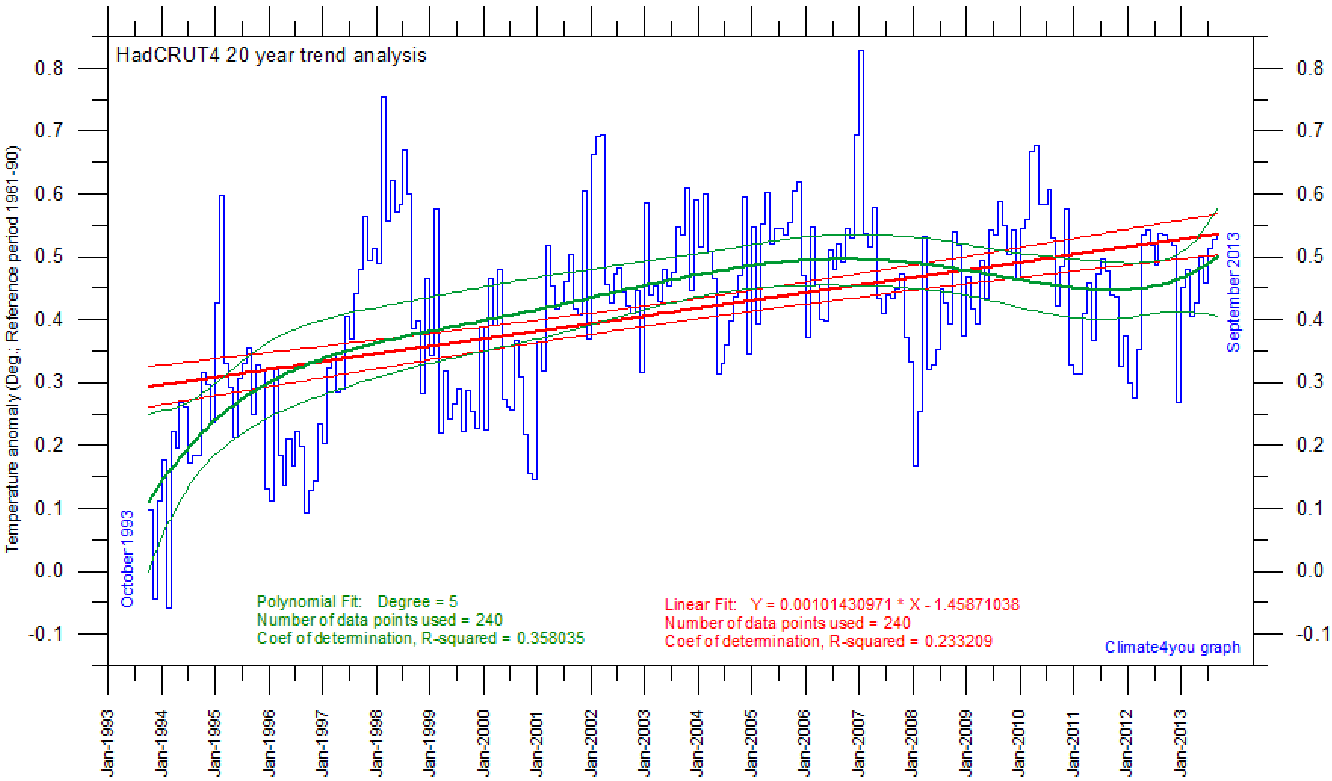
What exactly defines the critical length of a relevant time period to consider for evaluating the alleged importance of CO_2 remains elusive, and is still a topic for discussion. However, the critical period length must be inversely proportional to the temperature sensitivity of CO_2, including feedback 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 September 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 1872: The Baltic Sea flood November 1872

Figure 1. Denmark and northern Germany seen from SW. Sweden and the Baltic is seen in the upper part of the picture. The different place names refer to localities affected by the 1872 Storm Surge, as outlined in the text below. The distance from Eckernförde to Bornholm is about 350 km. Picture source: Google Earth.

The 1872 Baltic Sea flood is often referred to as a storm flood. In the night of 12-13 November 1872 the storm ravaged the western Baltic Sea coast from Denmark to Pomerania in northern Germany, and is considered the worst storm surge ever recorded in the Baltic region in historical time. The highest recorded peak water level was about 3-3.4 m above normal sea level along the coasts affected, resulting in substantial flooding of adjoining land areas and the loss of lives and property.

The 1872 storm surge took place in the final decades of the Little Ice Age, where storms in the North Atlantic were somewhat more frequent than now, mainly because of a somewhat larger thermal gradient between the Equator and the Arctic.

