Climate4you update October 2009

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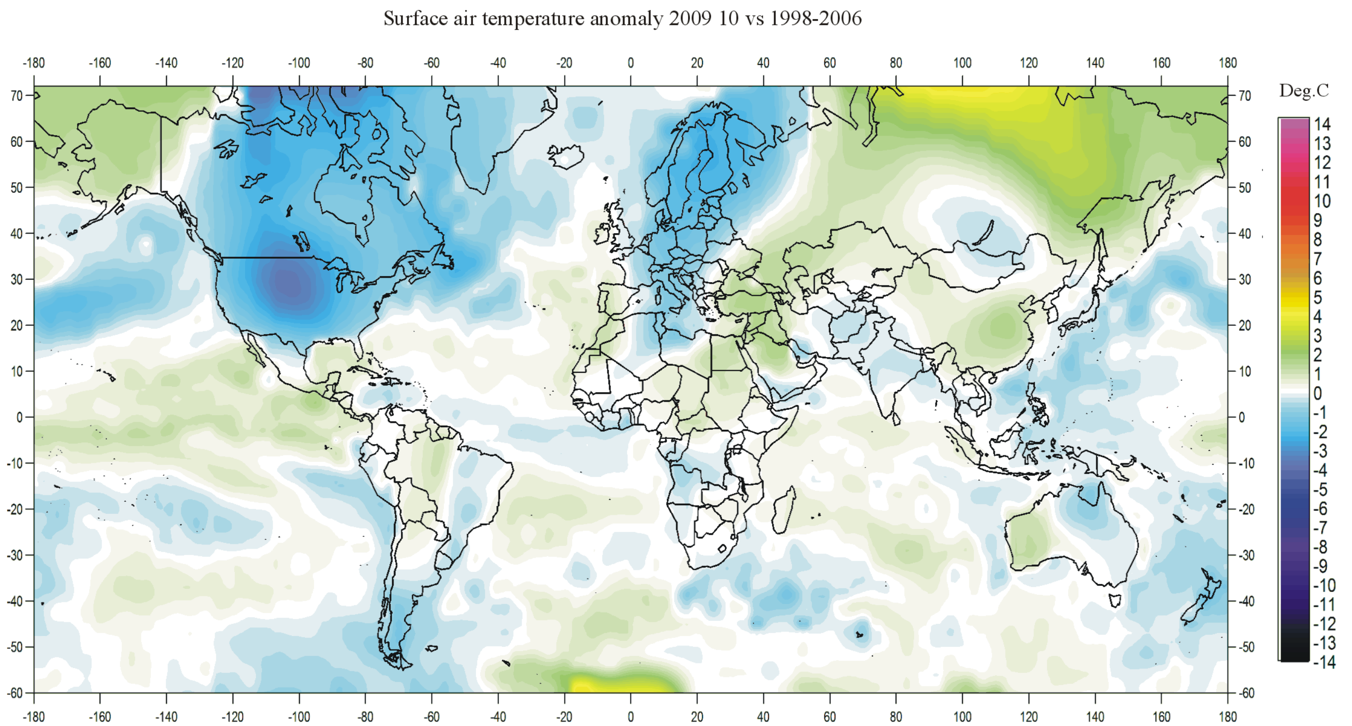
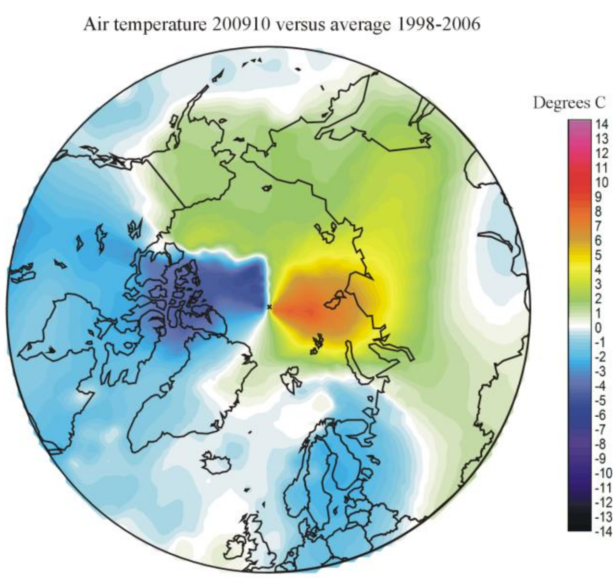
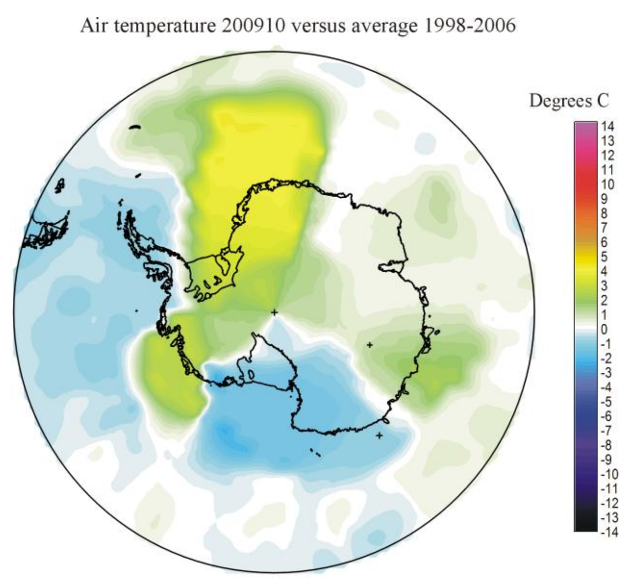
October 2009 global surface air temperature overview

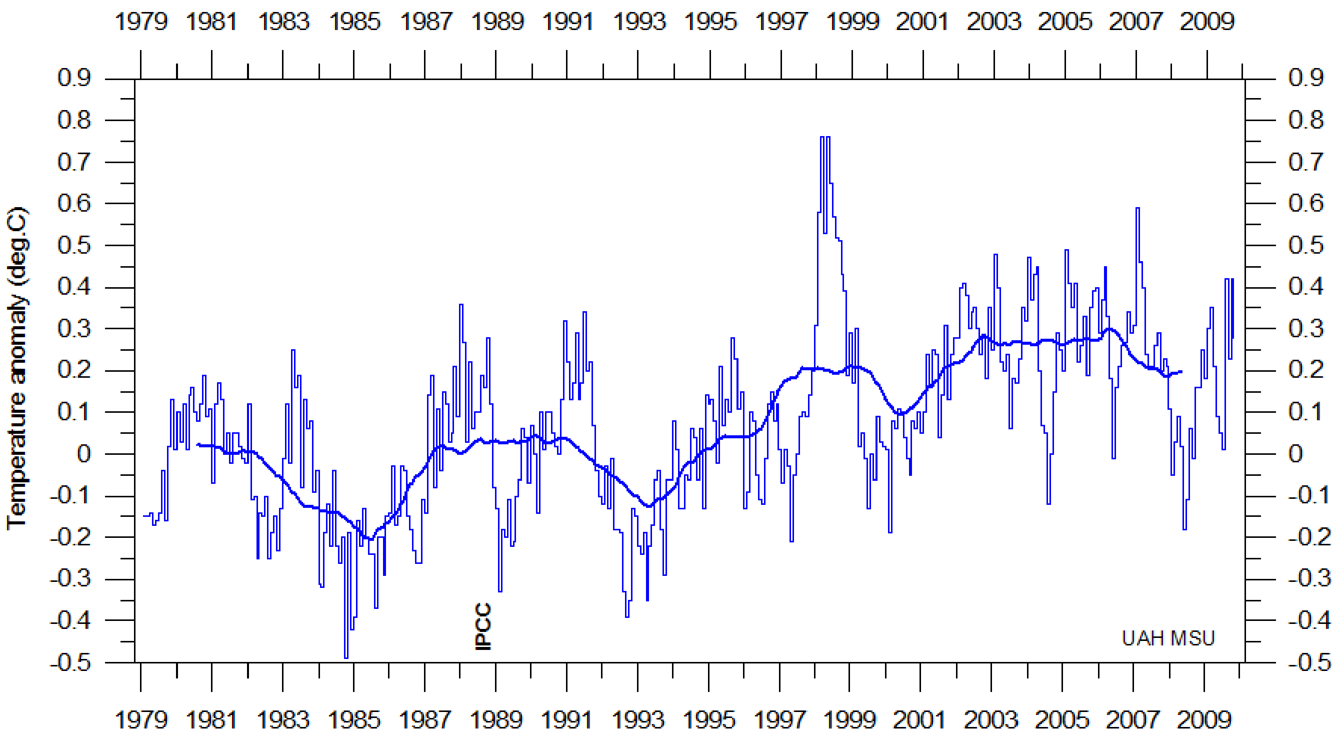




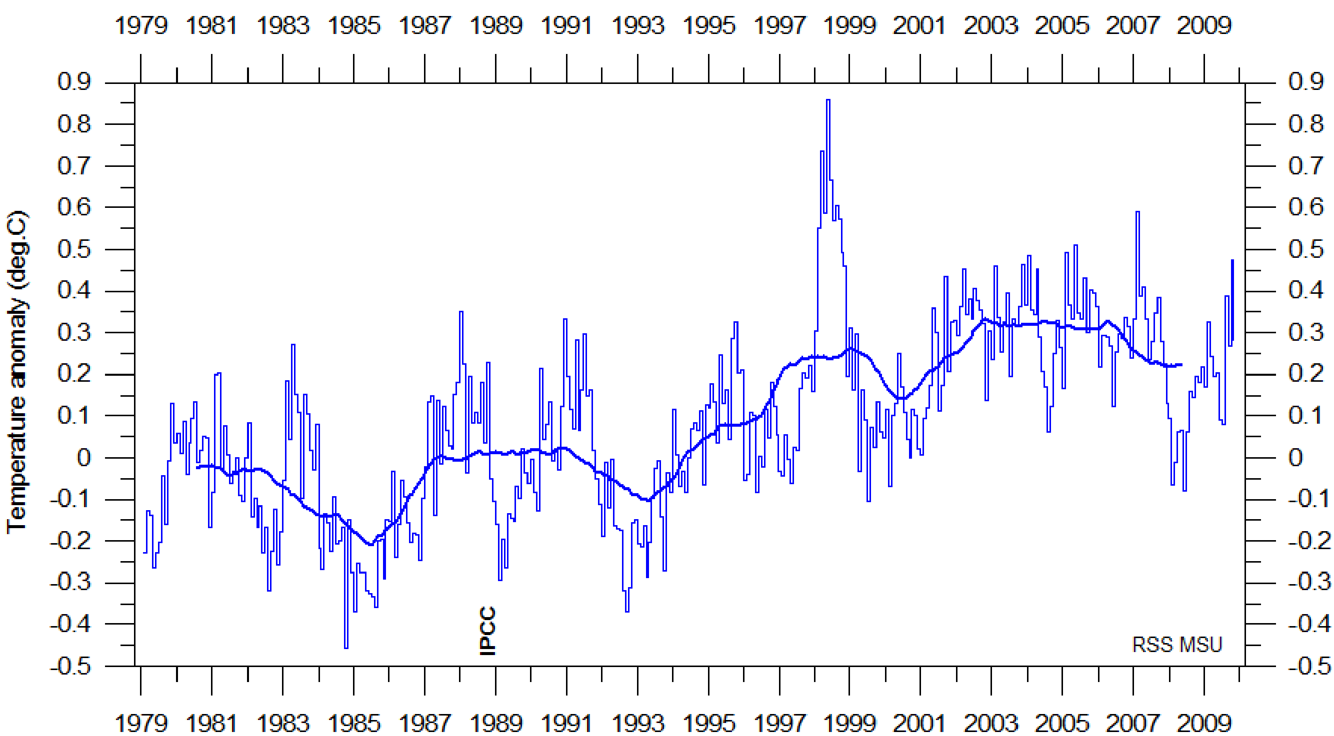


October 2009 surface air temperature compared to the average for October 1998-2006. Green.yellow-red colours indicate areas with higher temperature than the 1998-2006 average, while blue colours indicate lower than average temperatures. Data source: Goddard Institute for Space Studies (GISS)

