Climate4you update November 2011

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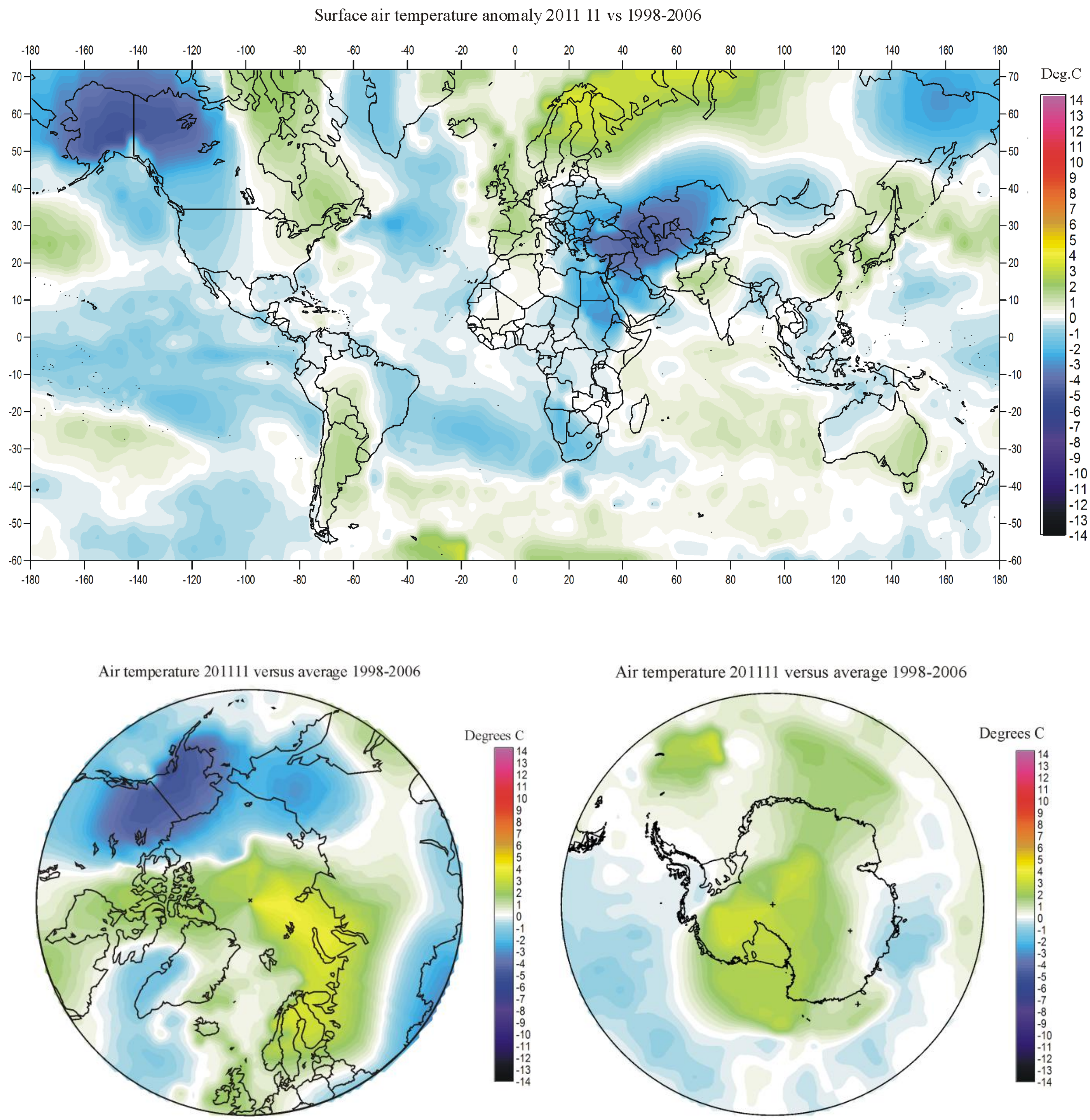
November 2011 global surface air temperature overview



November 2011 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](http://www.giss.nasa.gov) (GISS)

Comments to the November 2011 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 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 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 grater detail on www.Climate4you.com.

The average global surface air temperatures November 2011:

The Northern Hemisphere was characterised by high regional variability. Warmer than 1998-2006 average temperatures extended across most of western and northern Europe and eastern Canada. Lower than average temperatures were recorded in Alaska, western Canada and USA, eastern Mediterranean, southern Russia and eastern Siberia.

The Southern Hemisphere in general was close to or below average 1998-2006 conditions. Most of Africa experienced below average temperatures.

Near Equator temperatures conditions were in general below average 1998-2006 temperature conditions.

The Arctic was characterized by a high variability of average surface air temperatures. The European Arctic and easternmost Arctic Canada had above average temperatures. Eastern Siberia, Alaska and western Canada saw below average temperatures.

Most of the Antarctic continent experienced above average temperatures.

The global oceanic heat content has been almost stable since 2003/2004, but the latest update July-September 2011 suggests a new temperature increase (page 10).

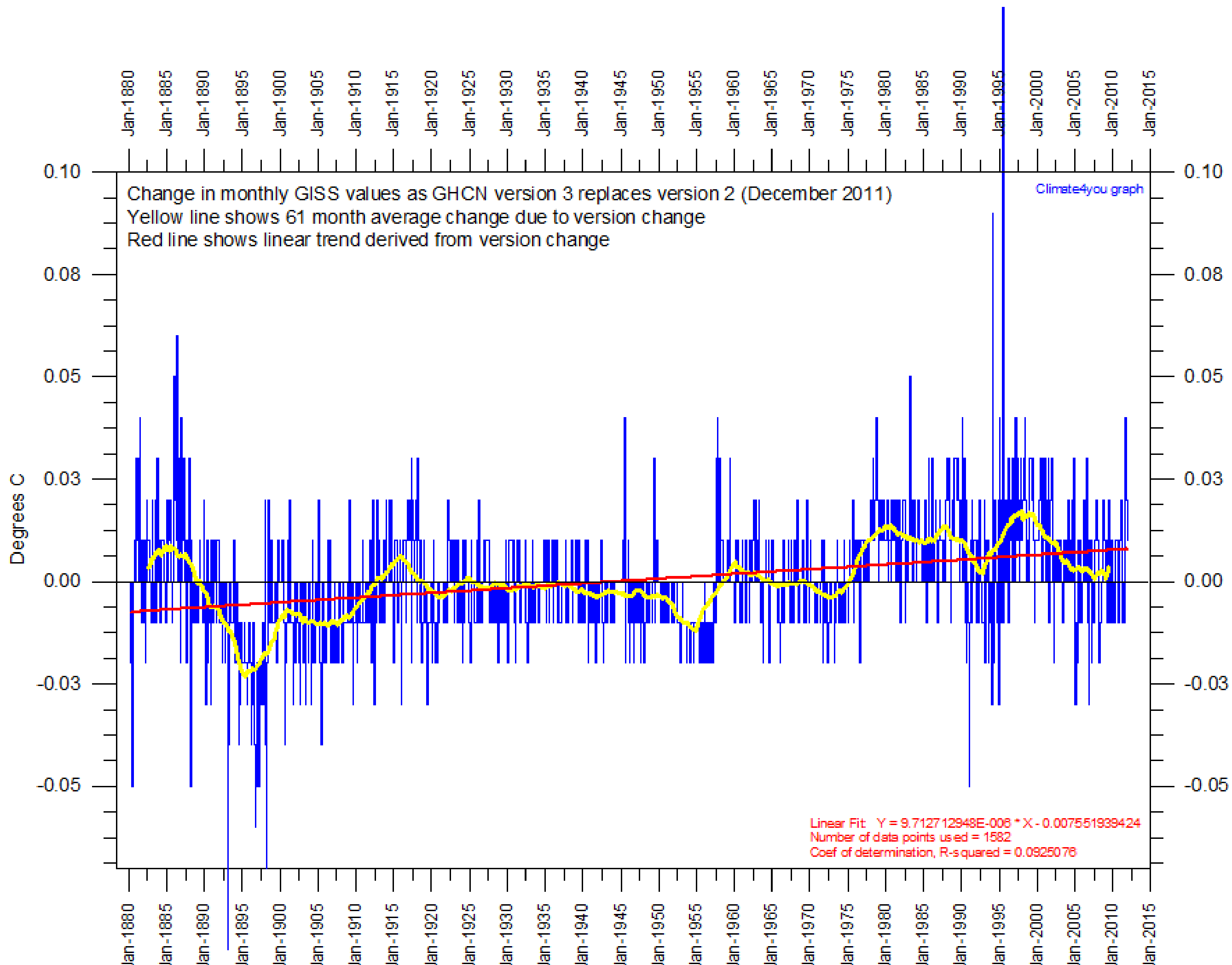
The global sea level has not been changing very much since 2009 (page 17).

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

GISS news December 2011: GHCN version 3 replaces version 2

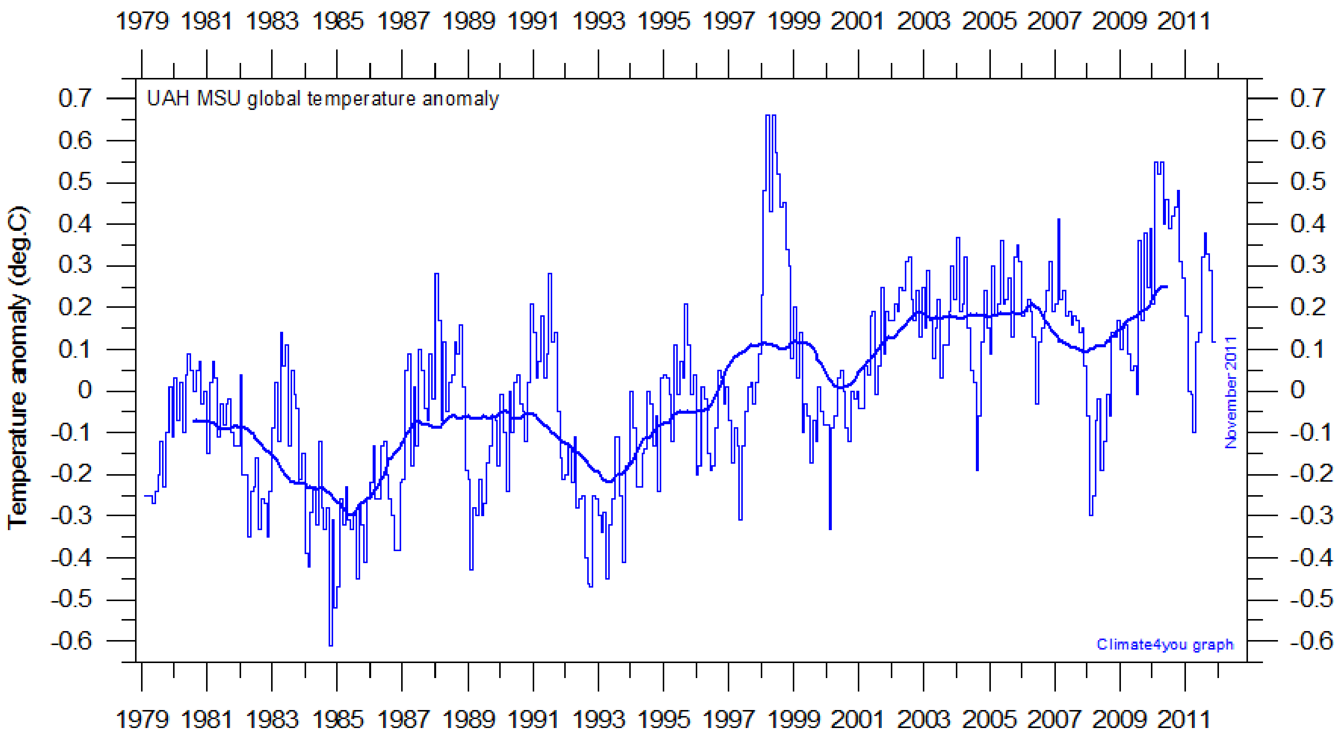
Info about the GISS Surface Temperature Analysis from http://data.giss.nasa.gov/gistemp/:

December 15, 2011: GHCN v2 is no longer being updated, hence the GISS analysis is now based on the adjusted GHCN version 3 data. Graphs comparing results of the GISS analysis using GHCN v2 and v3 are available on http://data.giss.nasa.gov/gistemp/updates_v3/V3vsV2/. A discussion of the impact of this change will be included with the GISS analysis of 2011 global temperature on http://data.giss.nasa.gov/gistemp/

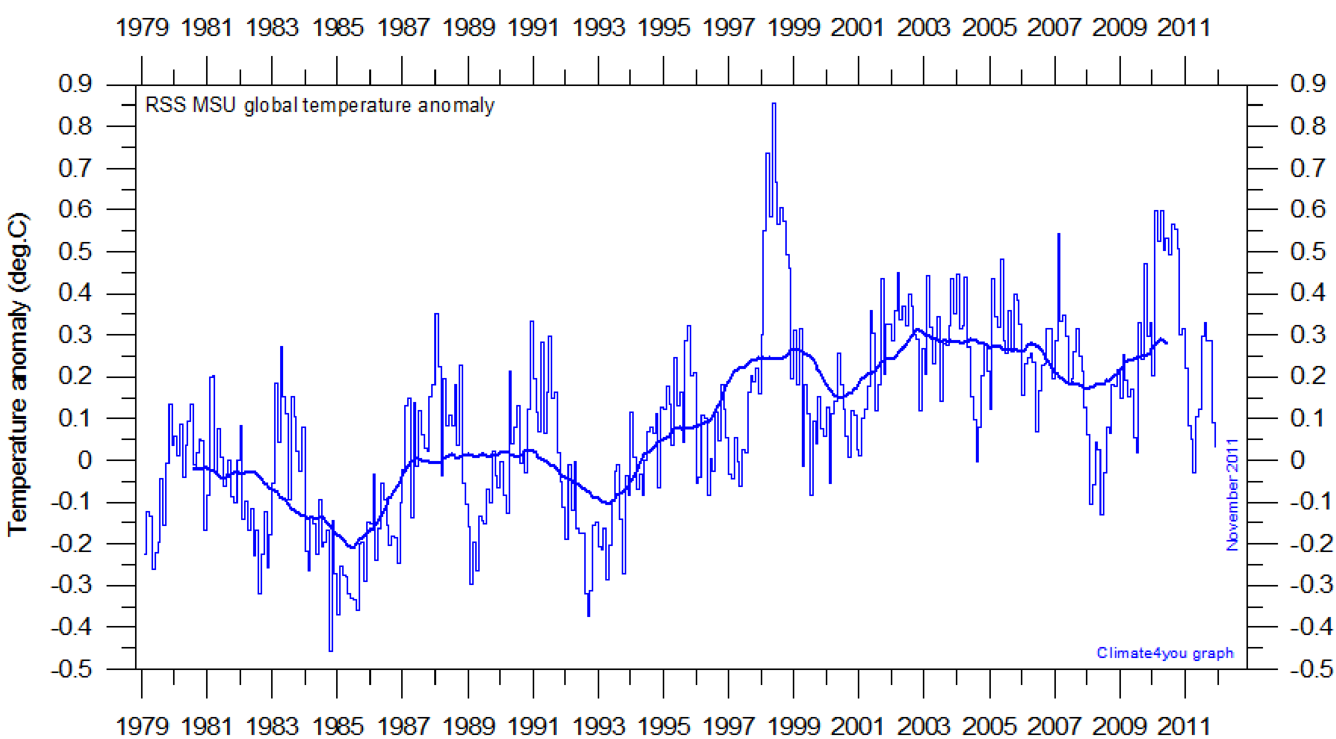


The diagram above illustrates the change introduced by the GHCN version change for the individual monthly GISS temperature anomalies from January 1880 to October 2011. In general, the version change results in lower global GISS temperatures in the early part of the record (especially 1890-1910), and higher temperatures in modern part of the record (especially 1978-2005). The overall net result of the version change is a somewhat steeper temperature increase 1880-2011 as indicated by the linear trend line shown above (red line).