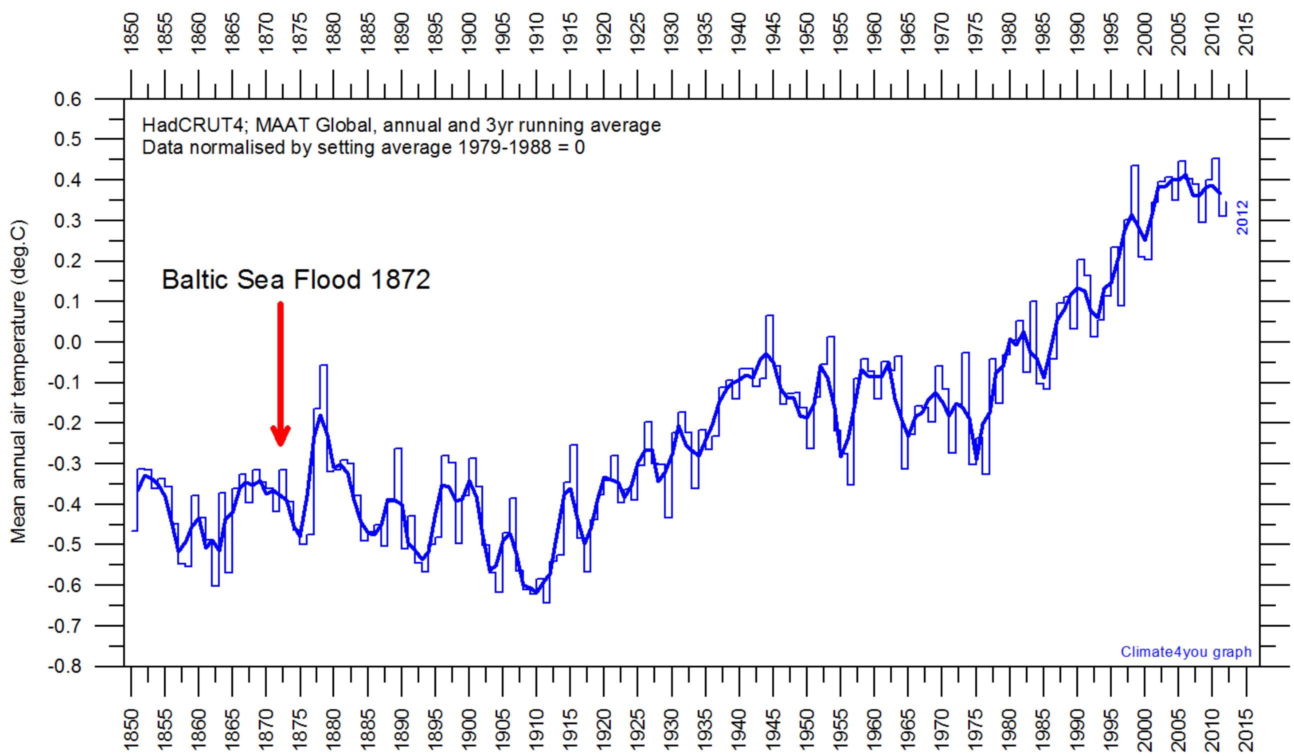


Figure 2. Anomalies of global annual surface air temperature (MAAT) since 1850 according to Hadley CRUT, a cooperative effort between the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK. The thin line represents the annual values, and the thick line is the simple running 3 year average. The Baltic Sea Flood took place in a somewhat cooler global climate than now.

In the first week of November 1872 weather over northern Europe and the Baltic region was calm (Hansen 1879, Petersen 1924). However, during November 7. the wind increased to storm from directions initially SW and later NW over Denmark and northern Germany. The strong NW wind resulted in water being driven into the western Baltic from the North Sea and Kattegat between Denmark and Sweden.

Usually there is a steady outflow of water (of relatively low salinity) from the Baltic because of large rivers entering the Baltic, but now the situation for a couple of days shifted to net inflow of water because of the strong NW winds. At the town Sønderborg at the Baltic coast in southern Jutland (Denmark) the sea water salinity by this increased from 1.987% to 2.434% (Petersen 1924). At the same time, the surface current in the sounds between the Danish islands became southerly 6-8. November, instead of being northerly as is usually the case (Colding 1981, Petersen 1924). Due to the net inflow the water level in the Western Baltic increased to about 20-40 cm above normal.