Lower troposphere temperature from satellites, updated to October 2009

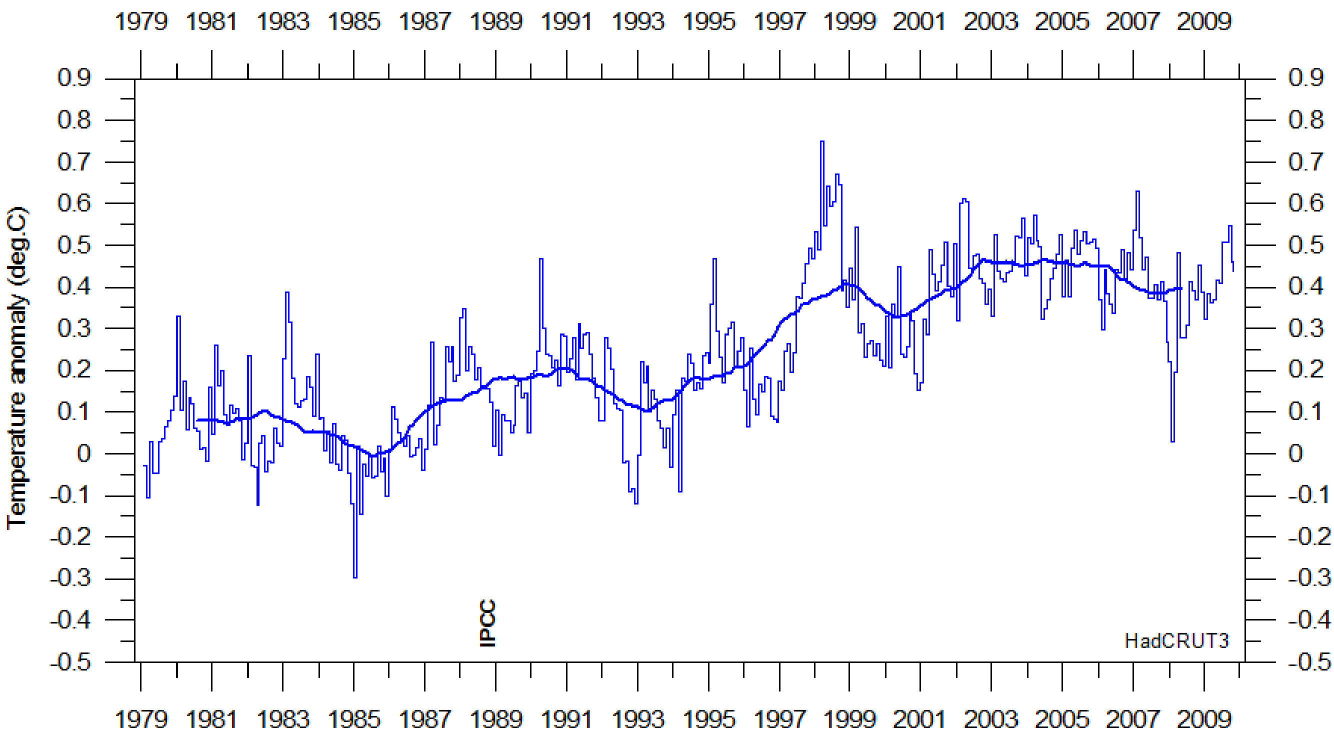


Global monthly average lower troposphere temperature (thin line) since 1979 according to [University of Alabama](#) at Huntsville, USA. The thick line is the simple running 37 month average.

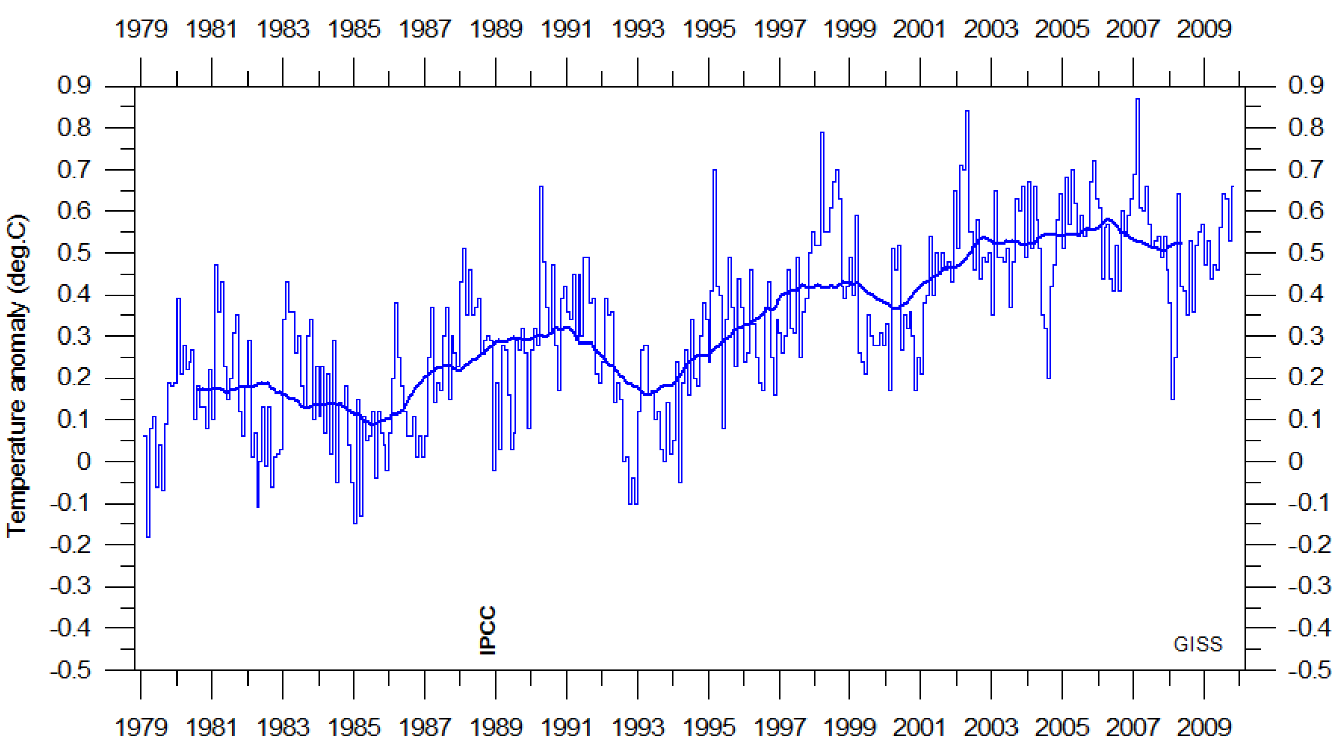


Global monthly average lower troposphere temperature (thin line) since 1979 according to according to [Remote Sensing Systems](#) (RSS), USA. The thick line is the simple running 37 month average.

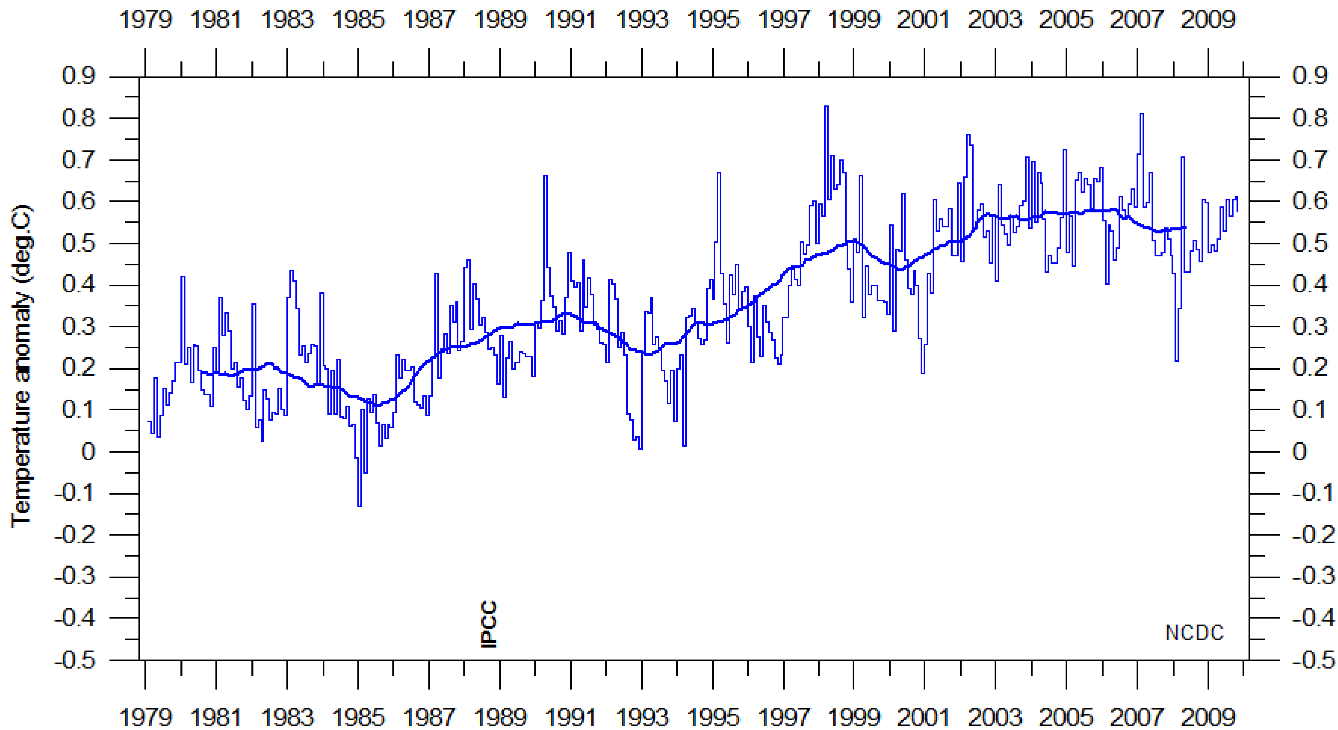
[Global surface air temperature, updated to October 2009]



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.