[Lower troposphere temperature from satellites, updated to November 2011]

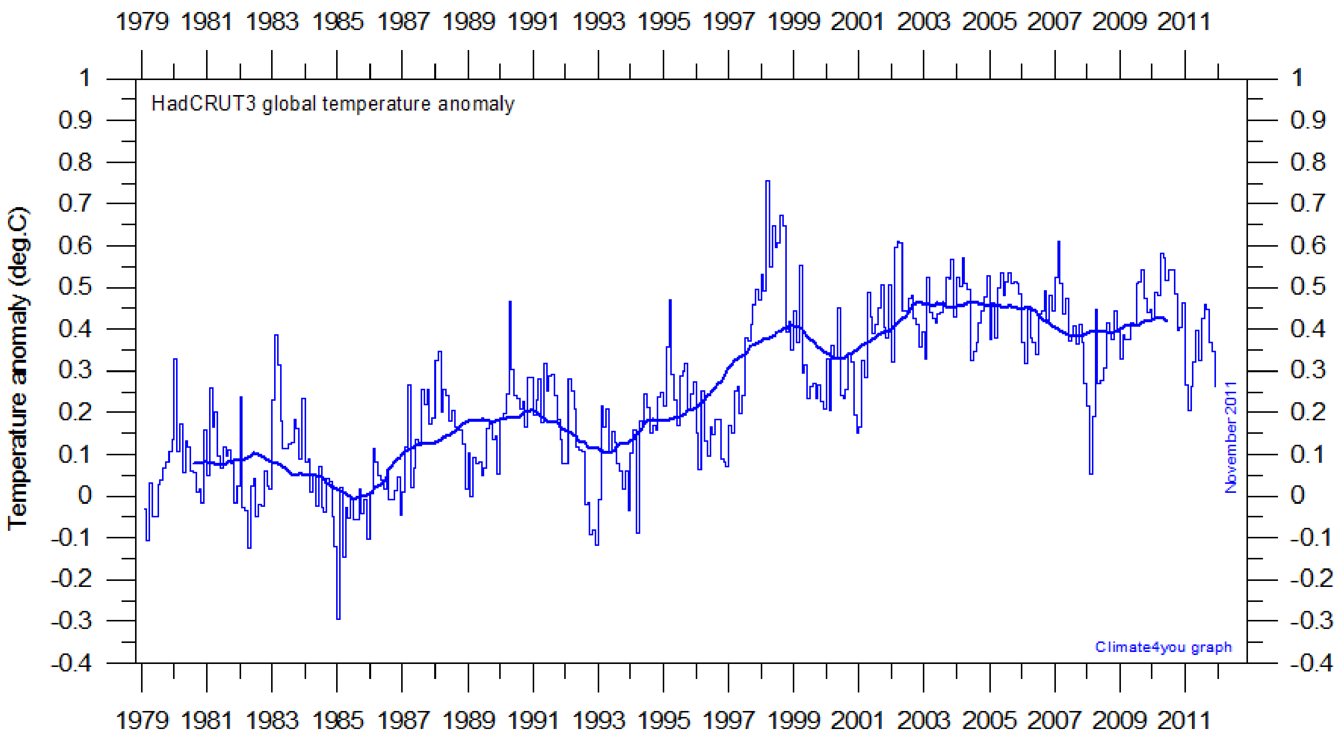


Global monthly average lower troposphere temperature (thin line) since 1979 according to [University of Alabama] at Huntsville, USA. The thick line is the simple running 37 month average.

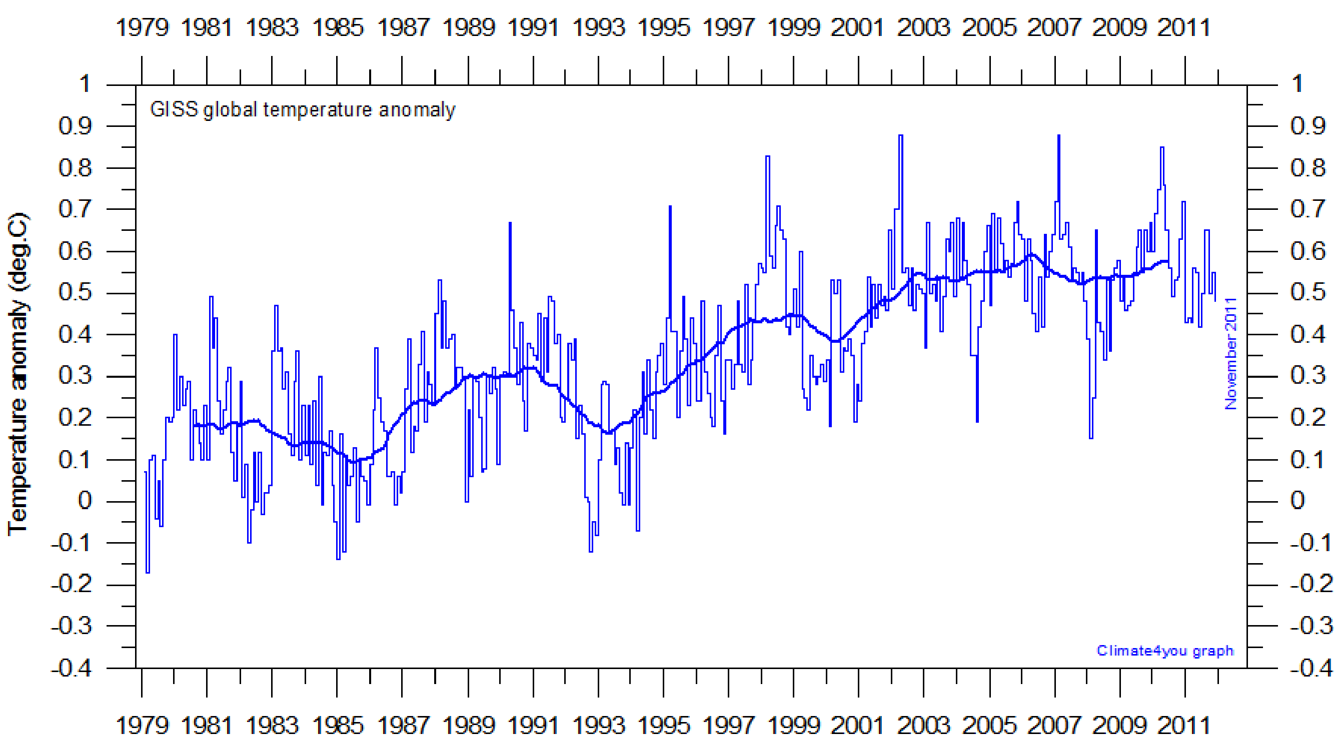


Global monthly average lower troposphere temperature (thin line) since 1979 according to according to [Remote Sensing Systems] (RSS), USA. The thick line is the simple running 37 month average.

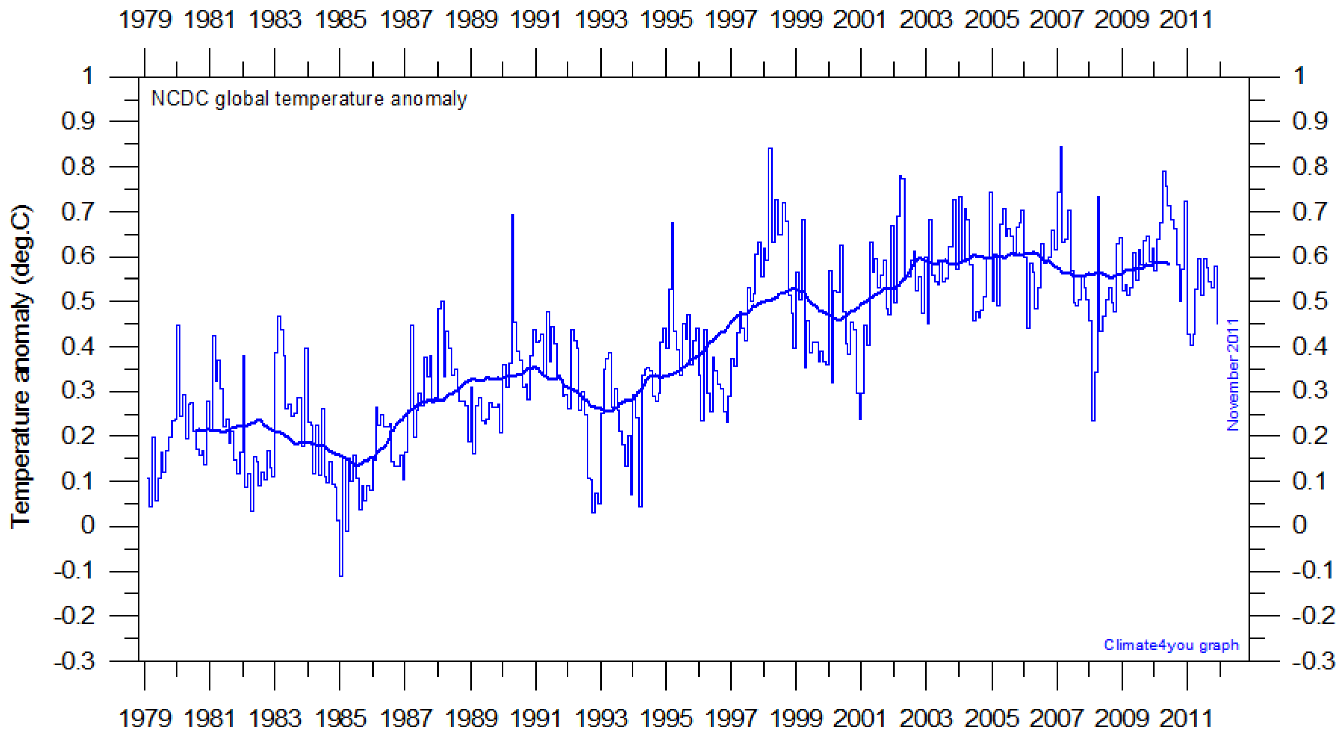
Global surface air temperature, updated to November 2011



Global monthly average surface air temperature (thin line) since 1979 according to according to the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK. The thick line is the simple running 37 month average.



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



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

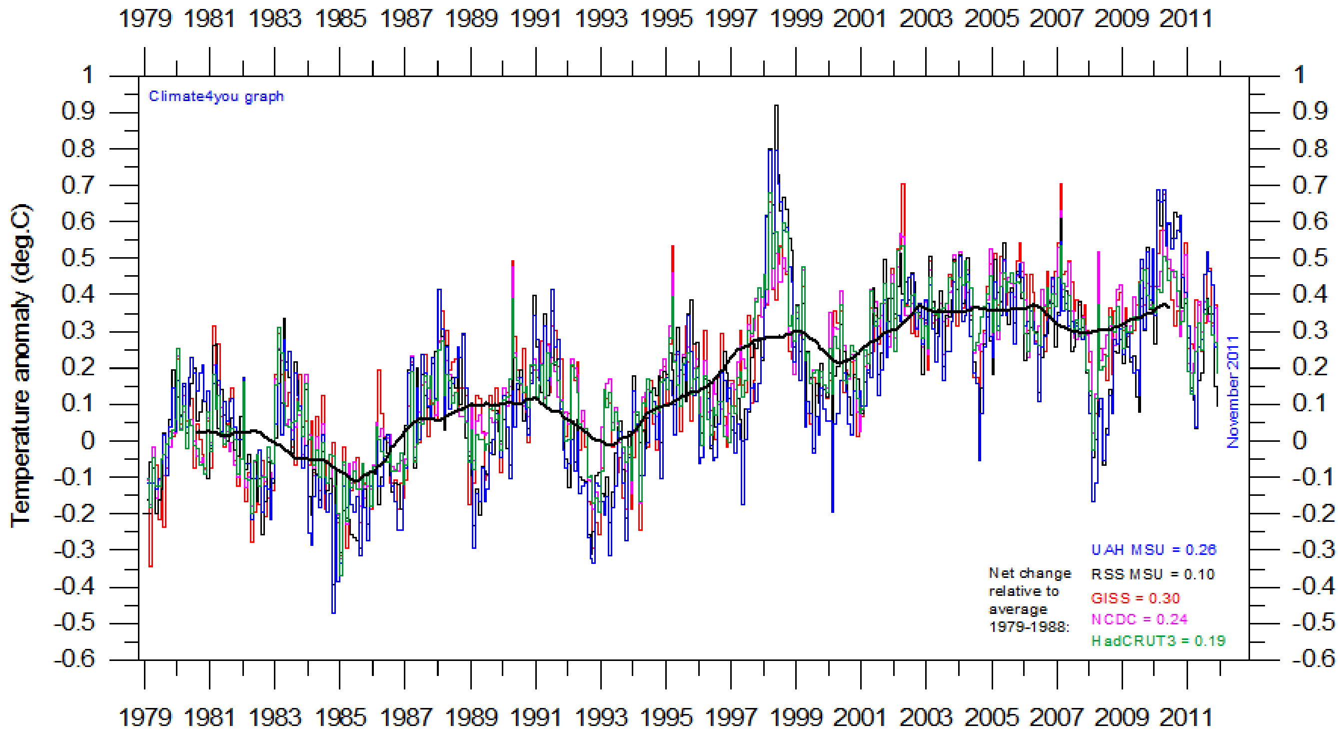
A note on data record stability:

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 additional data being added, but actually for all months back to the very beginning of the records. Presumably this reflects recognition of errors and changes in the averaging procedure followed.

The most stable temperature record over time of the five global records shown above is the HadCRUT3 series.

