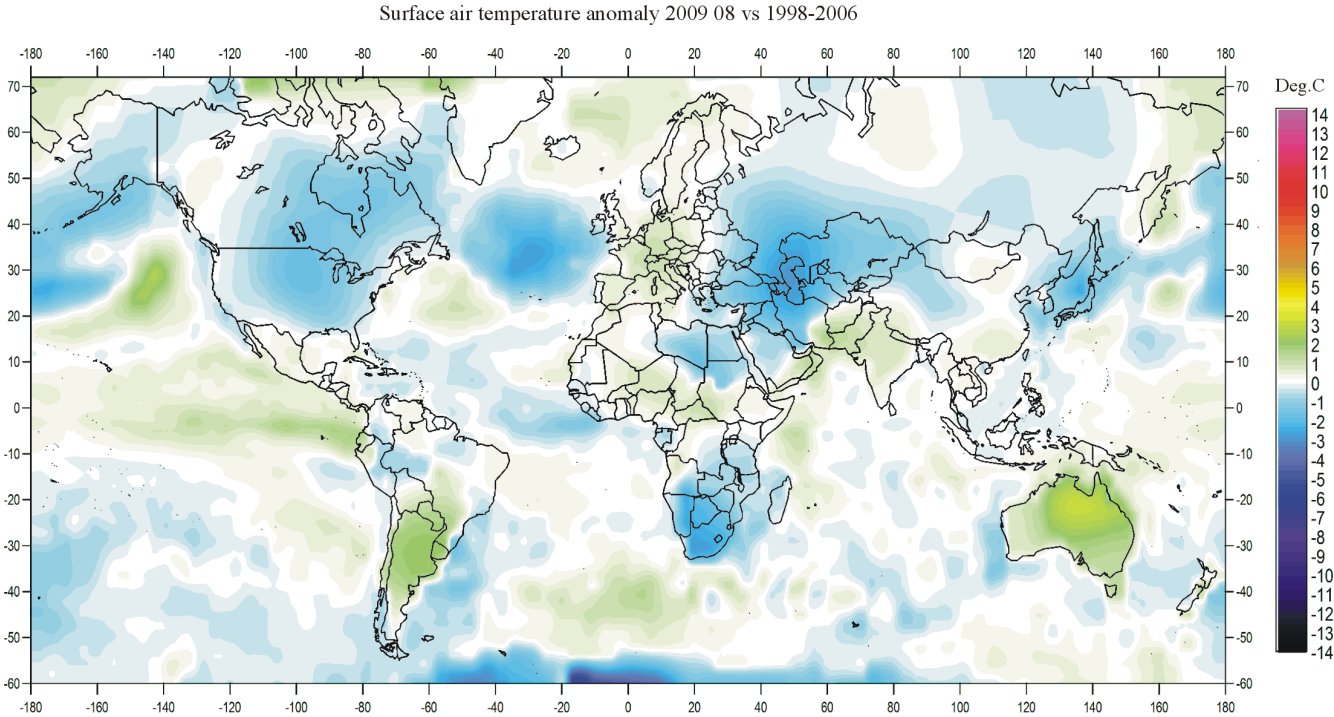


Climate4you update August 2009

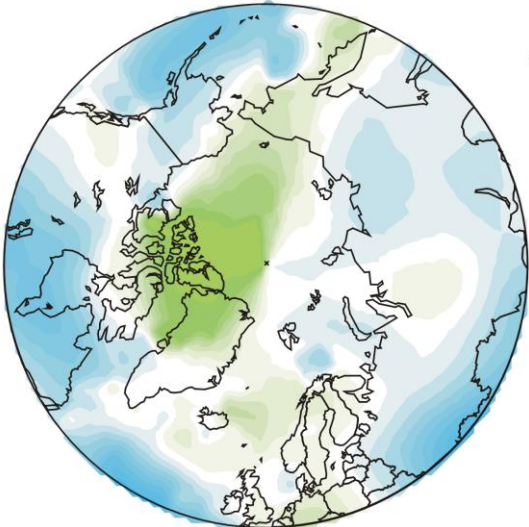
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August 2009 global surface air temperature overview