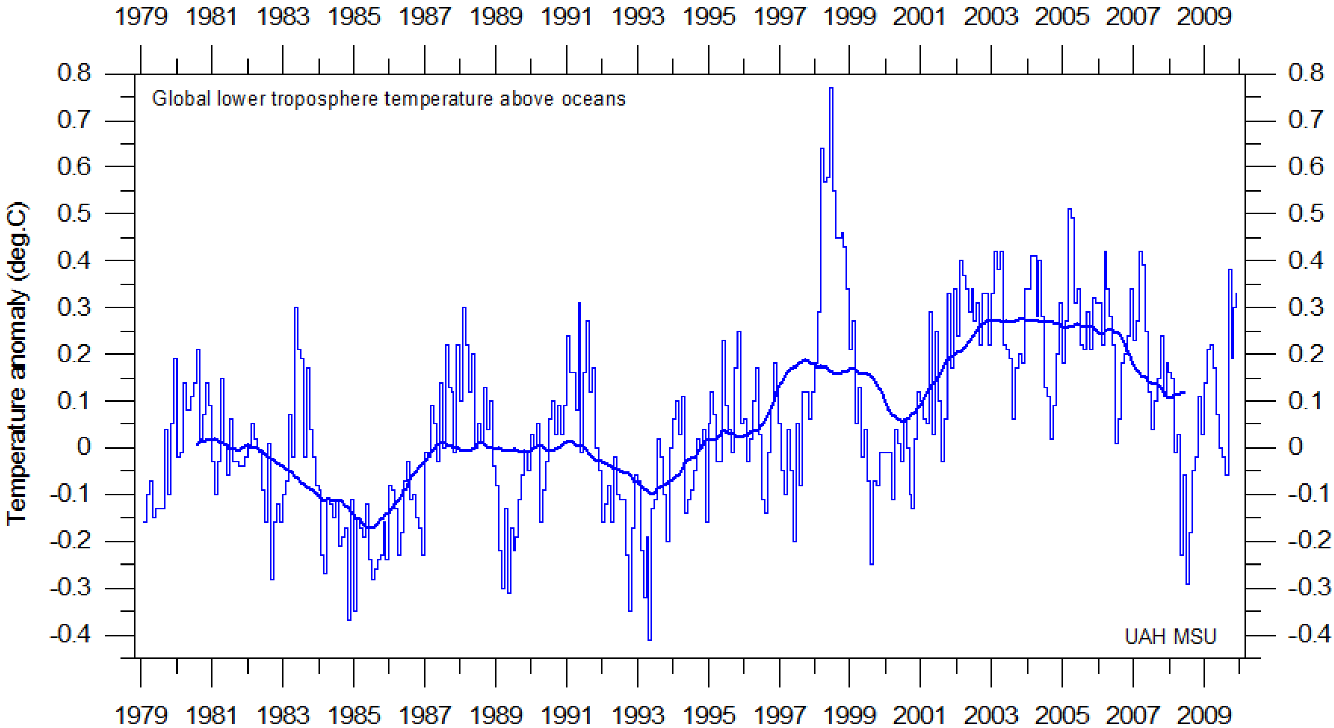


Global monthly average surface air temperature (thin line) since 1979 according to according to the [Goddard Institute for Space Studies] (GISS), at Columbia University, New York City, USA. The thick line is the simple running 37 month average.

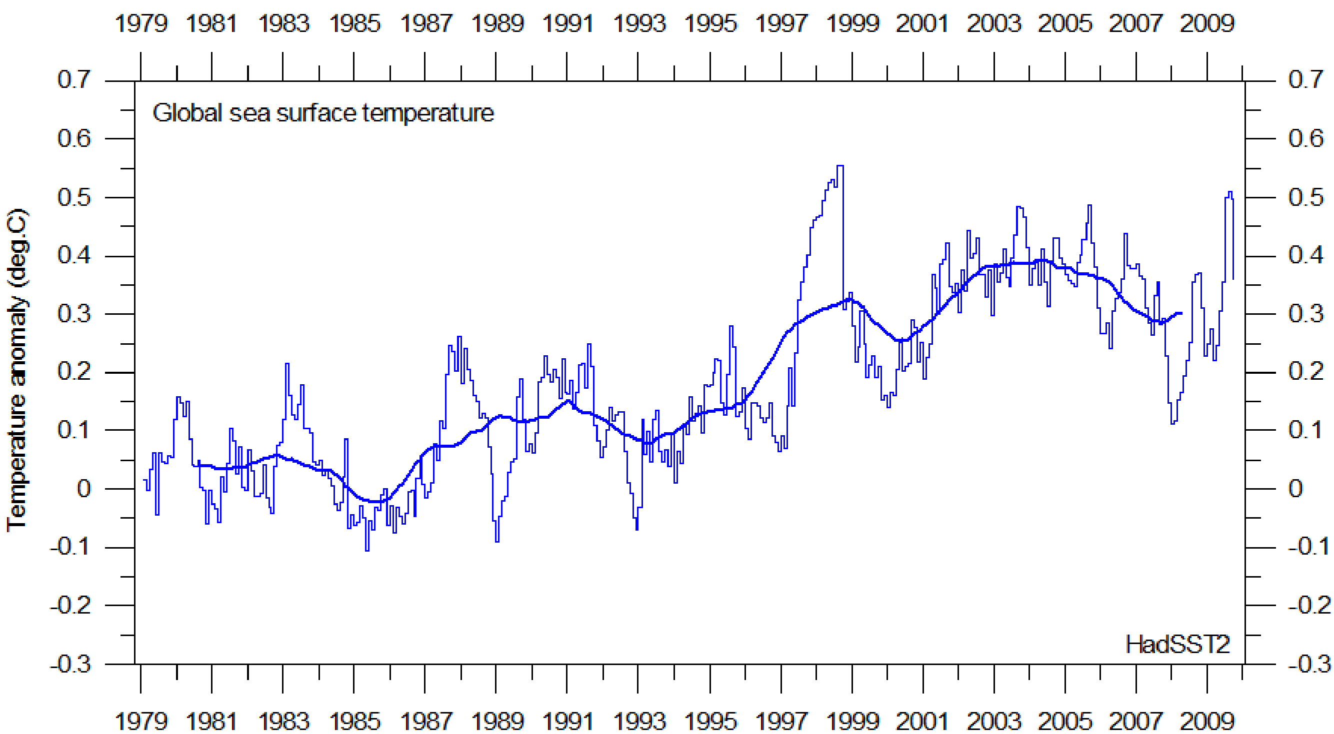


Global monthly average surface air temperature since 1979 according to according to the [National Climatic Data Center](#) (NCDC), USA. The thick line is the simple running 37 month average.

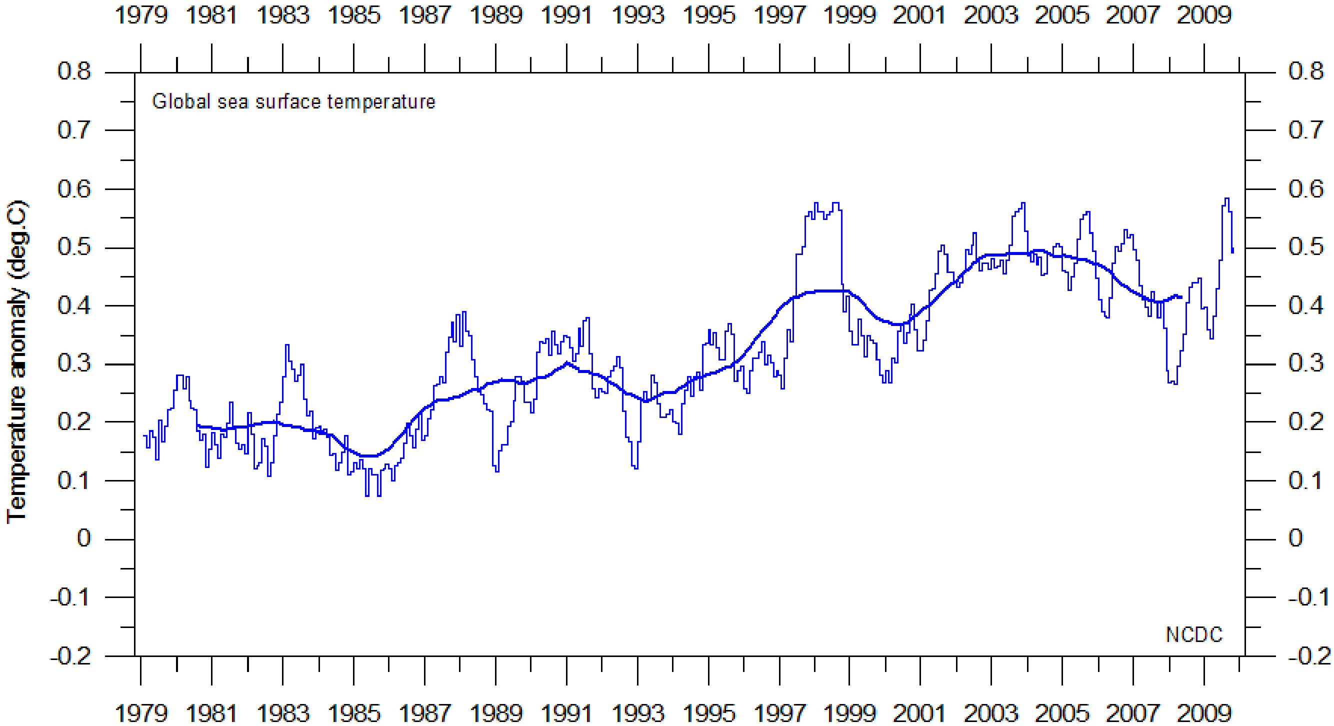
[Global sea surface temperature, updated to October 2009]



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.

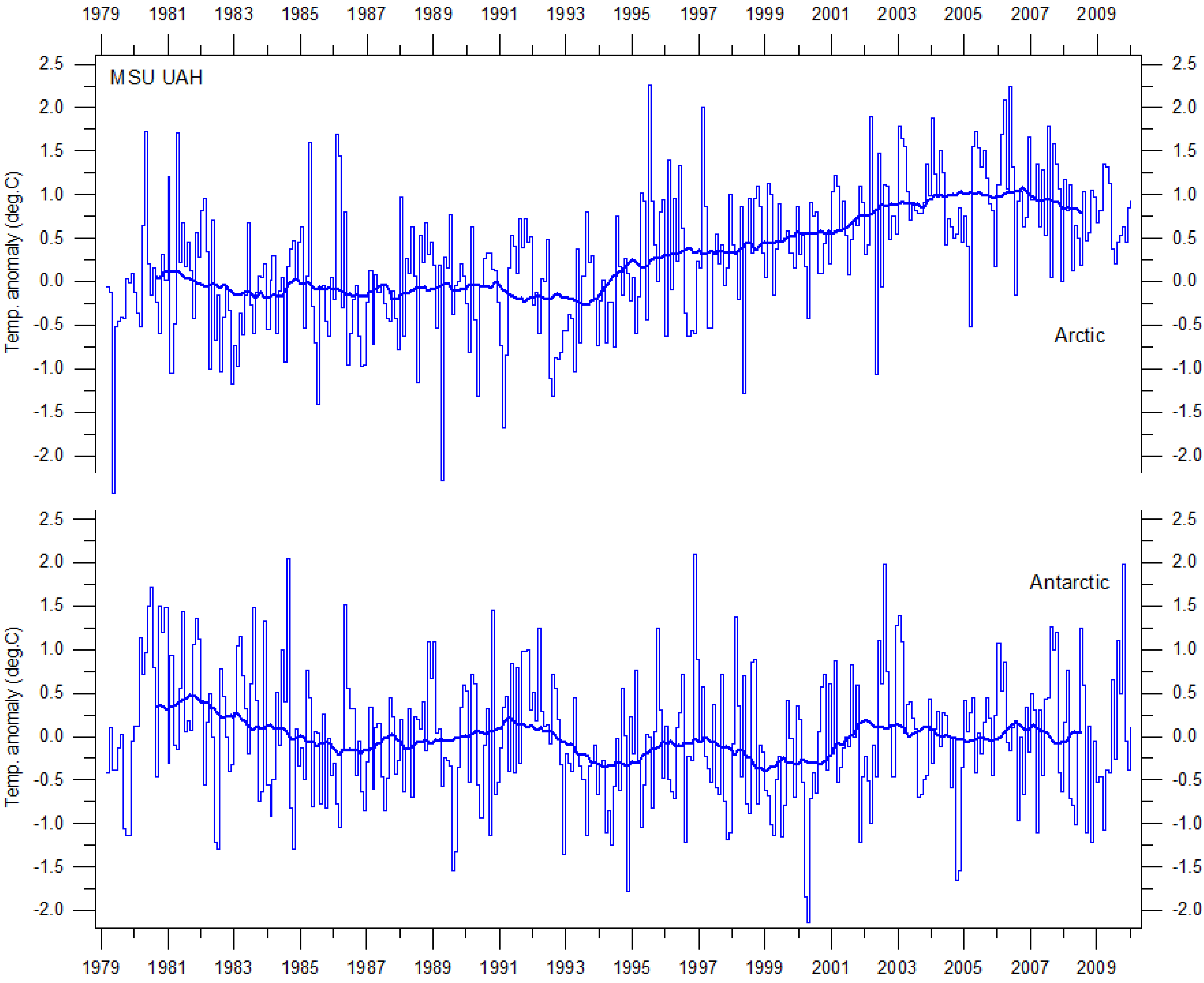


Global monthly average sea surface temperature since 1979 according to University of East Anglia's [Climatic Research Unit] ([CRU]), UK. Base period: 1961-1990. The thick line is the simple running 37 month average. Updated to September 2009.