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

All in one, updated to November 2011

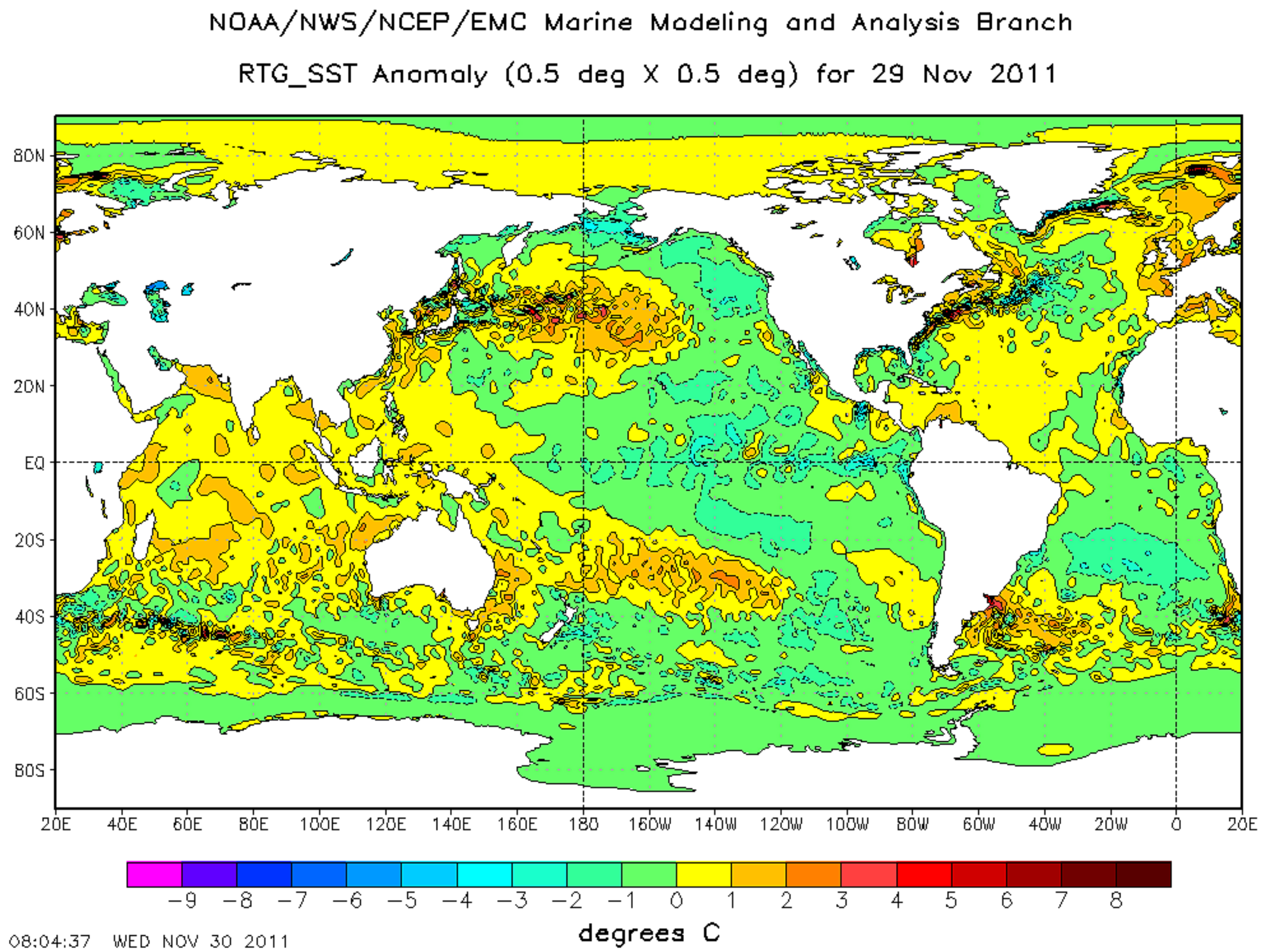


Superimposed plot of all five global monthly temperature estimates shown above. As the base period differs for the different temperature estimates, they have all been normalised by comparing to the average value of their initial 120 months (10 years) from January 1979 to December 1988. The heavy black 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 1979-1988 average.

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 may be considerable differences between the individual records.

All five global temperature estimates presently show 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.

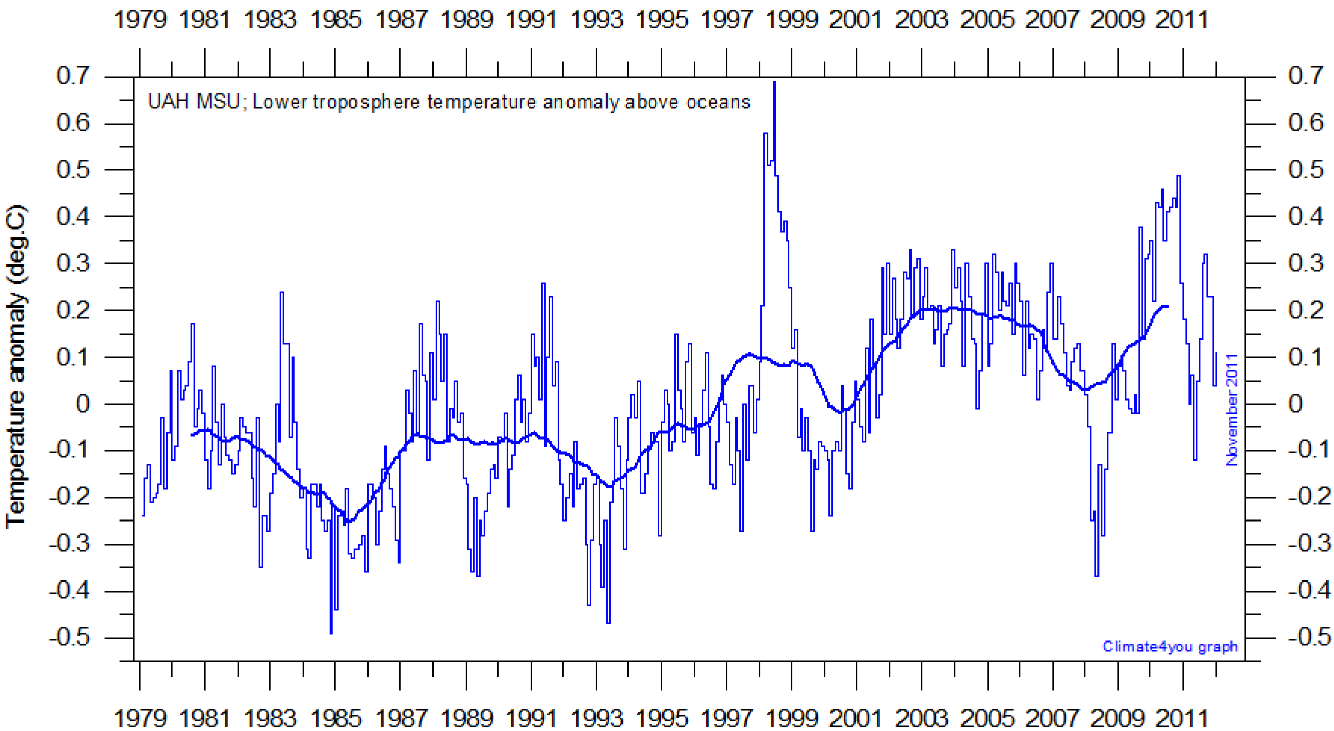
Global sea surface temperature, updated to the end of November 2011



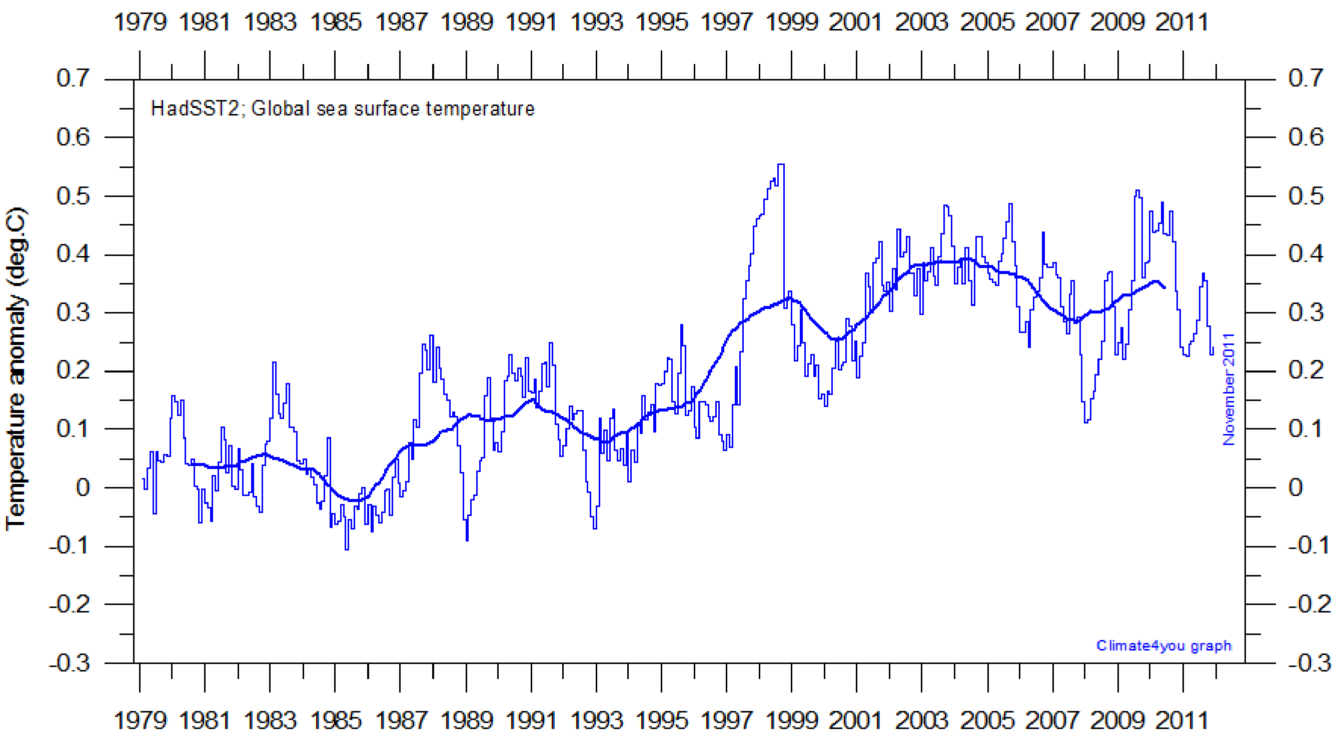
Sea surface temperature anomaly at 29 November 2011. Map source: National Centers for Environmental Prediction (NOAA).

Relative cold surface water dominates the regions near Equator, especially in the eastern Pacific Ocean, and represents remnants of the previous La Niña, fading away in the spring 2011. Apparently a new El Niño is not going to materialise, and surface temperatures are dropping. Because of the large surface areas involved near Equator, the relatively cold surface water in these regions affects the global atmospheric temperature.

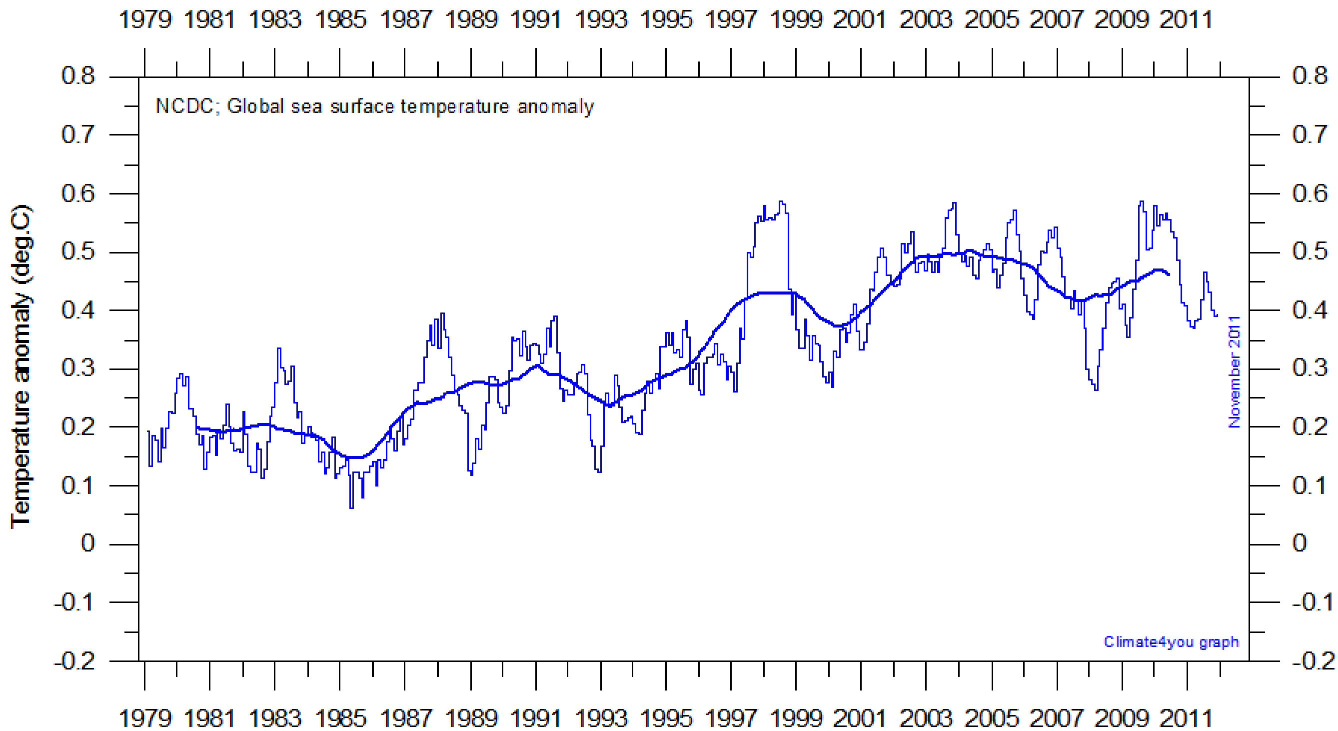
The significance of any warming or cooling seen in surface air temperatures should not be over stated. Whenever Earth experiences cold La Niña or warm El Niño episodes (Pacific Ocean) major heat exchanges takes place between the Pacific Ocean and the atmosphere above, eventually showing up in estimates 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 the above heat exchange mainly reflects a 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.

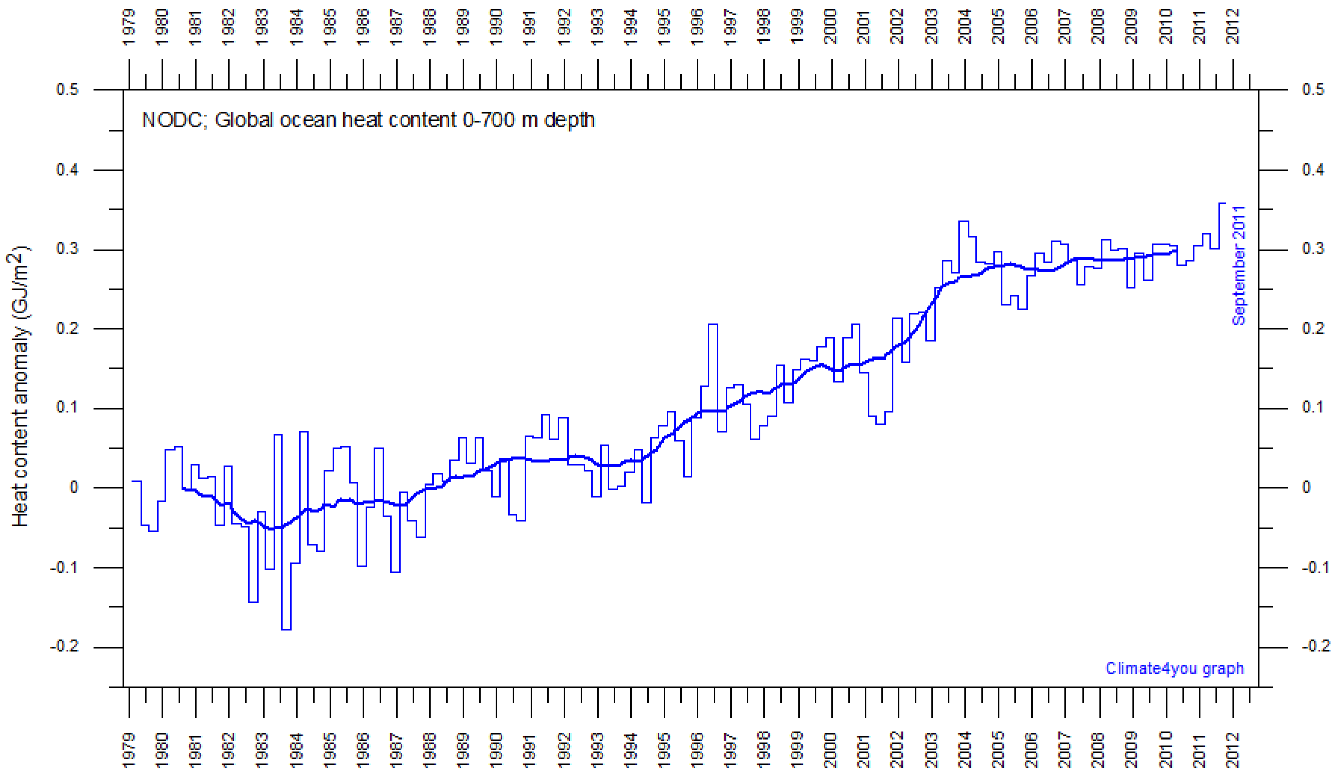


Global monthly average sea surface temperature since 1979 according to University of East Anglia's Climatic Research Unit (CRU), UK. Base period: 1961-1990. The thick line is the simple running 37 month average.