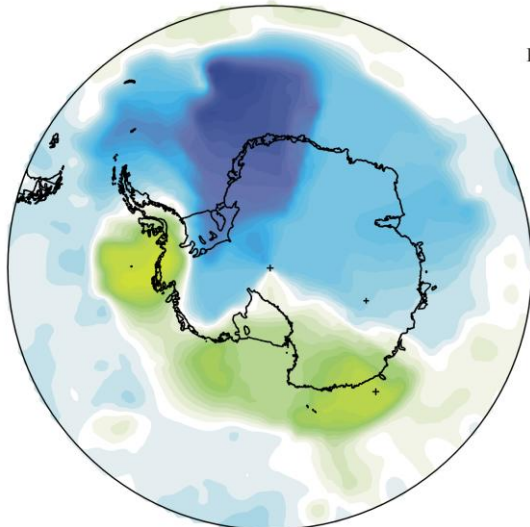


1

Air temperature 200908 versus average 1998-2006

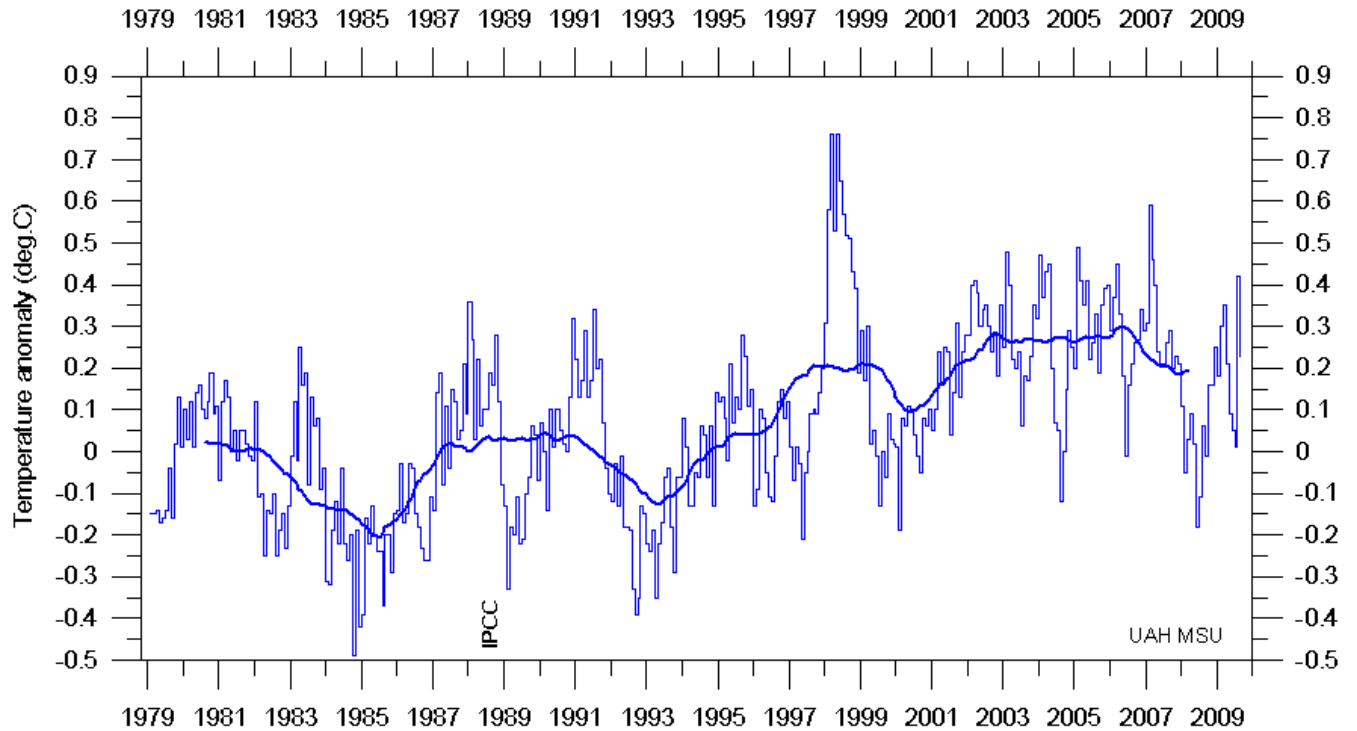


Air temperature 200908 versus average 1998-2006