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

Arctic and Antarctic lower troposphere temperature, updated to October 2009



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 September 2009]

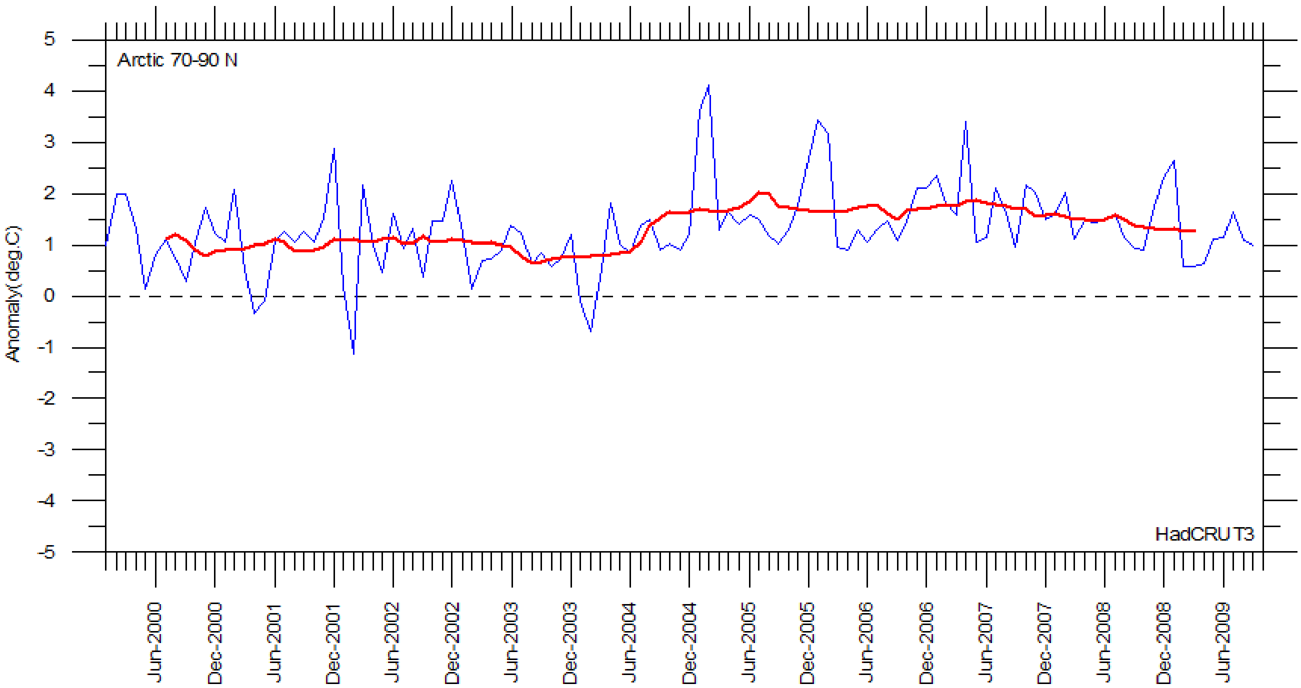


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre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

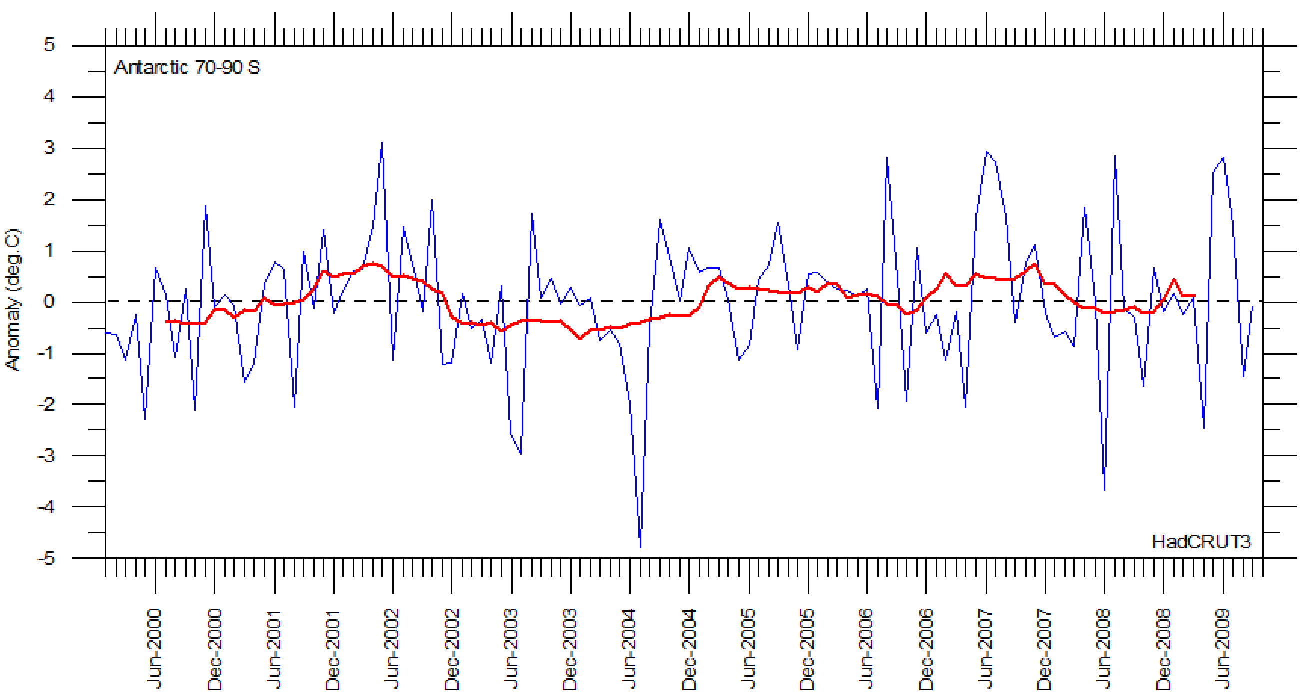


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley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

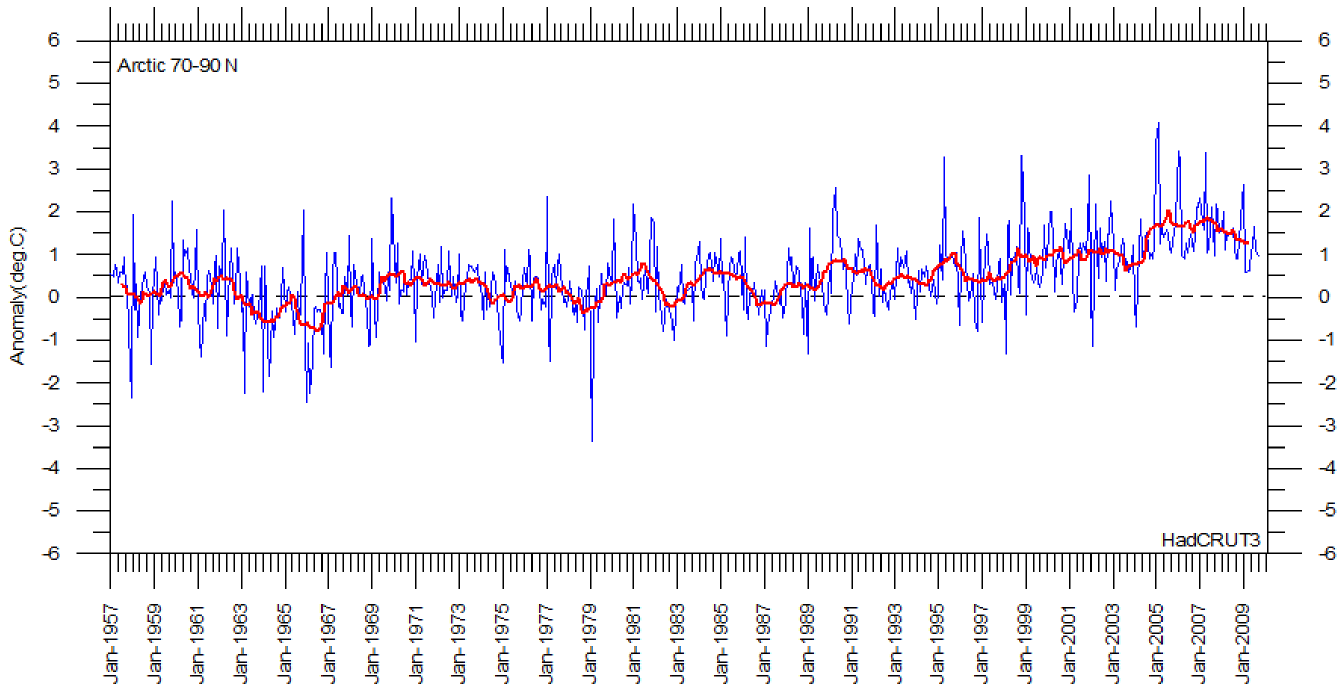


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 has been chosen as starting year, to ensure easy comparison with the maximum length of the realistic Antarctic temperature record shown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