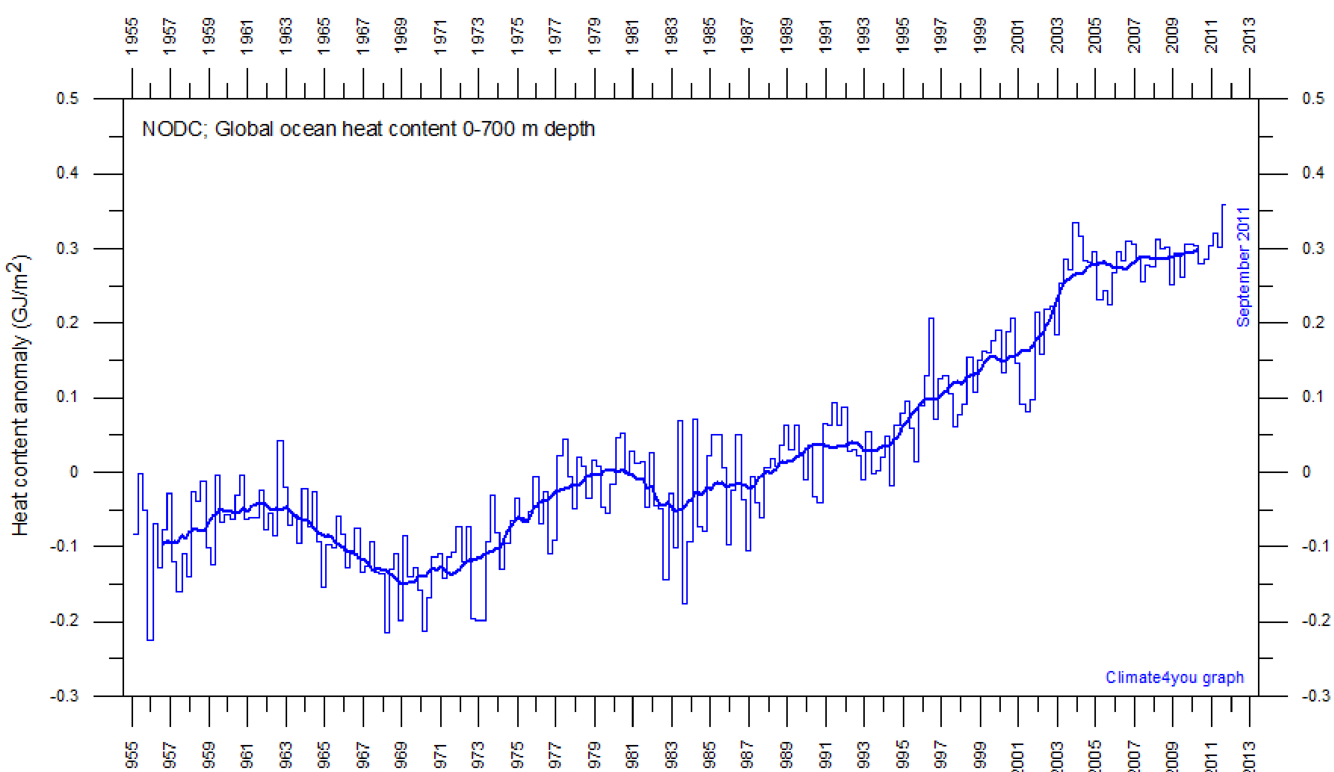


Global monthly average sea surface temperature since 1979 according to the [National Climatic Data Center](#) (NCDC), USA. Base period: 1901-2000. The thick line is the simple running 37 month average.

Global ocean heat content, updated to September 2011

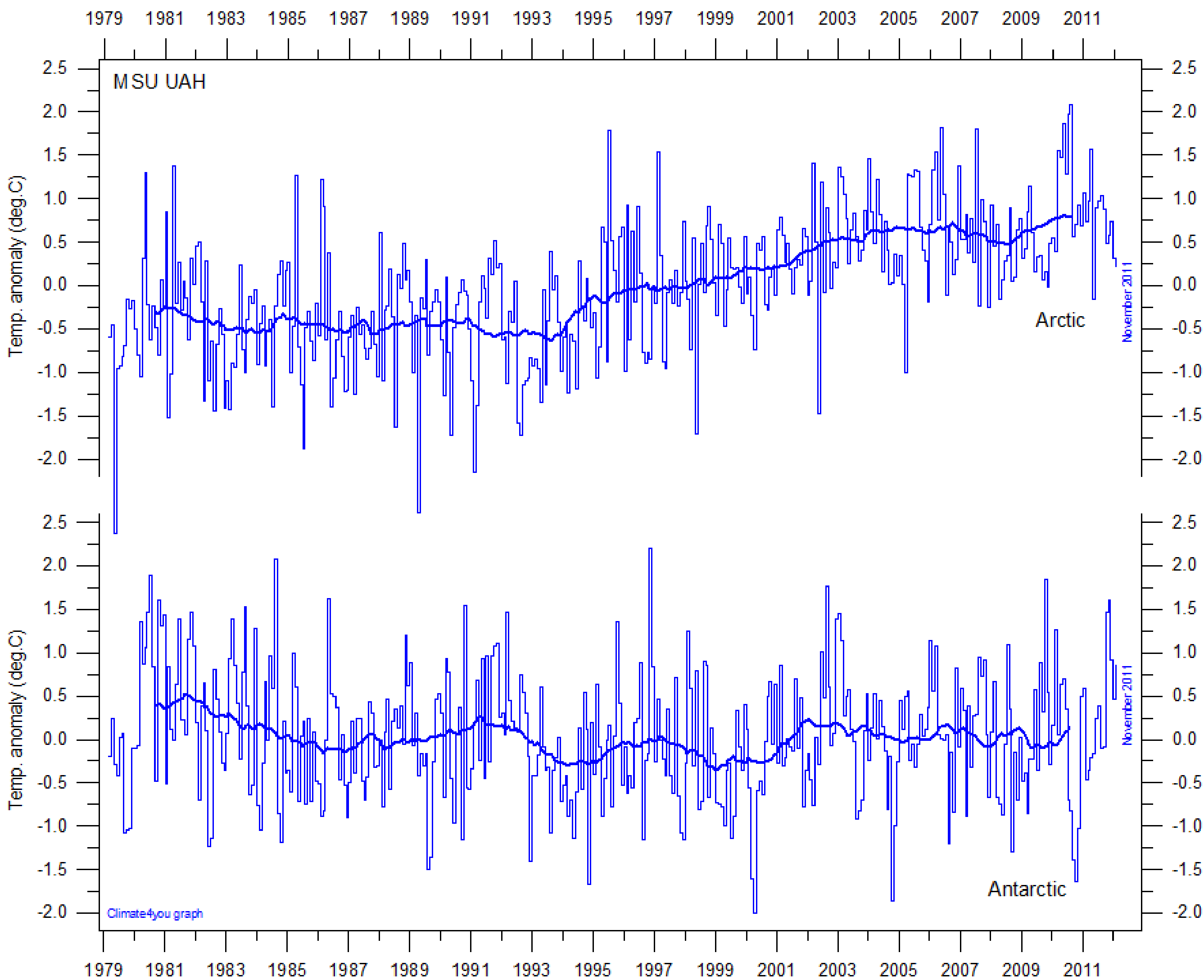


Global monthly heat content anomaly (GJ/m2) in the uppermost 700 m of the oceans since January 1979. Data source: National Oceanographic Data Center(NODC).



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).

Arctic and Antarctic lower troposphere temperature, updated to November 2011



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 October 2011

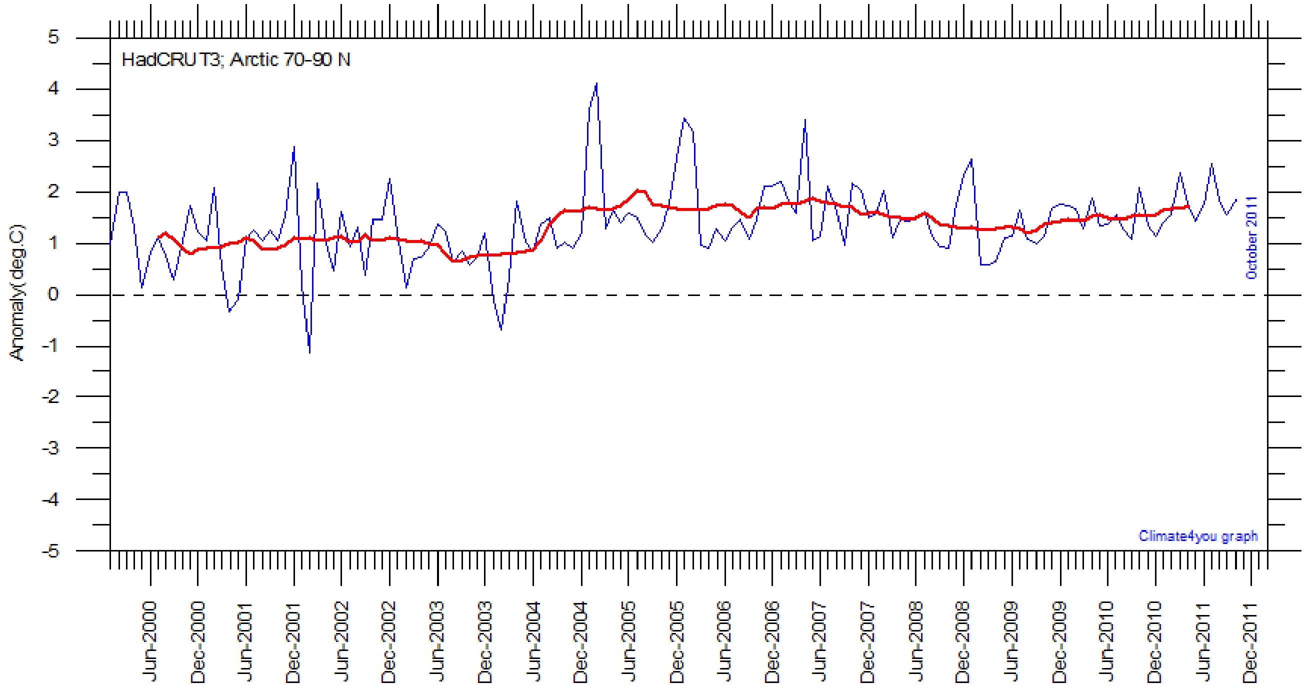


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK.

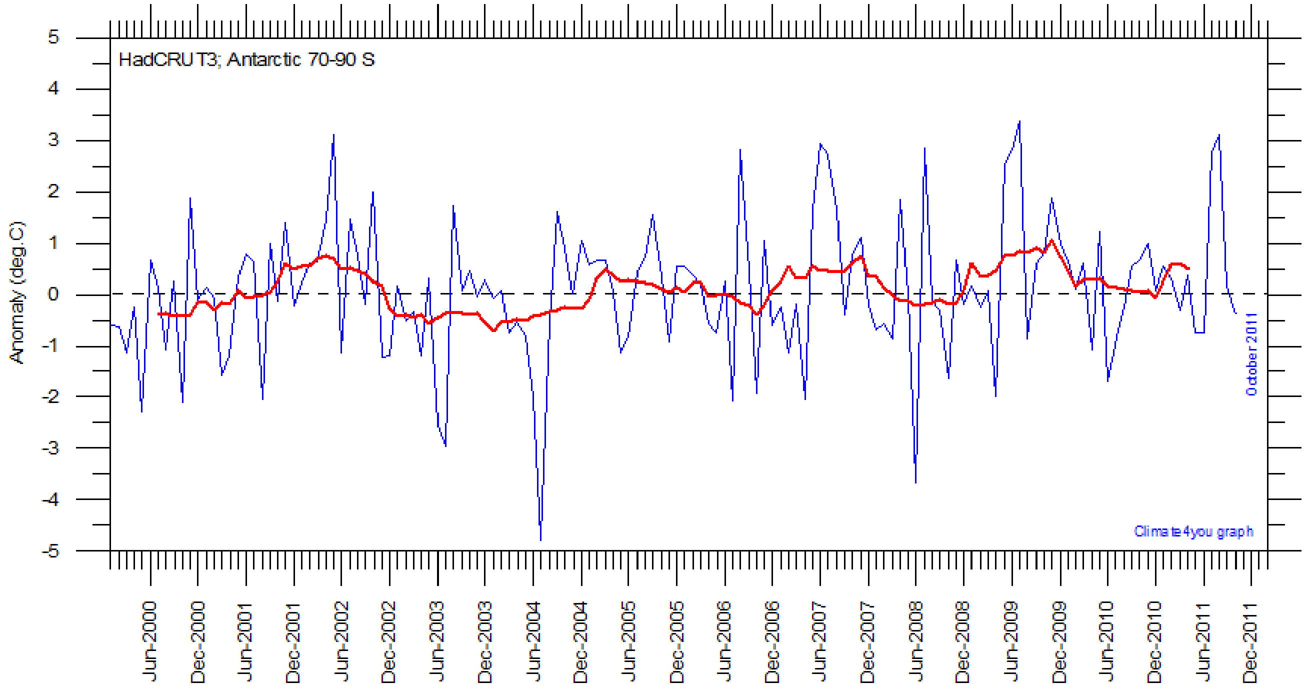


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK.