Under normal conditions there is a surface gradient along the axis of the Baltic towards southern Denmark, to make the outflow of excess water possible, but now this gradient was suddenly reduced by the wind-induced net inflow of water, resulting in the accumulation of a huge water body in the eastern part of the Baltic (Colding 1981, Petersen 1924).

Figure 3. Drawing in the Danish newspaper 'Illustreret Tidene' December 1, 1872. The illustration shows a house belonging to Peter Skipper in Gedesby, southernmost Falster, being destroyed by the flood and large waves during the Storm Surge in the early morning of November 13, 1872. For location of Gedesby see 'Climate4you update June 2013'. Picture source: Den Gamle Købmandsgård, Gedser, 2013.

During November 9 the wind began to reduce in force, and everything appeared to return to normal, but then wind changed its direction. Initially this change was recorded at the north coast of the German island Rügen. From morning November 10 the wind turned into NE, and began to increase in strength over the entire western Baltic and later also the eastern parts. During November 11 the wind increased to gale and then storm from NE on the next day. Later that day, November 12, the wind increased to hurricane, to the knowledge of the author until now the only recorded NE hurricane in this part of Europe. The area exposed to the highest wind speed was the western part of the Baltic between Rügen and the Danish island Bornholm south of Sweden.

By this the water masses accumulated in the Baltic was forced towards the western end of the Baltic, where the water level rapidly began to rise. Simultaneously, the hurricane-force NE wind partly prohibited the natural drainage of the excess water masses north into the Danish sounds (Petersen 1924).

In the night between 12 and 13 November and during the following morning extensive coastal areas along the western part of the Baltic was flooded by water masses rising 3-3.4 m above normal. Huge waves caught coastal dwellers by surprise and caused floods over a metre high in coastal towns and villages. Probably the NE hurricane culminated in the early morning hours of November 13.

Many of the flooded areas already had protective dikes before the storm surge, as this was not the first severe flooding event to hit this part of northern Europe, but almost without exception these dikes were no match for the storm surge in November 1872.

Of all the German coastal settlements, Eckernförde (Fig. 1) was most heavily damaged due to its location on the Bay of Eckernförde which was wide open to the northeast, directly into the hurricane wind. The entire town was flooded, 78 houses were destroyed, 138 damaged and 112 families became homeless. In Mecklenburg and West Pomerania 32 people lost their lives on land due to the floods. In the Greifswald village of Wieck almost all the buildings were destroyed and nine people drowned. Houses were destroyed as far as the centre of Greifswald. Peenemünde was completely flooded.

Figure 4. Contemporary illustration showing rescue efforts carried out in the early morning November 13, 1872, by people from the mainland of the Danish island Falster. Several houses from the village Bøtø near the eastern coast of the island were taken by the flood and drifted across the lagoon (Bøtø Nor) between the barrier island and the mainland to the west. The illustration shows a family being rescued from the still floating roof section of their house. Picture source: Det Lollandske Dige 2013.

The Danish island of Lolland, which has large areas protected by dikes, was badly hit and partly submerged and 28 persons lost their lives. On the Danish island Falster farther to the east the situation was even worse, being exposed to the full might of the NE hurricane. Dikes along the east coast of southern Falster were rapidly overwhelmed and eroded away, and entire villages were destroyed by the flood, resulting in the loss of 52 people. Many people scrambled to the top floor of their houses as the water depth rapidly increased, but were trapped inside without escape possibilities when the buildings subsequently collapsed and were washed away by the waves.

In total the flood cost the lives of at least 271 people along the Baltic Sea coast; 2,850 houses were destroyed or at least badly damaged and 15,160 people left homeless as a result. These numbers should be seen on the background of a much smaller population than today. At sea about 260 ships were lost (Ejdorf 2003), amounting to the biggest shipping catastrophe in Denmark.

Statistically the 1872 flood counts as a 100-year flood. A storm flood of similar dimensions today might cause far more damage because the coastal region today is much more densely populated than at that time. In many of the affected areas, however, dikes have now been reconstructed with dimensions corresponding to the 1872 flood. Several places these man-made dikes have later been reinforced by nature itself, as sand dunes have been accumulating along the coastal side of them.

Figure 5. The 17 km dike along the southern part of the east coast of Falster was constructed rapidly after the 1872 storm surge, and was finished in its present form already in 1875. During the following 138+ years a ridge of sizeable sand dunes has accumulated on the coastal side of the dike (to the east). The dike is seen in the foreground, and the sand dunes to the right. View towards NNE. March 15, 2013.

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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

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