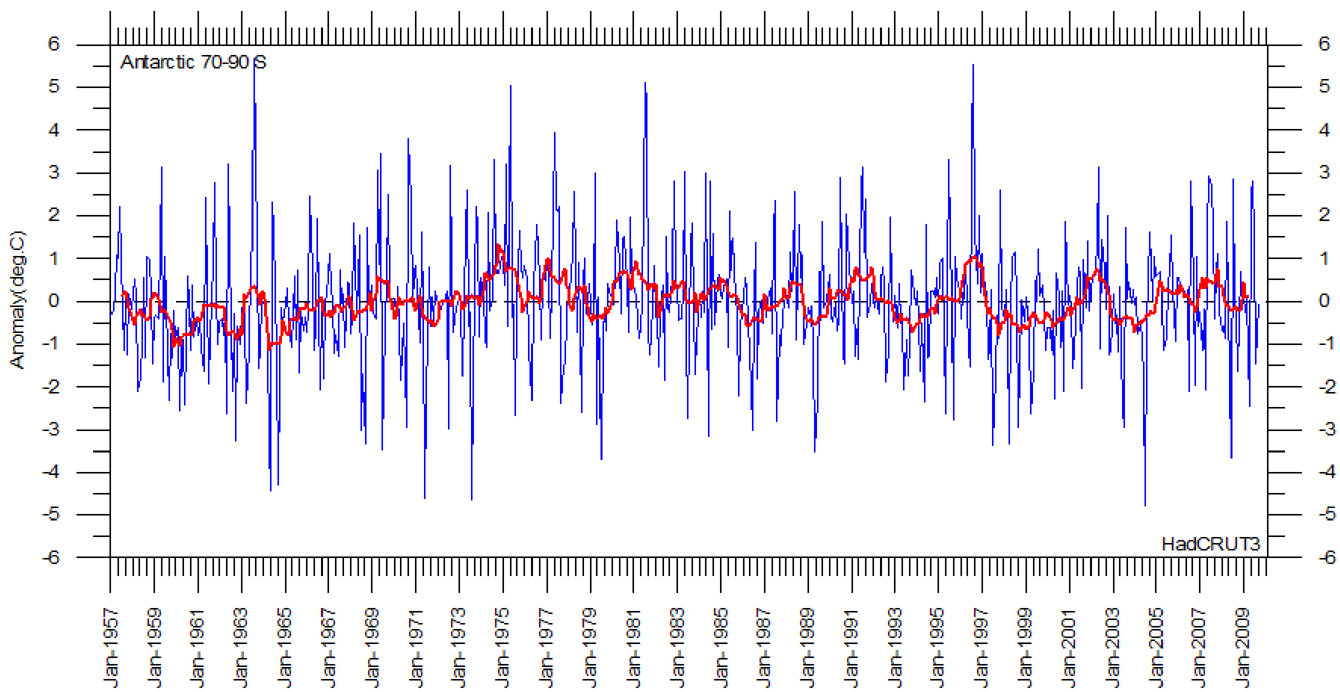


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 1957, in relation to the WMO reference "normal" period 1961-1990. The year 1957 was an international geophysical year, and several meteorological stations were established in the Antarctic because of this. Before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

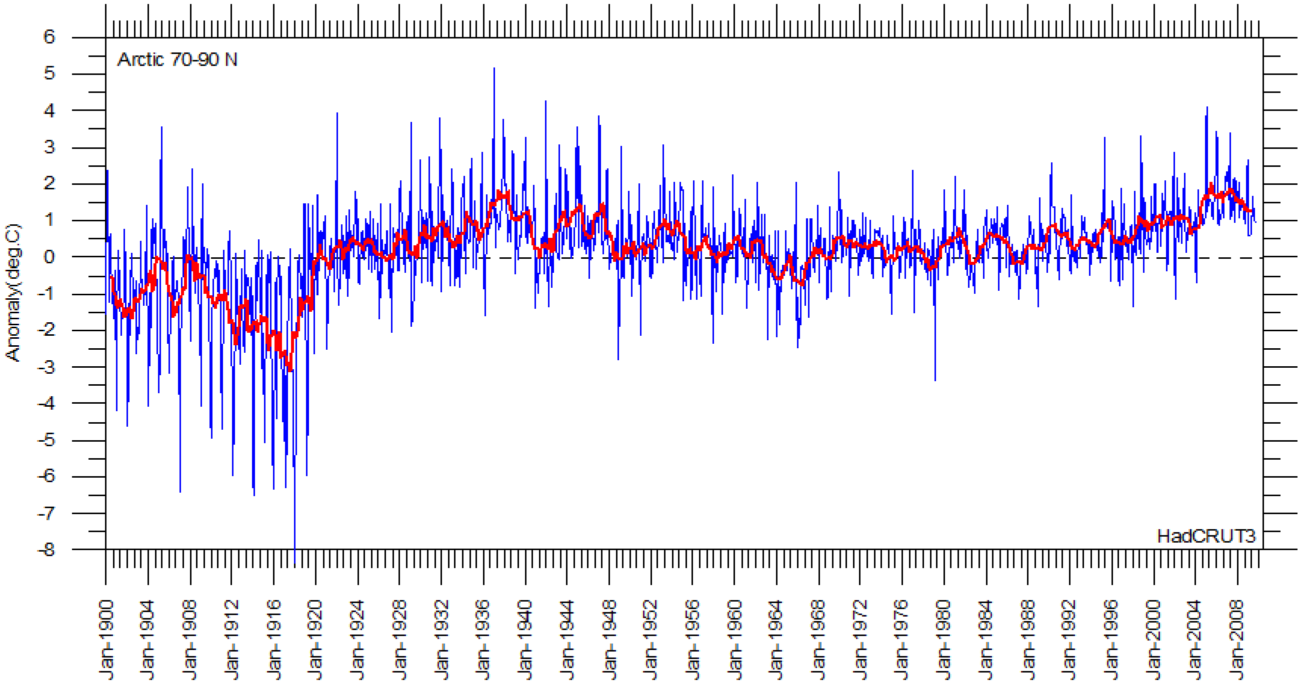
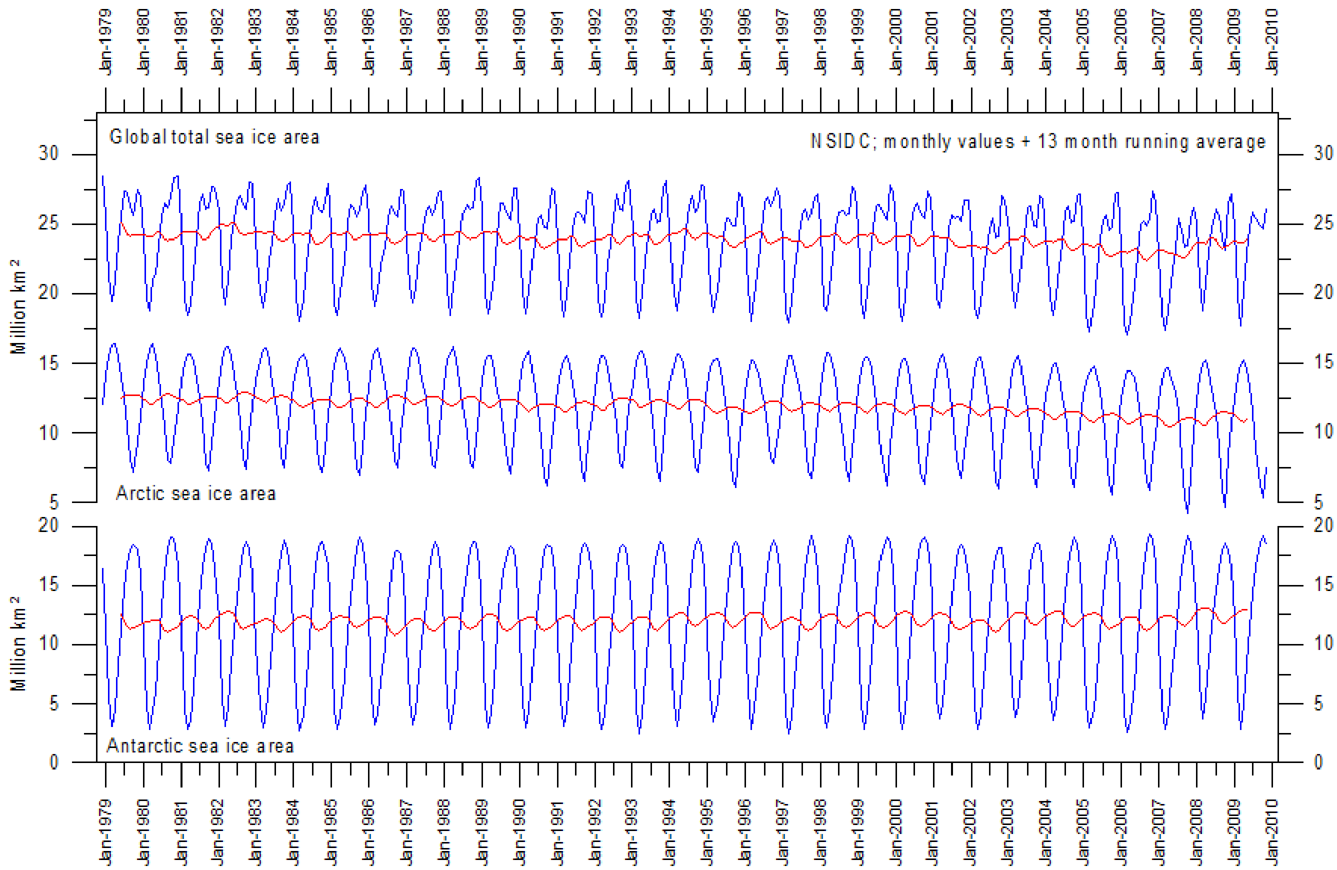


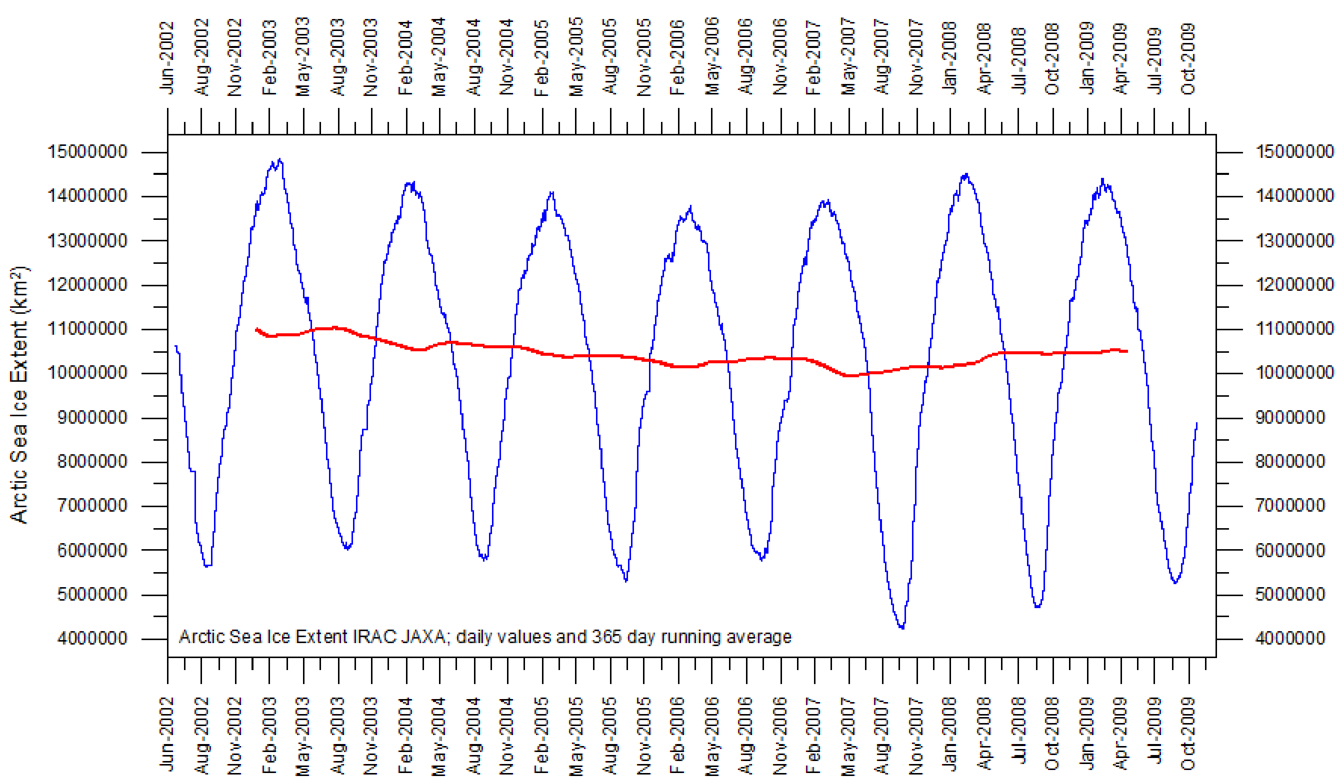
Diagram showing Arctic monthly surface air temperature anomaly 70-90^{o}N since January 1900, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. In general, the range of monthly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