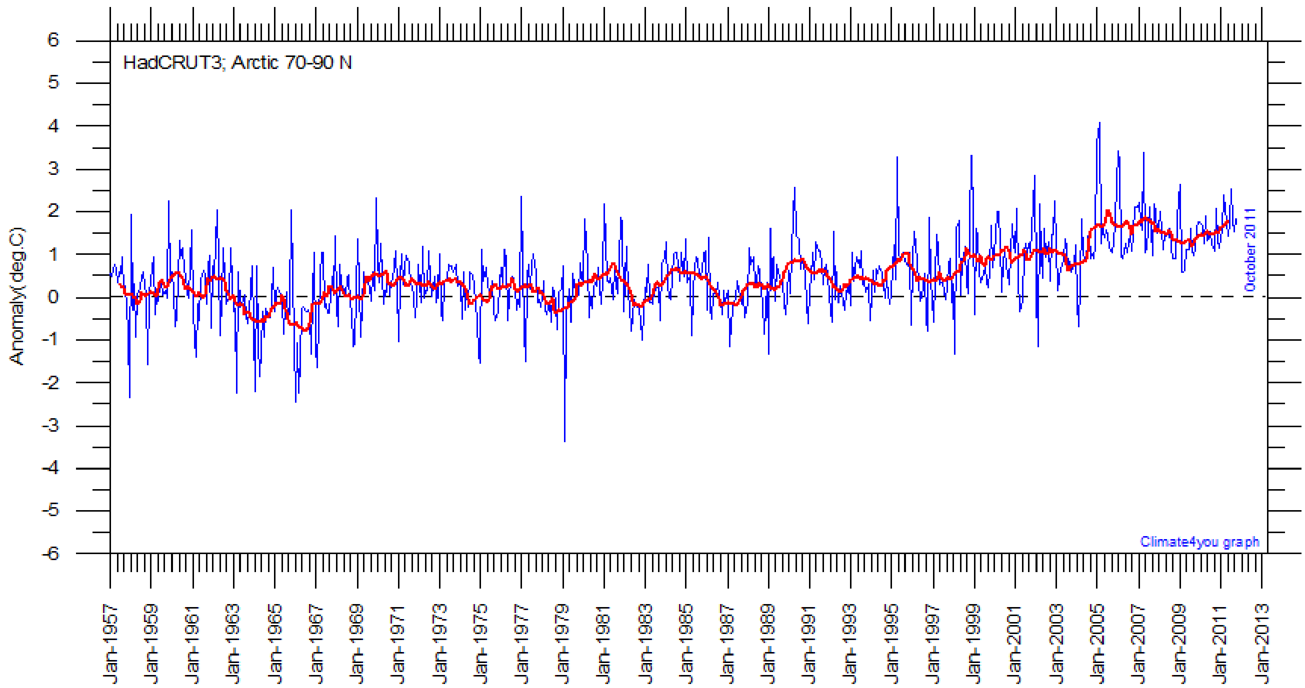


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 has been chosen as starting year, to ensure easy comparison with the maximum length of the realistic Antarctic temperature record shown below. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK.

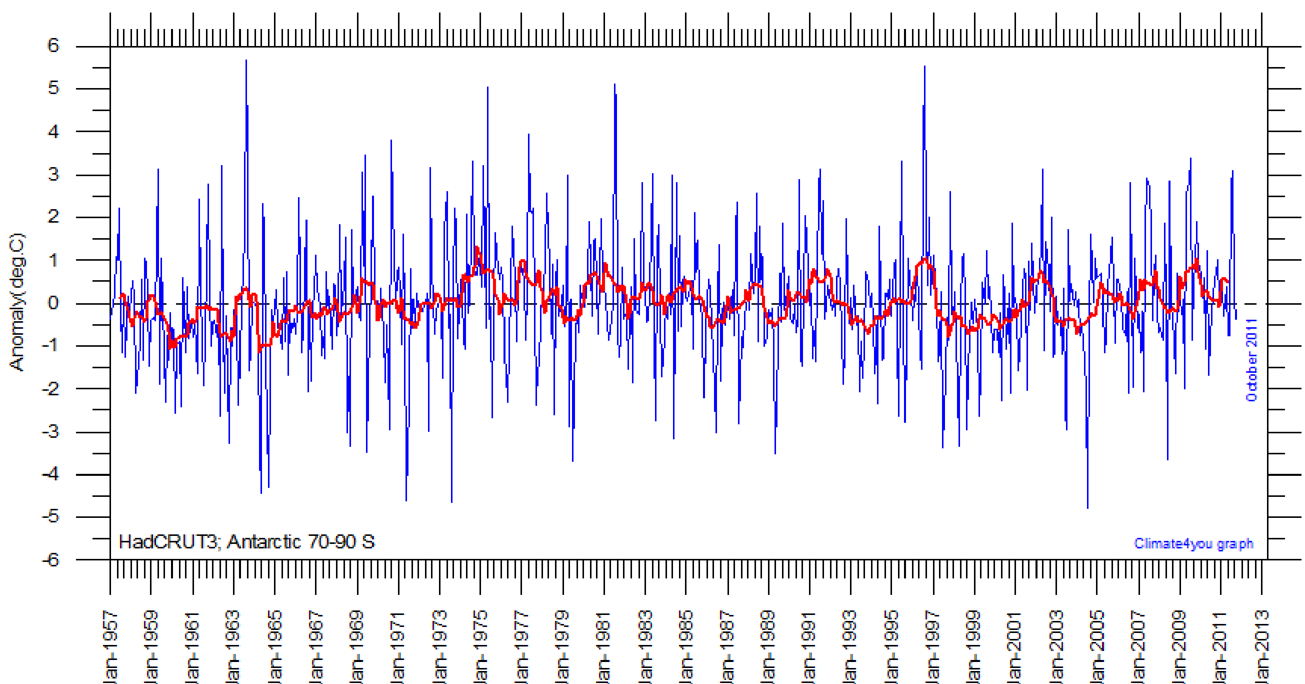


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 was an international geophysical year, and several meteorological stations were established in the Antarctic because of this. Before 1957, the meteorological coverage of the Antarctic continent is poor. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's [Climatic Research Unit](#) ([CRU](#)), UK.

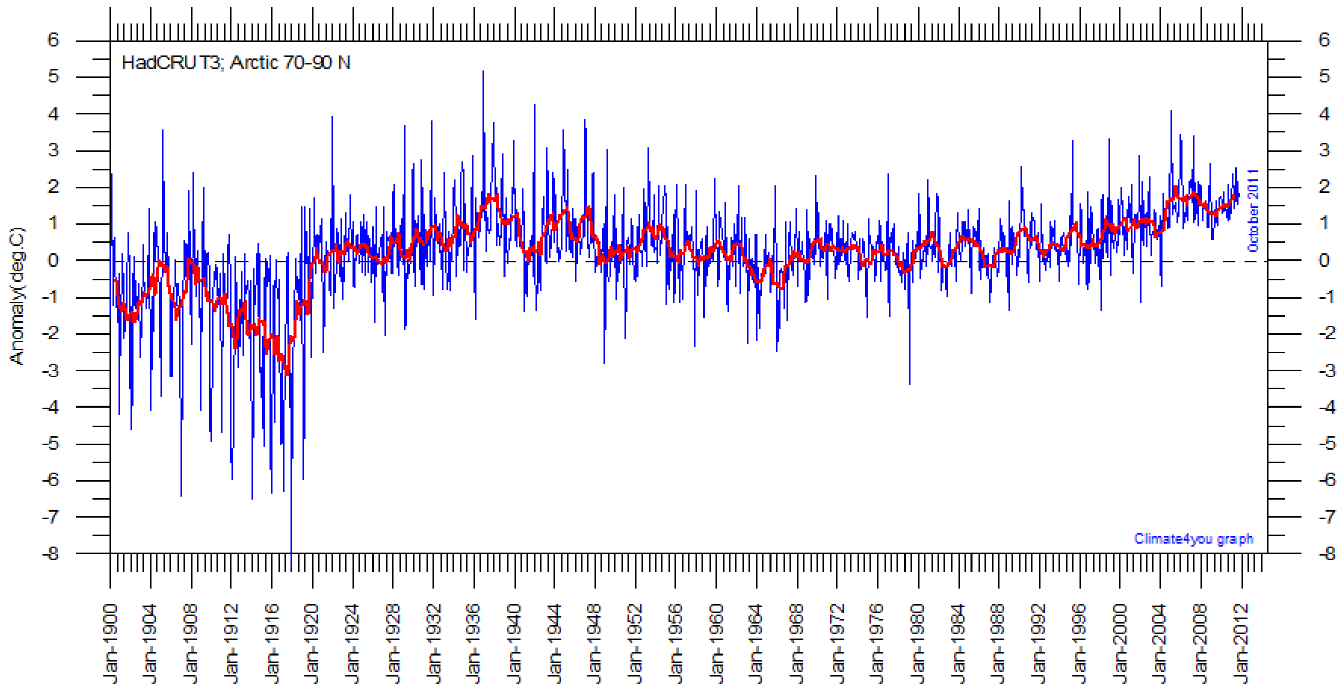


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1900, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. In general, the range of monthly temperature variations decreases throughout the first 30-50 years of the record, reflecting the increasing number of meteorological stations north of 70°N over time. Especially the period from about 1930 saw the establishment of many new Arctic meteorological stations, first in Russia and Siberia, and following the 2nd World War, also in North America. Because of the relatively small number of stations before 1930, details in the early part of the Arctic temperature record should not be over interpreted. The rapid Arctic warming around 1920 is, however, clearly visible, and is also documented by other sources of information. The period since 2000 is warm, about as warm as the period 1930-1940. Data provided by the Hadley Centre for Climate Prediction and Research and the University of East Anglia's Climatic Research Unit (CRU), UK

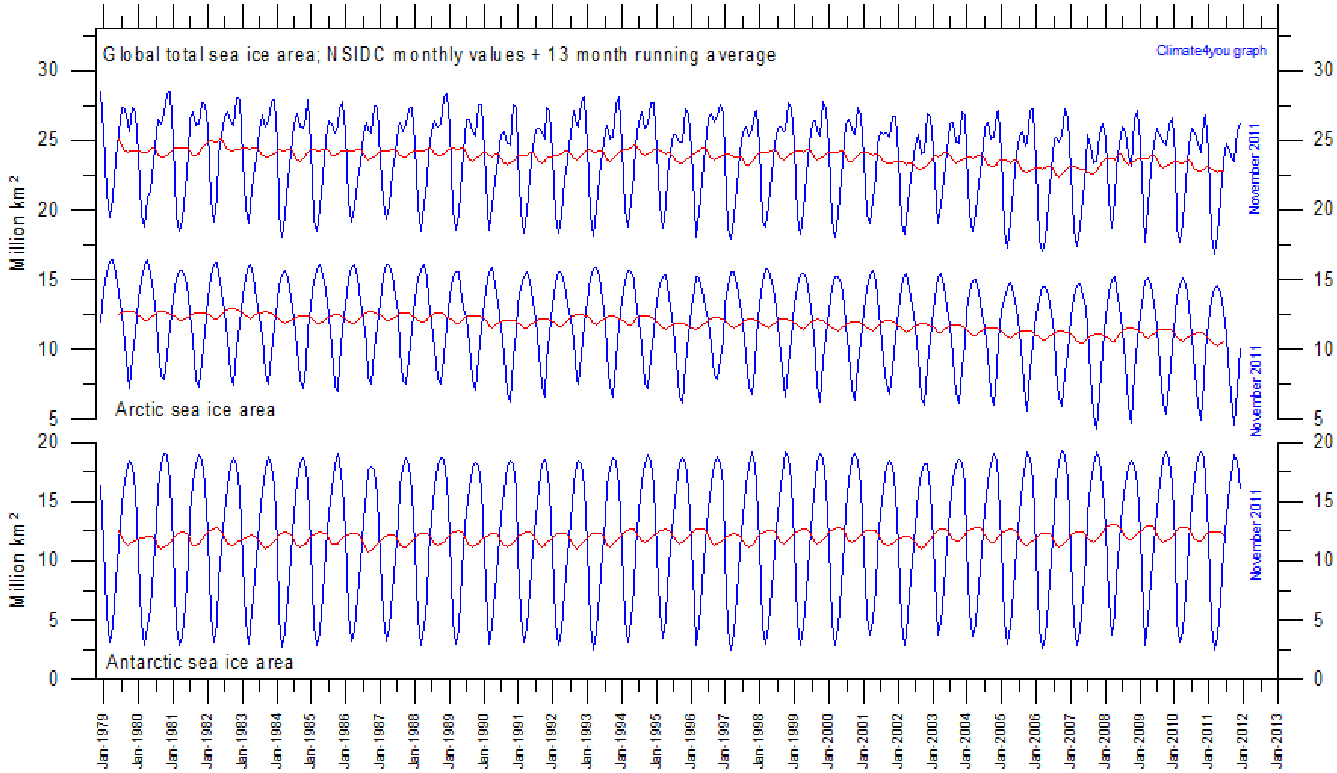
In general, the Arctic temperature record appears to be less variable than the Antarctic record, presumably at least partly due to the higher number of meteorological stations north of 70°N, compared to the number of stations south of 70°S.

As data coverage is sparse in the Polar Regions, the procedure of Gillet et al. 2008 has been followed, giving equal weight to data in each 5°x5° grid cell when calculating means, with no weighting by the surface areas of the individual grid dells.

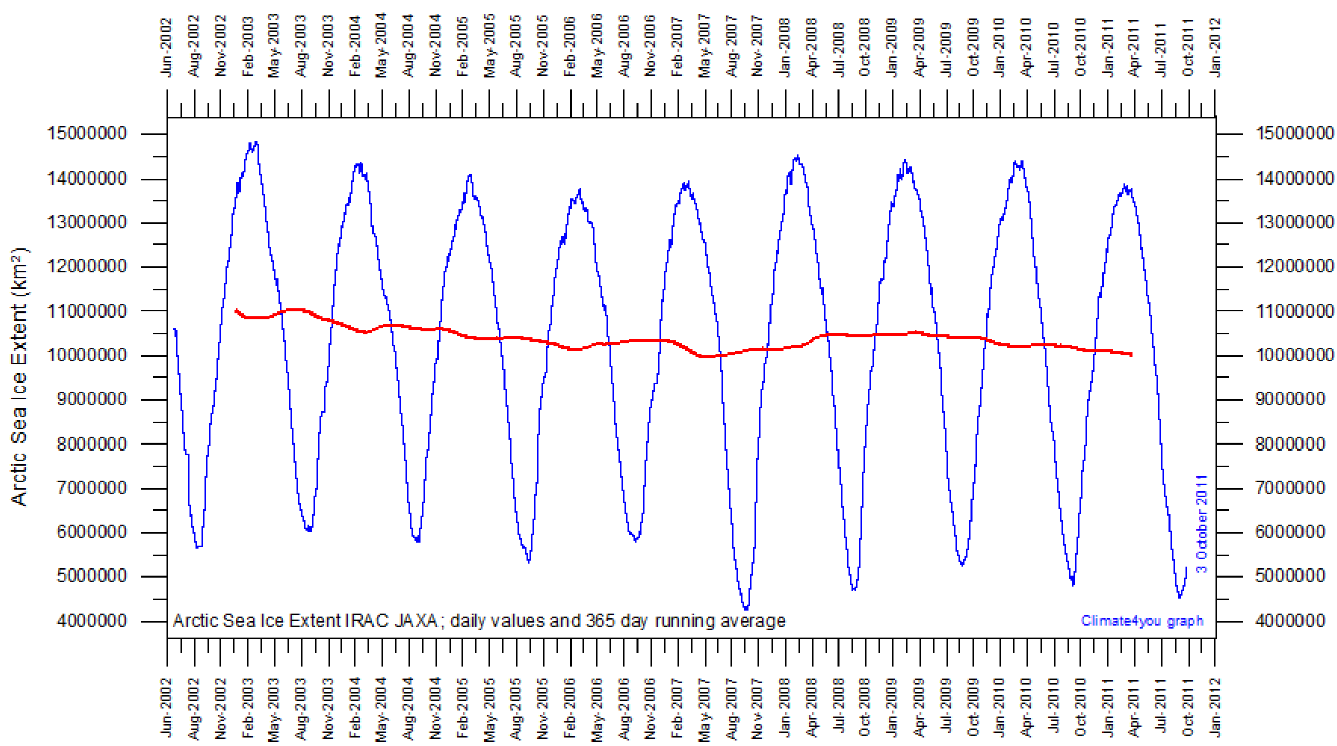
Literature:

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.