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

[Arctic and Antarctic sea ice, updated to October 2009]

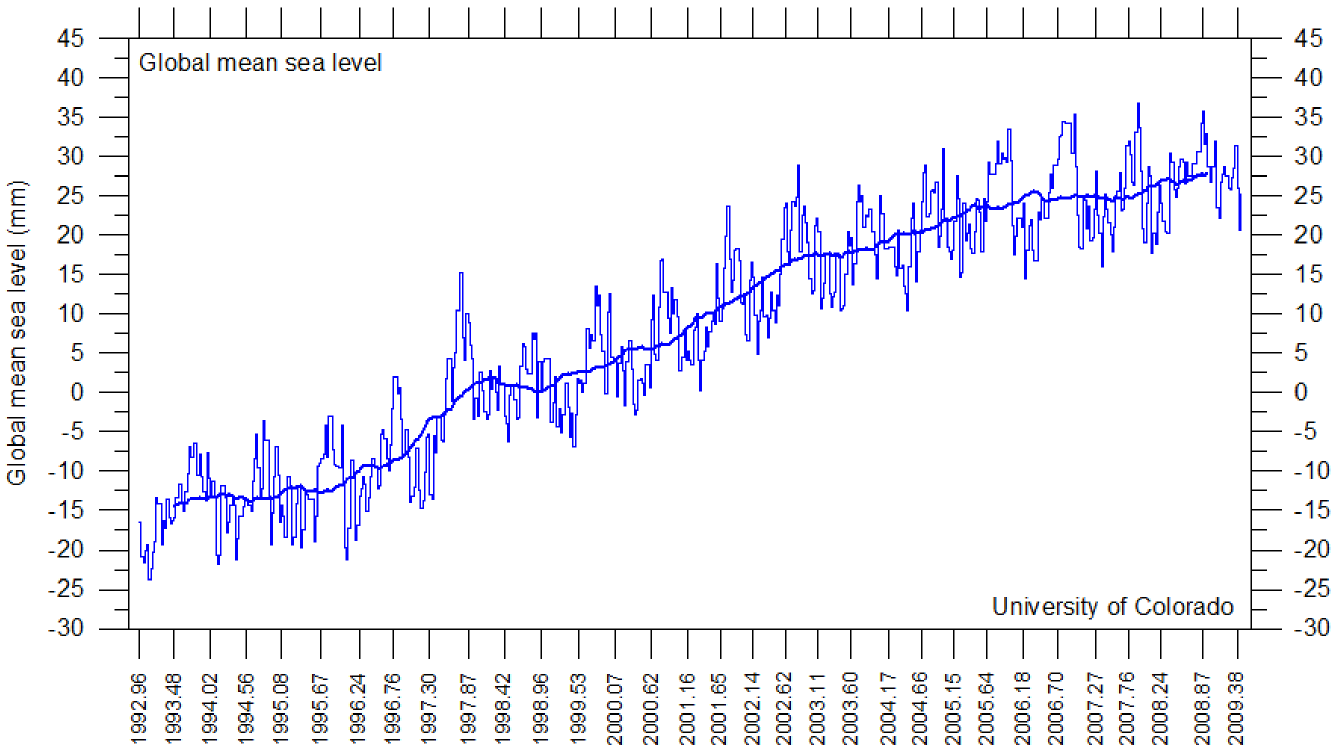


Graphs showing monthly Antarctic, Arctic and global sea ice extent since November 1978, according to the [National Snow and Ice data Center] (NSIDC).

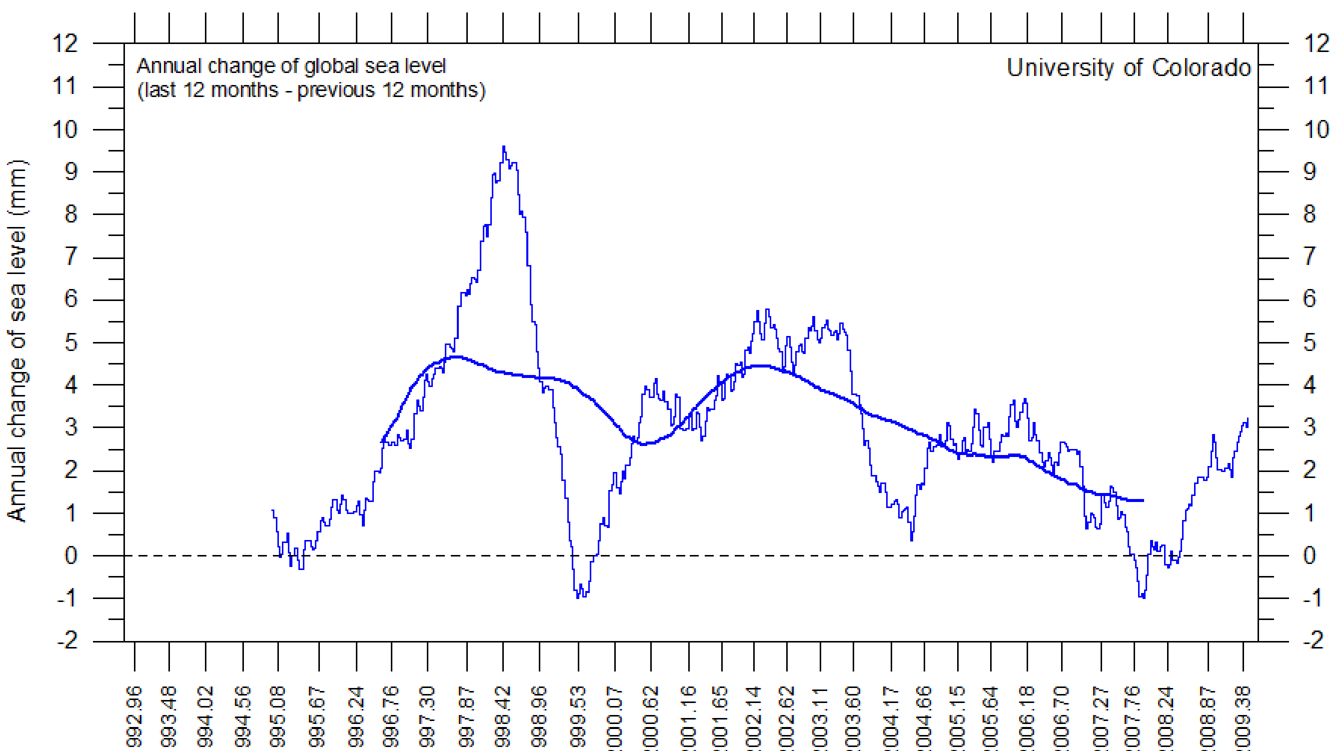


Graph showing daily Arctic sea ice extent since June 2002, to 09/11 2009, by courtesy of [Japan Aerospace Exploration Agency] (JAXA).

Global sea level, updated September 2009

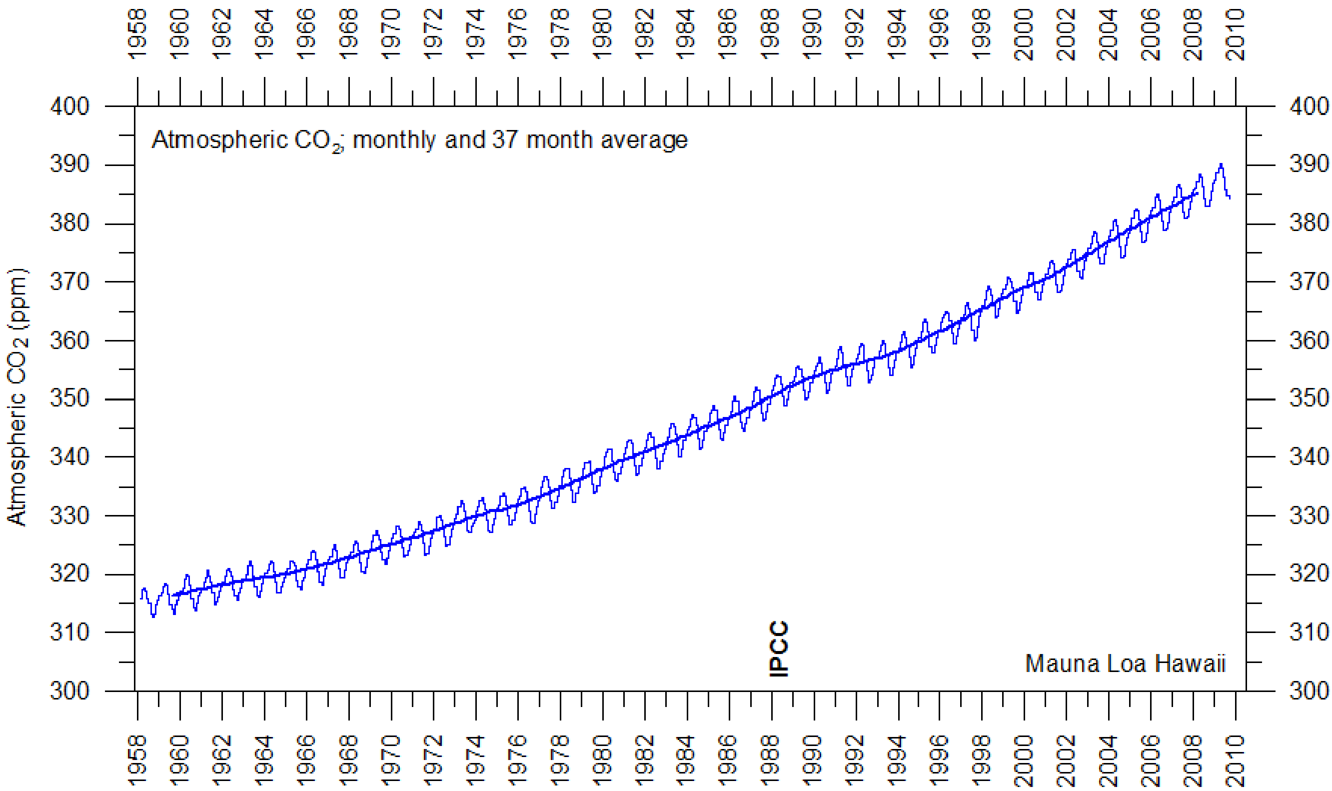


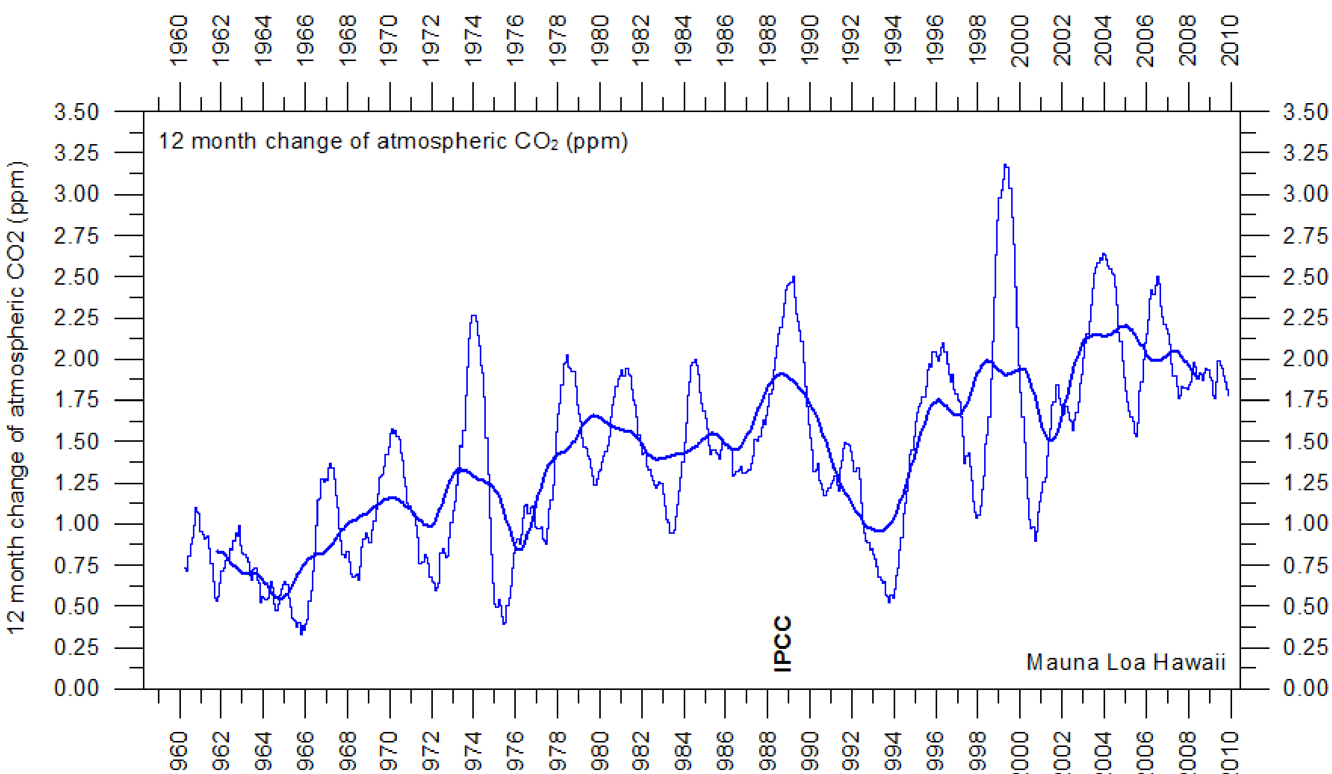
Globa lmonthly sea level since late 1992 according to the Colorado Center for Astrodynamics Research at University of Colorado at Boulder, USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.



Annual change of global sea level since late 1992 according to the Colorado Center for Astrodynamics Research at University of Colorado at Boulder, USA. The thick line is the simple running 3 yr average.

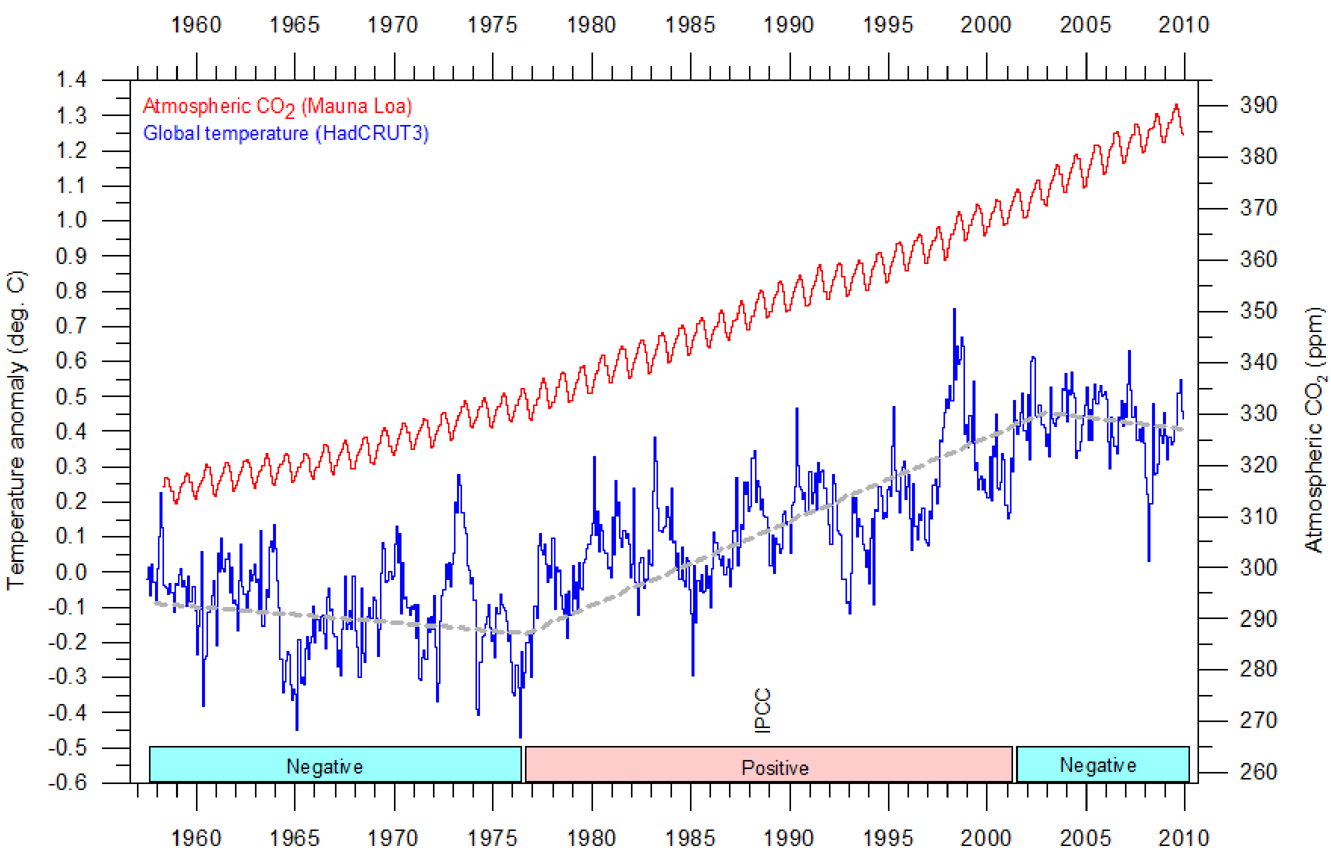
Atmospheric CO_2, updated to October 2009