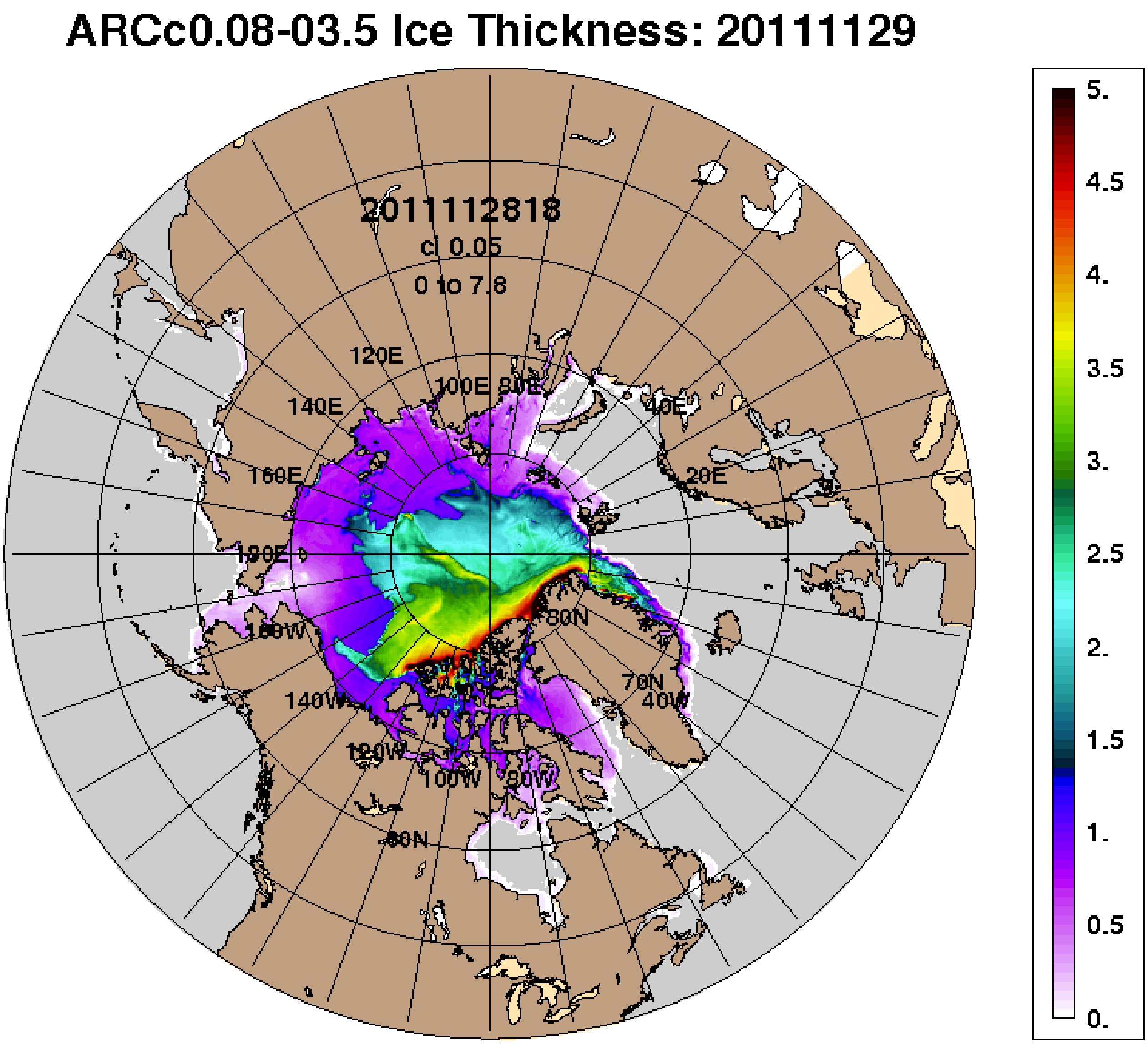
[Arctic and Antarctic sea ice, updated to November 2011](#)



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

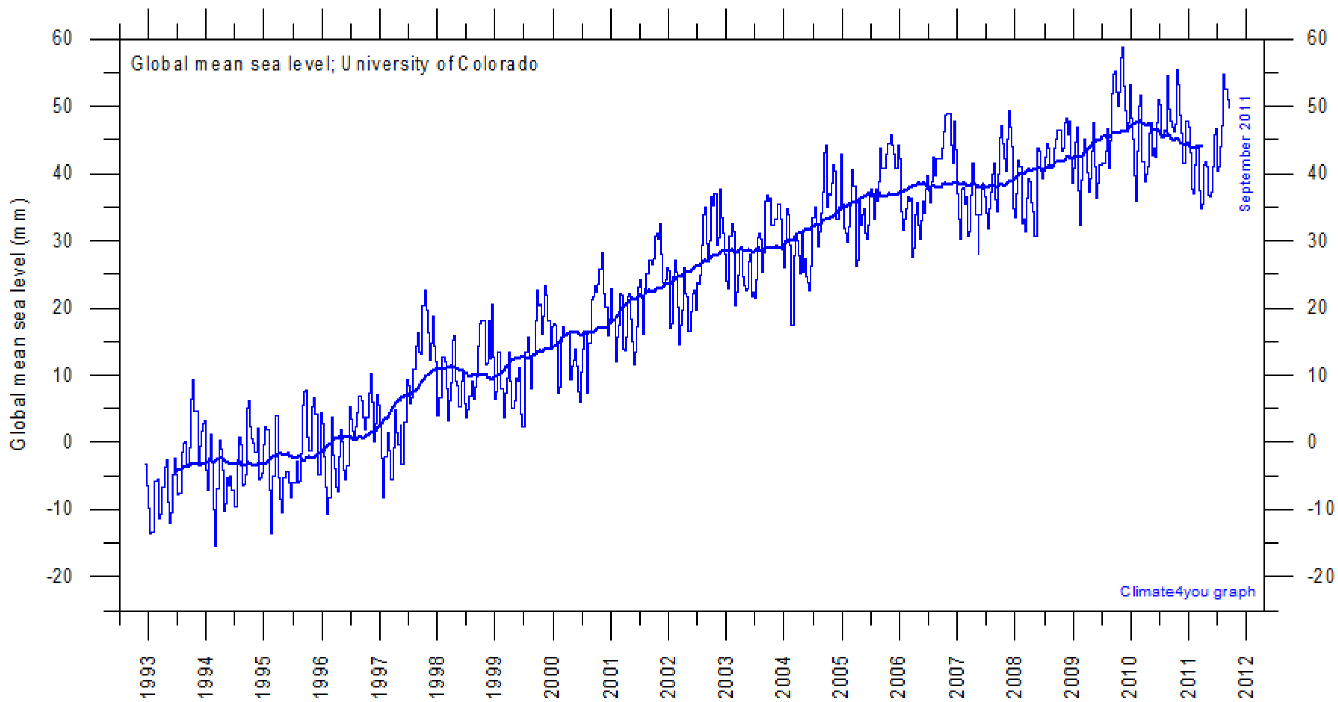


Graph showing daily Arctic sea ice extent since June 2002, to October 3, 2011, by courtesy of [Japan Aerospace Exploration Agency](#) (JAXA). Please note that this diagram is not updated beyond 3 October 2011 due to the suspension of AMSR-E observation.

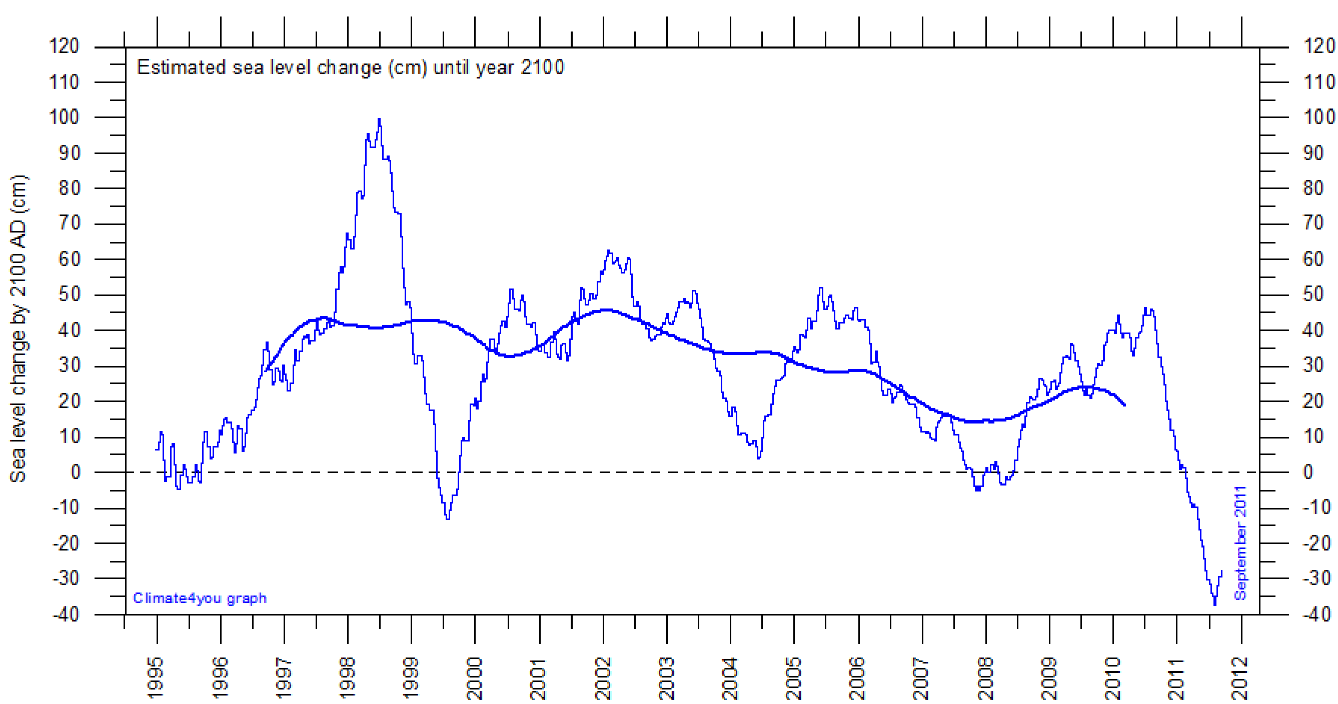


Northern hemisphere sea ice thickness on 29 November 2011 according to the [Arctic Cap Nowcast/Forecast System](#) (ACNFS), US Naval Research Laboratory. Thickness scale (m) is shown to the right.

Global sea level, updated to September 2011

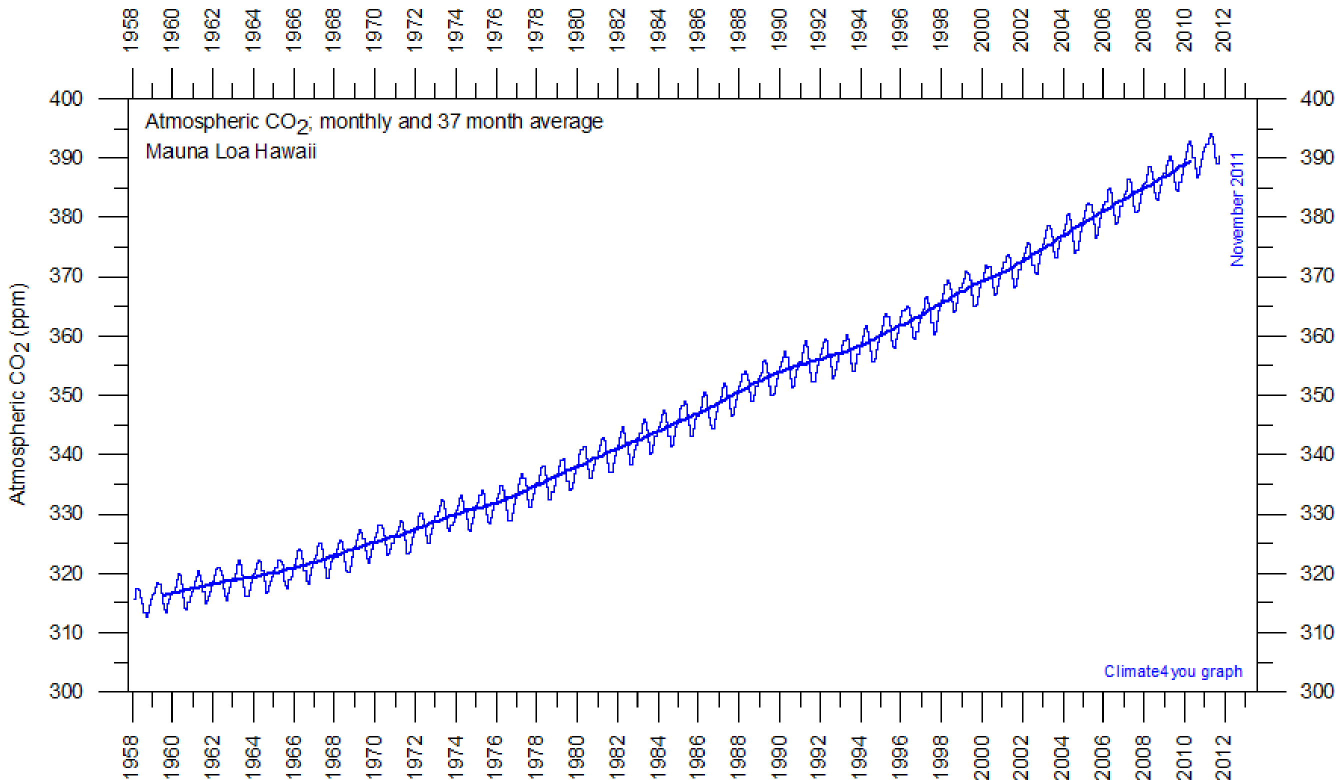


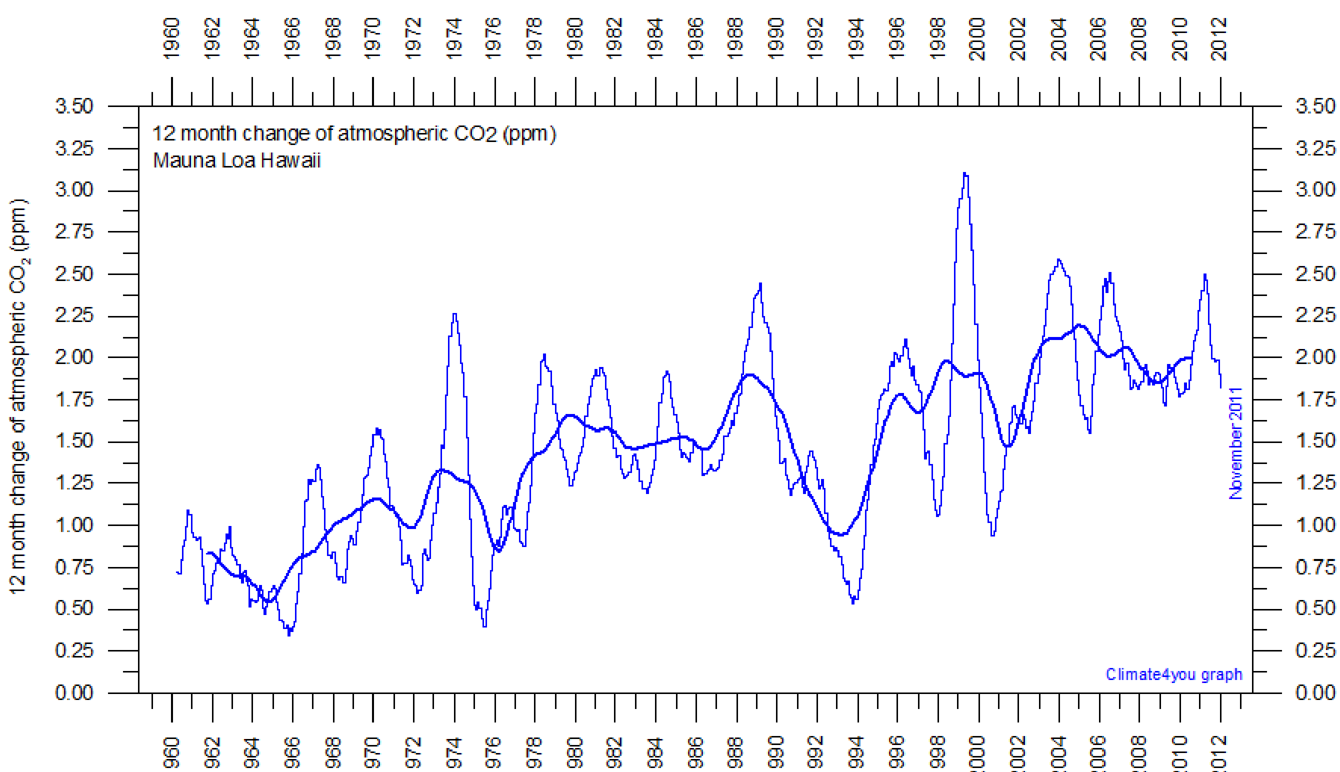
Globa lmonthly sea level since late 1992 according to the Colorado Center for Astrodynamics Research at [University of Colorado at Boulder](), USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.



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 empirical forecast of sea level change until 2100 is about +20 cm.

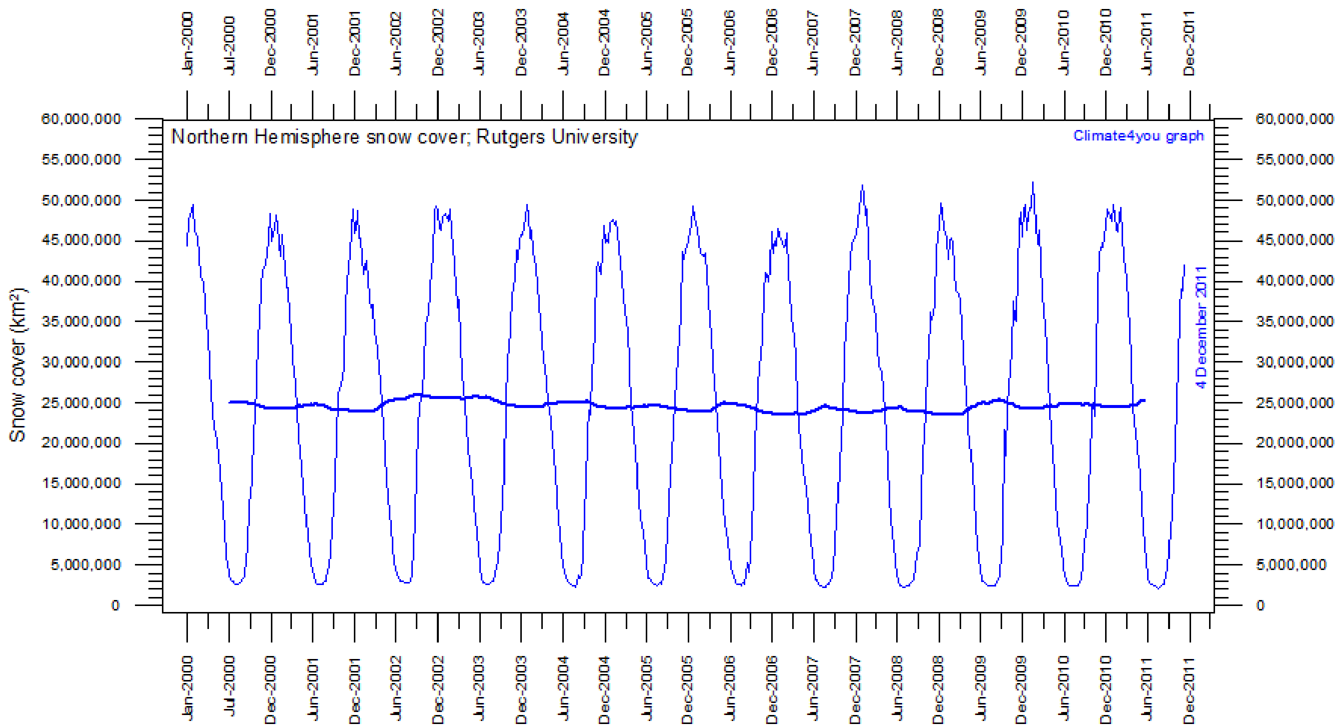
Atmospheric CO_2, updated to November 2011



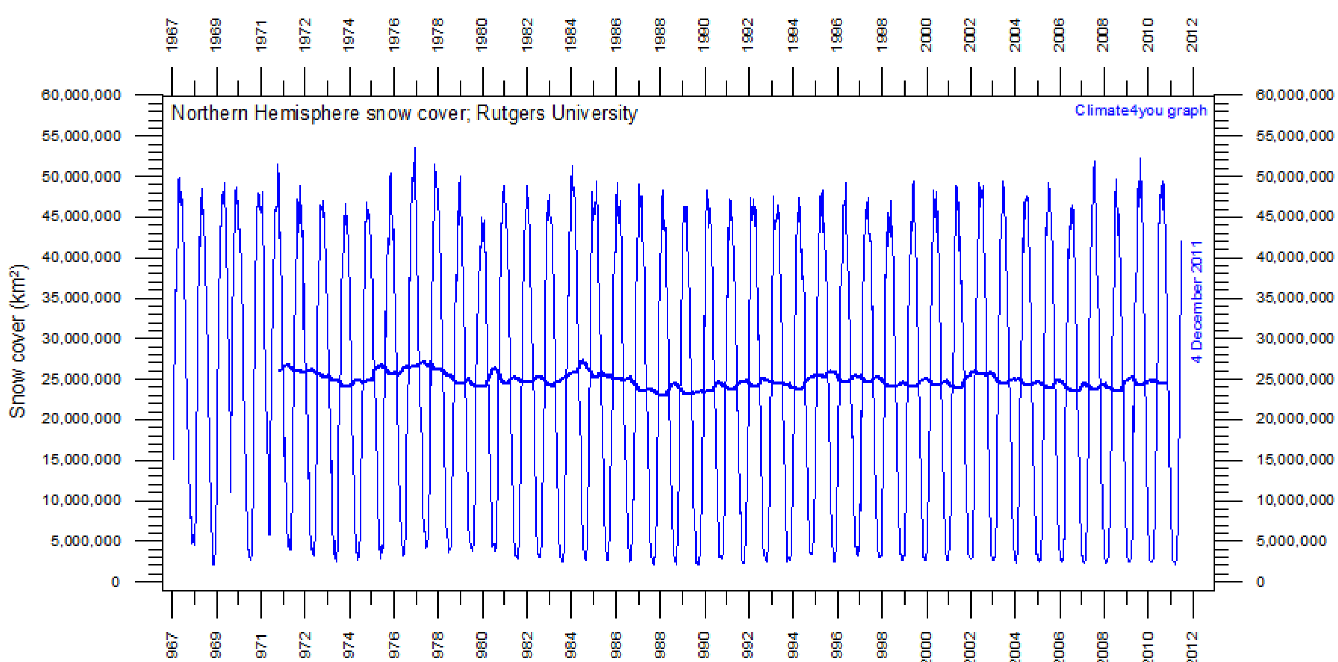


Monthly amount of atmospheric CO_2 (above) and annual growth rate (below; average last 12 months minus average preceding 12 months) of atmospheric CO_2 since 1959, according to data provided by the Mauna Loa Observatory, Hawaii, USA. The thick line is the simple running 37 observation average, nearly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

Northern Hemisphere weekly snow cover, updated to early December 2011

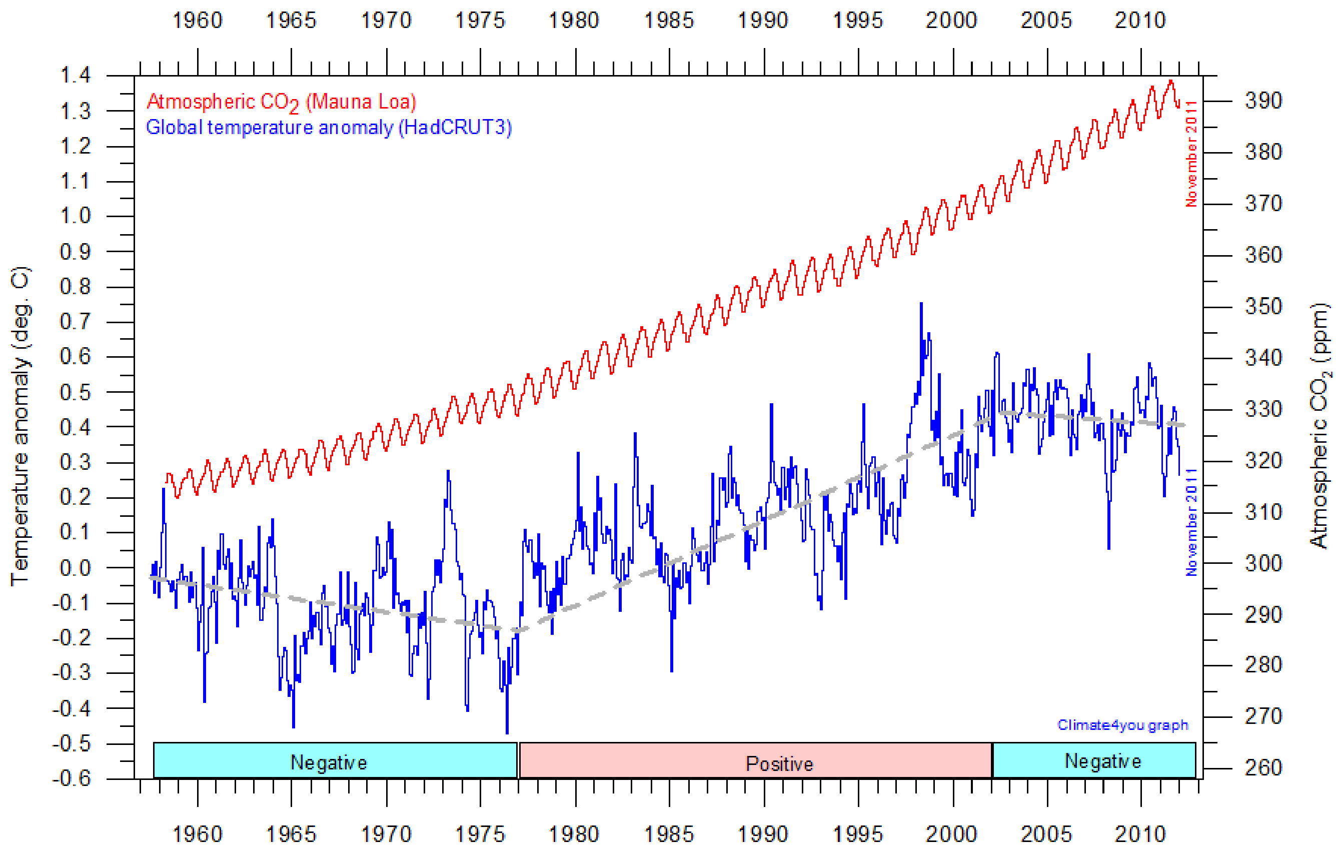


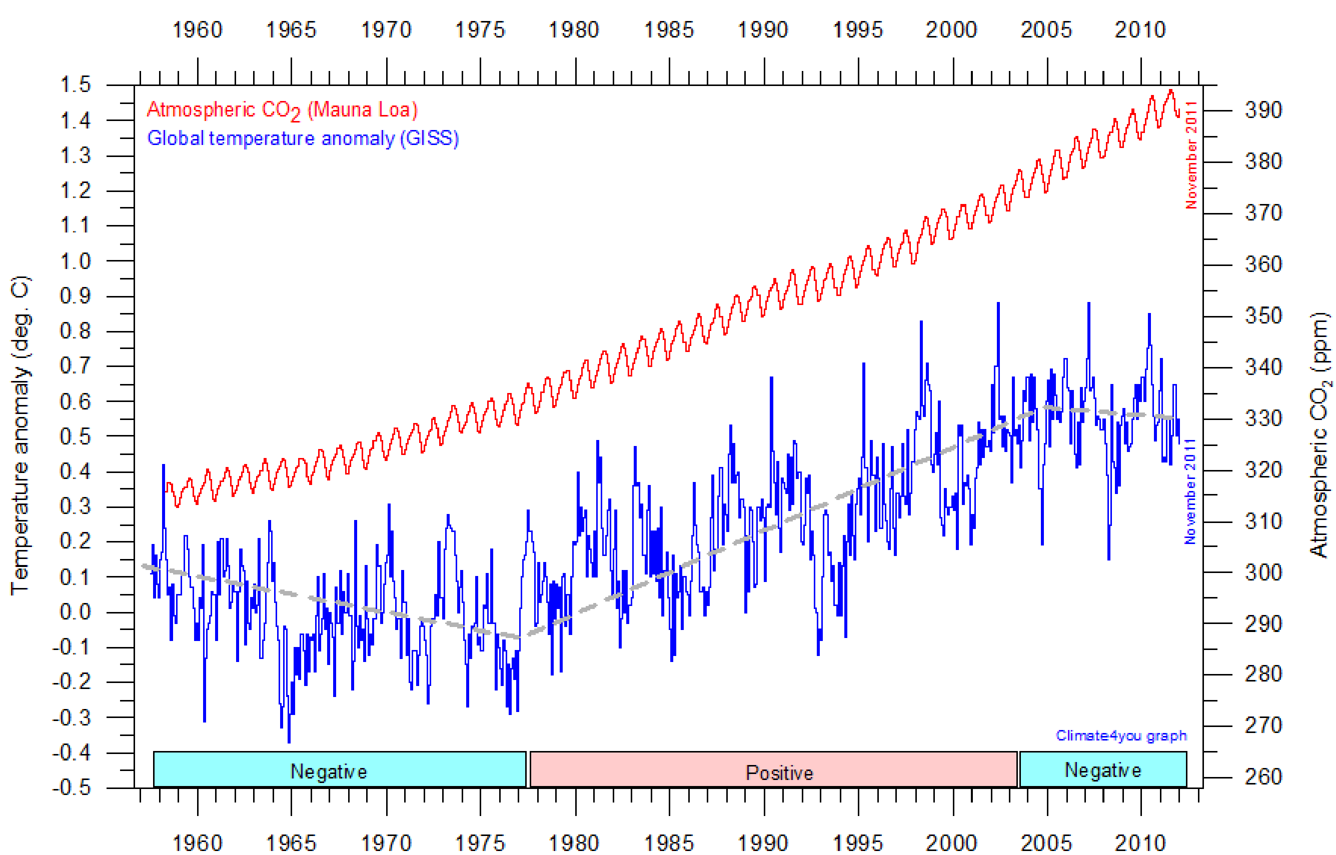
Northern hemisphere weekly snow cover since January 2000 according to Rutgers University Global Snow Laboratory. The thin line is the weekly data, and the thick line is the running 53 week average (approximately 1 year).