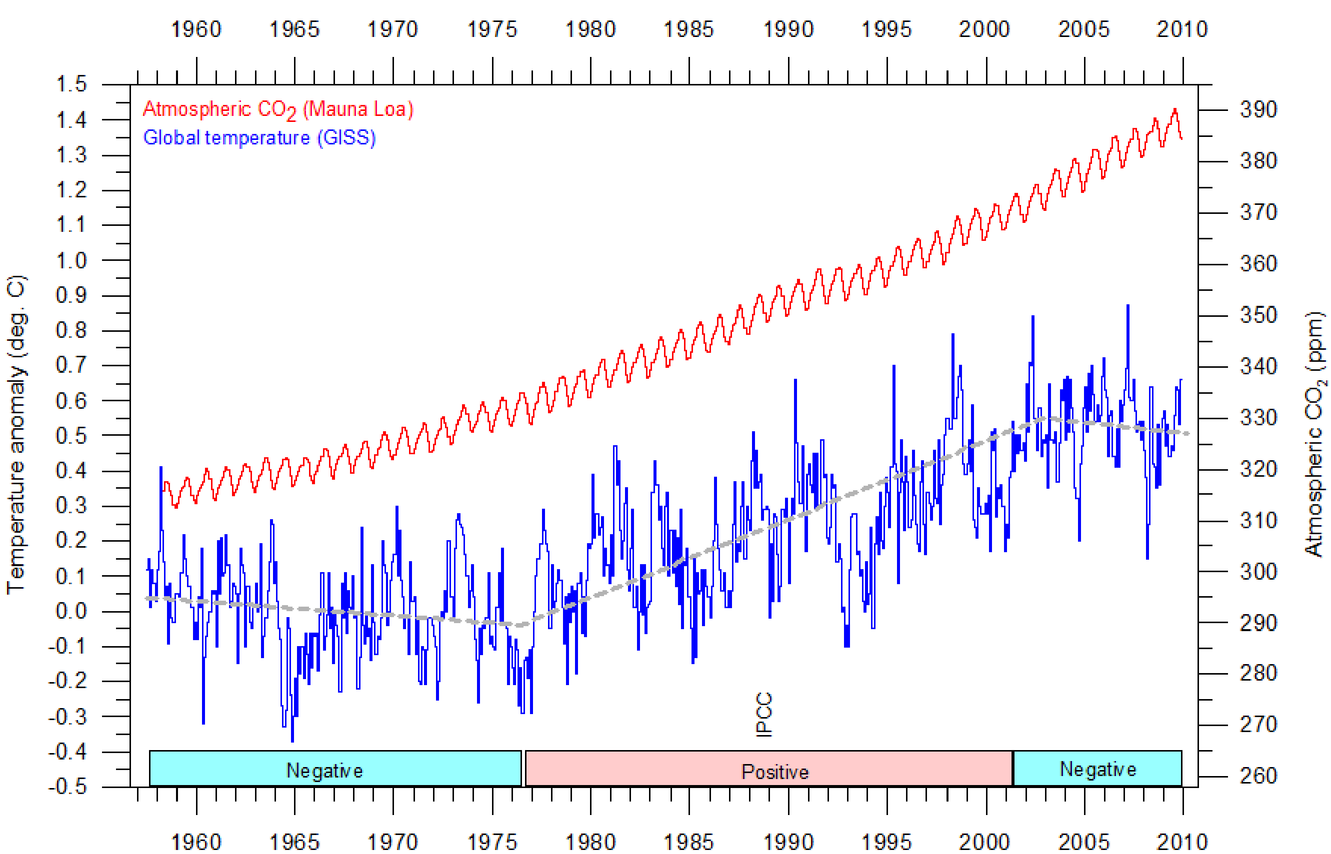


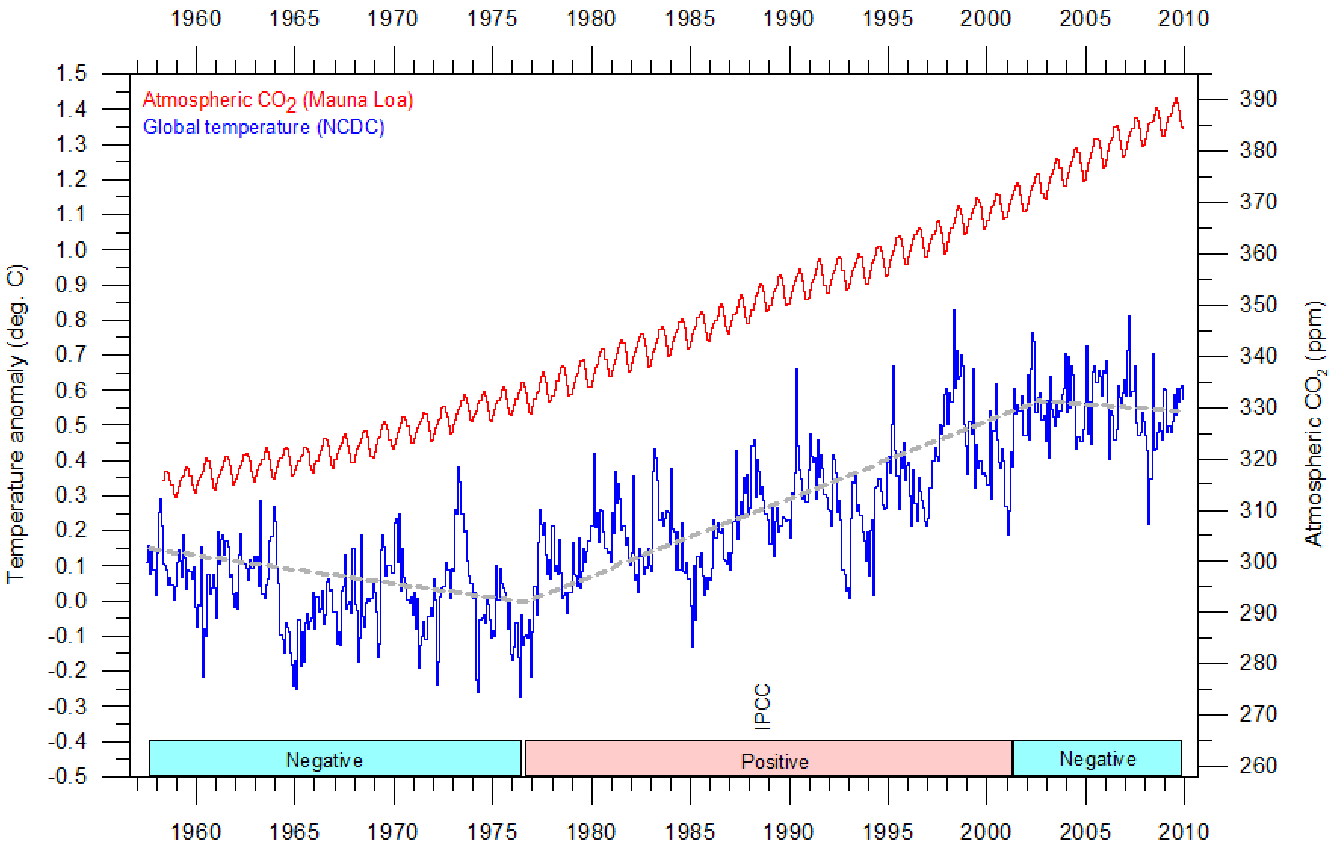


Monthly amount of atmospheric CO_2 (above) and annual growth rate (below; average last 12 months minus average preceding 12 months) of atmospheric CO_2 since 1959, according to data provided by the Mauna Loa Observatory, Hawaii, USA. The thick line is the simple running 37 observation average, nearly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

Global surface air temperature and atmospheric CO_2, updated to September-October 2009







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

Most climate models assume the greenhouse gas carbon dioxide CO_2 to influence significantly upon global temperature. Thus, it is relevant to compare the different global temperature records with measurements of atmospheric CO_2, as shown in the diagrams above. Any comparison, however, should not be made on a monthly or annual basis, but for a longer time period, as other effects (oceanographic, clouds, etc.) may well override the potential influence of CO_2 on short time scales such as just a few years.

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

What exactly defines the critical length of a relevant time period to consider for evaluating the alleged high importance of CO_2 remains elusive, and is still a topic for debate. The critical period length must, however, be inversely proportional to the importance of CO_2 on the global temperature, including feedback effects, such as assumed by most climate models.

After about 10 years of global temperature increase following global cooling 1940-1978, IPCC was established in 1988. Presumably, several scientists interested in climate then felt intuitively that their empirical and theoretical understanding of climate dynamics was sufficient to conclude about the importance of CO2 for global temperature. However, for obtaining public and political support for the CO_2-hyphotesis the 10 year warming period leading up to 1988 in all likelihood was important. Had the global temperature instead been decreasing, public support for the hypothesis would have been difficult to obtain. Adopting this approach as to critical time length, the varying relation (positive or negative) between global temperature and atmospheric CO_2 has been indicated in the lower panels of the three diagrams above.

Climate and history; one example among many

1812: Napoleon's retreat from Moscow

The actual armed forces at Napoleon's disposal as he left Moscow numbered no more than 95,000, and probably less. Marchal Kutuzow was still camping passively SW of Moscow, reinforcing his army to about 97,000 men. He was, however, still in no hurry to engage in regular warfare. So while Napoleon was retreating west towards Smolensk along the Moscow road, Kutuzov did not seriously attempt to cut across their line of retreat, even though he was excellently placed to do so.

The French retreat was slow, mainly due to lack of horsepower. The shortage of fodder had debilitated the horses, and they were growing too week to pull the guns and wagons. Part of the problem was that Napoleon saw himself carrying out a tactical withdrawal rather than a retreat. Therefore he refused to abandon a proportion of their guns to liberate horses and thereby save time. This determination not to loose face would cost him dear. As well as slowing their progress, all this had a demoralising effect on the French troops, marching down a devastated road, seeing only abandoned equipment, human and animal corpses. Kutuzow was still following south of the French army, but resolutely opposed to any suggestions from his generals to make an offensive move.

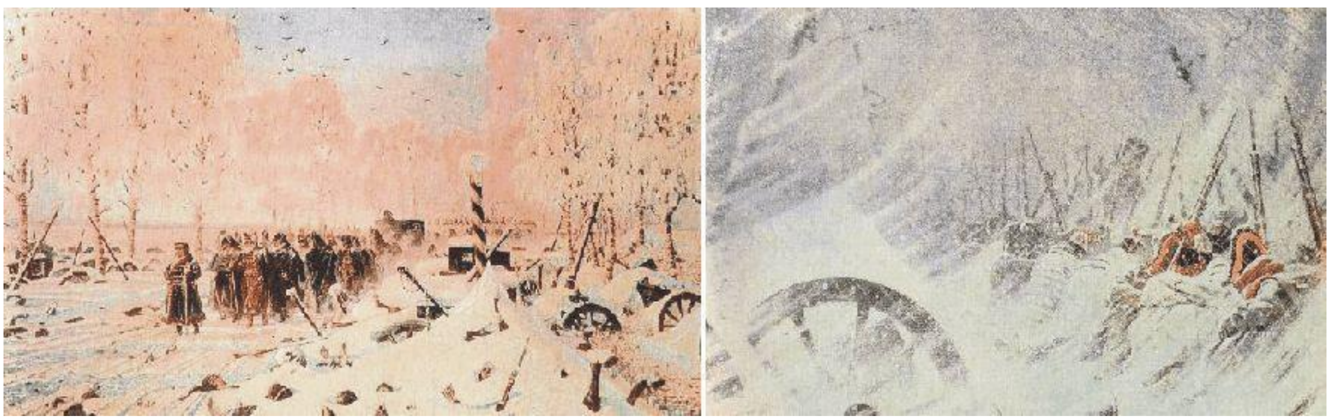
The good news for the French was that the weather was magnificent, and that the early snow in Moscow presumably just was a meteorological mishap. On 31 October, at Viazma, Napoleon therefore ridiculed those who had been attempting to scare him with stories of the Russian winter. The weather remained fine during the first days of November 1812, until 3 November, which was to be the last warm day. The wind turned north and the night between 4 and 5 November brought with it a rapid drop in air temperature. On 6 November the French retreat was entering a new phase. It began to snow, and in short time it lay half a meter thick on the ground. The drop in temperature had not been that great, probably not exceeding -10^{o}C. But the French army was not used to or dressed for cold weather. There was no such thing as a winter uniform, since in those days armies did not fight in winter. The cold also provided the last straw for many of the remaining horses. The meteorological change early November 1812 had a profound effect on the whole French army.

Napoleon and his army retreating in western Russia early November 1812.

Also the Russian army under Kutuzow was affected by the cold, and food and clothing was equally scarce. The war now grow even more vicious than before, and captives had become an unwelcome encumbrance to both sides. Many prisoners, French or Russian, were simply despatched with a bullet to the head.

When Napoleon 9 November reached Smolensk, the wind was still northerly and air temperatures were down to -15^{o}C. On 14 November, they sank to -28^{o}C. His army was now reduced to about 35,000 men. Kutuzow made some attempts at intersecting Napoleons further retreat towards Minsk, but without substantial success. 22 November Napoleon reached Tolochin, where he was informed that other Russian forces just had taken Minsk further to the west. What was left of the French army was surrounded. Napoleon, nevertheless, managed to extricate himself from this impossible situation by fainting an attack towards south, while his engineers at the same time was constructing two bridges across the frozen river Berezina, which was crossed 27-28 November.

The following two days may have been among the worst of the entire retreat. When Napoleon reached Pleshchenitse on 30 November, a temperature of -30^{o}C was recorded be Dr. Louis Lagneau (Zamoyski 2005). Frostbite was widespread among the tired and hungry soldiers. Selfishness reached new heights. Now that Napoleon had managed to get beyond his reach, Kutuzov felt even less inclined to force the pursuit than before. Also his army was in a terrible condition. His main force, which has marched out of Tarutino 97,000 strong one month before, was now reduced to 27,000 men due to the cold, according to his own figures (Zamoyski 2005).



Retreat of the French army in western Russia, mid- and late November 1812. Oil paintings by Vereschagin.

On the evening of 5 December, at Smorgonie, Napoleon decided that it was time for him to go back to Paris, and take control from there. He called together his marshals and apparently apologised for his mistake of having remained in Moscow for too long. He then set off into the night. The Imperial Mameluke, Roustam, later reported that the wine in Napoleon's carriage froze that night, causing the bottles to shatter. On 6 December the temperature fell even more, reaching -37.5^{o}C according to Dr. Louis Lagneau.

This was the end. On 9 December the main mass of the French army turned up at the gates of Vilnia. Vilnia, however, could not be hold, and the retreat had to continue towards the starting point along the river Niemen. The weather continued bitterly cold, with daytime temperatures around -35^{o}C. The French commander Murat realised that the line of Niemen could not be held, and had to retreat all the way to first Königsberg, and later Danzig and Küstrin much longer to the west. Eventually, the remnants of the French army were driven all the way back to Dresden.

It was only when the French retreat finally came to a stop towards the end of January 1813 that the true scale of the disaster began to emerge. June 1812 somewhere between 550,000 and 600,000 French and allied troops have been assembled along Niemen. Only about 120,000 came out of Russia in December 1812, including substantial reinforcements received after the invasion was launched 22 June. Presumably at least 400,000 French and allied troops died during the campaign, less than 100,000 in battle. On the Russian side is has been estimated that up to 400,000 soldiers and militia died, about 110,000 of them in battle.

The extremely cold winter November-December 1812, in combination with the previous warm summer July-August 1812 had been devastating for the whole military operation on both French and Russian side, and were to have lasting effects on Europe's political future.

The catastrophic outcome of the Russian campaign sealed Napoleon's fate. Not only did it cost him 300,000 of his best French soldiers, but it also punctured the aura of superiority and being invincible that has been surrounding Napoleon's person. Few saw this more clearly than the German patriots in Prussia, who had been suffering under the humiliation of French dominion. On 28 February 1813 an alliance was concluded between Russia and Prussia, and two weeks the latter declared war on France.

References

Zamyski, A. 2005. 1812 - Napoleon's Fatal March on Moscow. Harper Perennial, London, 644 pp.

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

New book about climate and climate change (Det ustyrlige klima; in Nordic language) to be published 30. November 2009.

More information on: www.bibliotek.trykkefrihed.dk

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

22 November 2009.