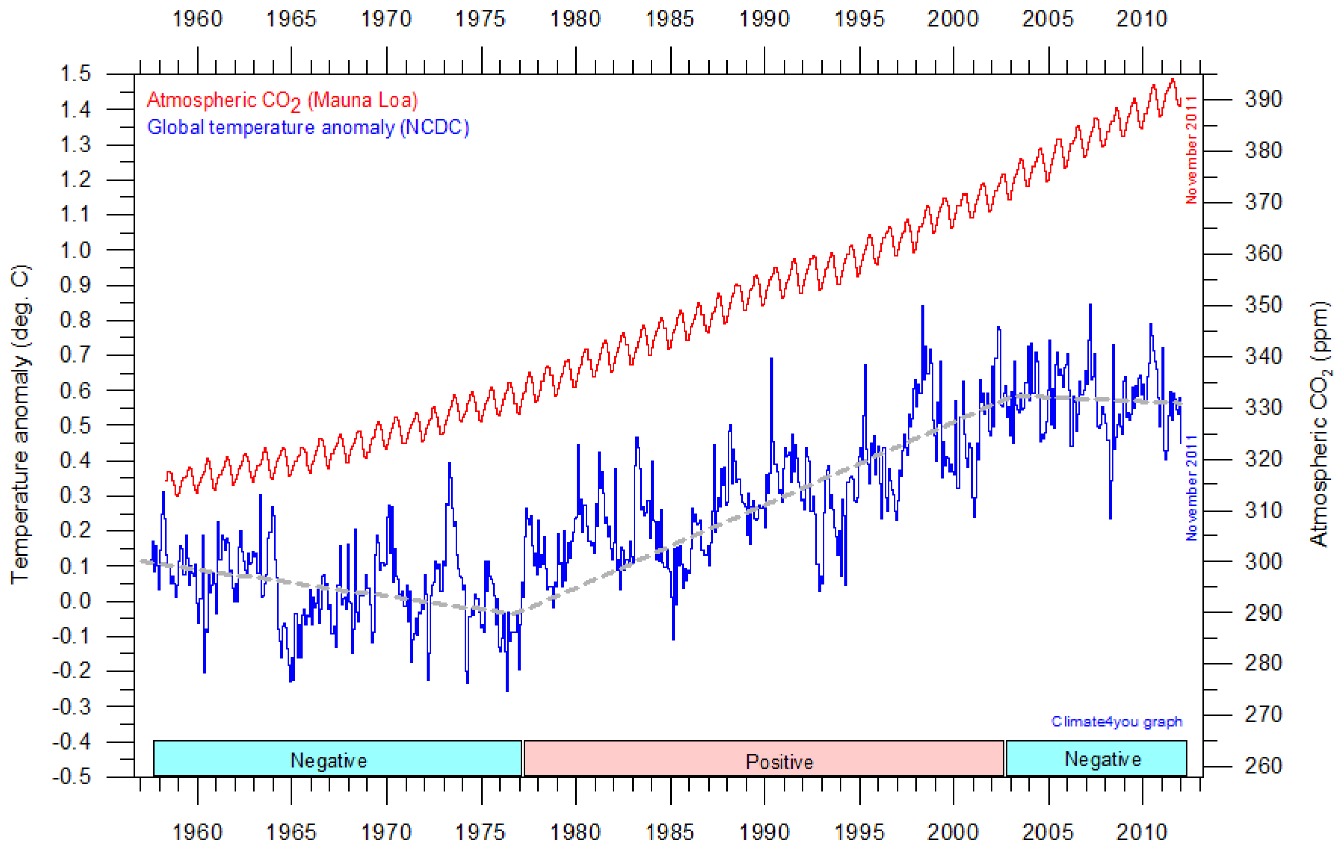


Northern hemisphere weekly snow cover since October 1966 according to Rutgers University Global Snow Laboratory. The thin line is the weekly data, and the thick line is the running 53 week average (approximately 1 year). The running average is not calculated before 1971 because of some data irregularities in this early period.

Global surface air temperature and atmospheric CO_2, updated to November 2011







Diagrams showing HadCRUT3, GISS, and NCDC monthly global surface air temperature estimates (blue) and the monthly atmospheric CO_2 content (red) according to the [Mauna Loa Observatory](), Hawaii. The Mauna Loa data series begins in March 1958, and 1958 has therefore been chosen as starting year for the diagrams. Reconstructions of past atmospheric CO_2 concentrations (before 1958) are not incorporated in this diagram, as such past CO_2 values are derived by other means (ice cores, stomata, or older measurements using different methodology, and therefore are not directly comparable with modern atmospheric measurements. The dotted grey line indicates the approximate linear temperature trend, and the boxes in the lower part of the diagram indicate the relation between atmospheric CO_2 and global surface air temperature, negative or positive.

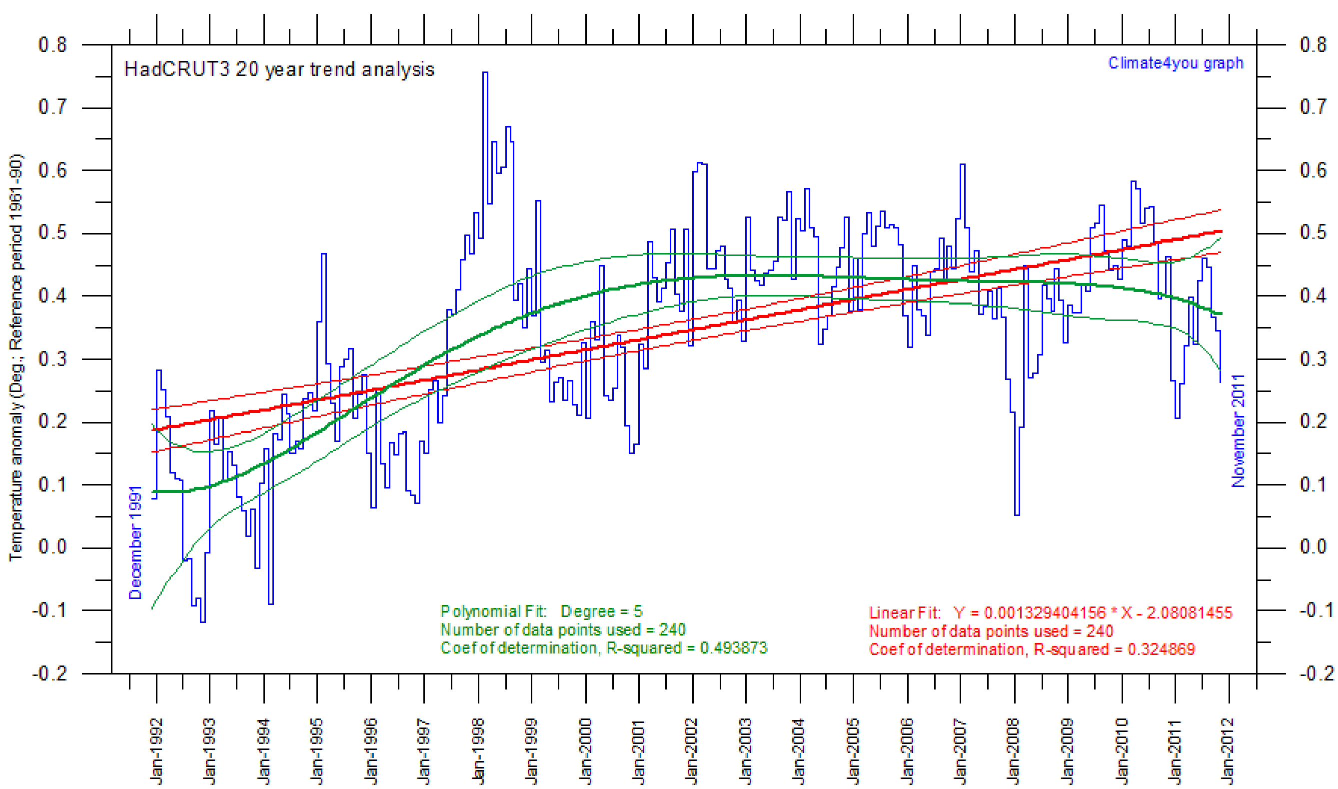
Most climate models assume the greenhouse gas carbon dioxide CO_2 to influence significantly upon global temperature. Thus, it is relevant to compare the different global temperature records with measurements of atmospheric CO_2, as shown in the diagrams above. Any comparison, however, should not be made on a monthly or annual basis, but for a longer time period, as other effects (oceanographic, clouds, volcanic, 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. However, the length of the critical period must be inversely proportional to the importance of CO_2 on the global temperature, including possible feedback effects. So if the net effect of CO_2 is strong, the length of the critical period is short, and vice versa.

After about 10 years of global temperature increase following global cooling 1940-1978, IPCC was established in 1988. Presumably, several scientists interested in climate in 1988 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, political and public support for the CO_2-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.

[Last 20 year surface temperature changes, updated to November 2011]



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. Last month included in analysis: November 2011.

From time to time it is debated if the global surface temperature is increasing, or if the temperature has leveled out during the last 10-15 years. The above diagram may be useful in this context. If nothing else, it demonstrates the differences between two different statistical approaches to determine recent temperature trends.

200-0 BC: European Science and Meteorology in the balance: Alexandria and Rome


The Royal Library of Alexandria, or Ancient Library of Alexandria, in Alexandria, Egypt, was probably the largest, and certainly the most famous, of the libraries of the ancient world. It flourished under the patronage of the Ptolemaic dynasty, and functioned as a major centre of scholarship, at least until the time of Rome's conquest of Egypt, and probably for many centuries thereafter.

Around 200 BC the Greek centre of science has more or less ceased to exist, and most of the previous scientific activity had moved away from Europe to Alexandria in the Nile delta. Alexandria was founded around a small pharaonic town c. 331 BC by Alexander the Great. Within a century, Alexandria had become the largest city in the world and, for some centuries more, was second only to Rome. It became Egypt's main Greek city, with Greek people from diverse backgrounds. It remained Egypt's capital for nearly a thousand years, until the Muslim conquest of Egypt in AD 641. Much of the summary below is adopted from different sources in Wikepedia and from Rasmussen 2010, from where additional information is available.

The Royal Library of Alexandria, or Ancient Library of Alexandria, was the largest and most significant library of the ancient world. It flourished under the patronage of the Ptolemaic dynasty and functioned as a major centre of scholarship from its construction in the 3rd century BC until the Roman conquest of Egypt in 30 BC. Apparently the library was initially organized by Demetrius of Phaleron, a student of Aristotle, under the reign of Ptolemy Soter (ca.367 BC—ca.283 BC). The library had about 500,000 books in its collections and also comprised gardens, a room for shared dining, a reading room, lecture halls and meeting rooms. The influence of this model may still be seen today in the layout of many university campuses. The library itself is known to have had an acquisitions department, and a cataloguing department. A hall contained shelves for the collections of scrolls (books were at this time on papyrus scrolls), known as bibliothekai. Legend has it that carved into the wall above the shelves was an inscription that read: *The place of the cure of the soul*.

The first known library of its kind to gather a serious collection of books from beyond its country's borders, the Library at Alexandria was charged with collecting the entire world's knowledge. It did so through an aggressive and well-funded royal mandate involving trips to the book fairs of Rhodes and Athens, supplemented by a policy of pulling the books off every ship that came into port. They kept the original texts and made copies to send back to their owners.

Other than collecting works from the past, the library was also home to a host of international scholars, well-patronized by the Ptolemaic dynasty with travel, lodging and stipends for their whole families. As a research institution, the library filled its stacks with new works in mathematics, astronomy, physics, natural sciences and other subjects. In this way much of the knowledge acquired and formulated by Aristotle and his students were kept alive after the golden period of science had ceased in Greece, and for a period, Alexandria became the new scientific center in the Mediterranean area. Part of the reason for the golden period of science coming to an end in Greece was the growing power of the Roman Republic and later the Roman Empire, spreading throughout the Mediterranean.

The Roman Republic was the period of the ancient Roman civilization where the government operated as a republic. It began with the overthrow of the Roman monarchy around 508 BC, and its replacement by a government headed by two consuls, elected annually by the citizens and advised by a senate. A complex constitution gradually developed, centered on the principles of a separation of powers and checks and balances. Except in times of dire national emergency, public offices were limited to one year, so in theory at least, no single individual could dominate his fellow-citizens.

The Roman Republic was gradually weakened through several civil wars, and several events are commonly proposed to mark the transition from Republic to Empire, including Julius Caesar's appointment as perpetual dictator (44 BC) and the Battle of Actium (2 September 31 BC).

Roman expansion began in the days of the Republic, but the Empire reached its greatest extent under Emperor Trajan: during his reign (98 to 117 AD) the Roman Empire controlled approximately 6.5 million km^2 of land surface. Because of the Empire's vast extent and long endurance, the institutions and culture of Rome had a profound and lasting influence on the development of language, religion, architecture, philosophy, law, and forms of government in the territory it governed, particularly Europe, and by means of European expansionism throughout the modern world.

Both the Roman Republic and the Roman Empire, however, had little interest in science. Scientific knowledge was only regarded as relevant from an applied point of view, and basic research was neither interesting nor encouraged by the society. This is why the Library at Alexandria for some time developed into a safe haven for much of the knowledge, including meteorological, which has been developed by Aristotle and his students in Greece during the golden period.

At the same time, Christianity was increasing its influence rapidly in Europe, and the Greek scientific knowledge was increasingly considered as an expression of old paganism, and for that reason something which should be subjected to suppression and ban. As the political influence of Christianity grew in Europe and across the entire Mediterranean region, it became more and more difficult for the Library at Alexandria to carry on as previously. Eventually, many of the scientists associated with the Library were exposed to persecution. Many therefore had to leave Alexandria and moved to Damascus, into the growing Arab Caliphate, where science and scientists were welcomed. So once again, the scientific tradition and knowledge established by Aristotle and his students had to evacuate to a new safe haven outside Europe, in order to survive.

References:

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

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