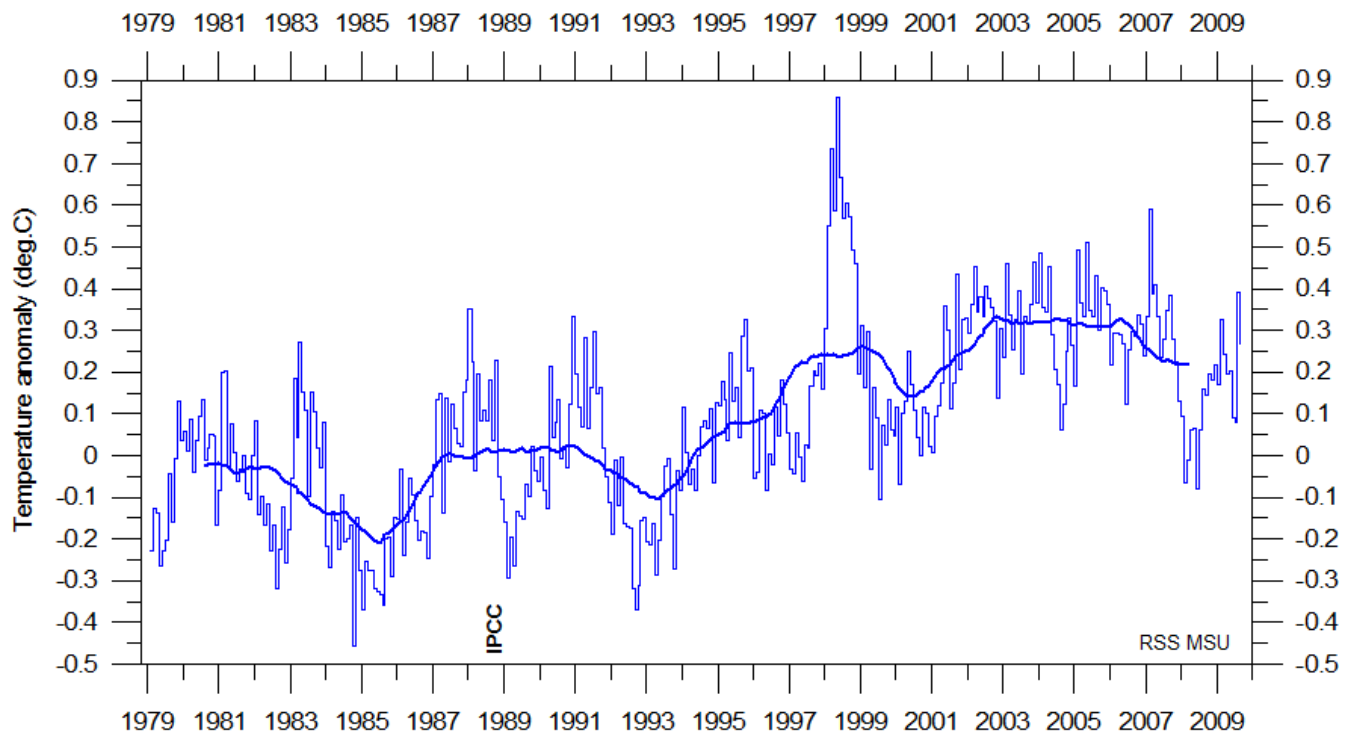
August 2009 surface air temperature compared to the average for August 1998-2006. Green,yellow-red colours indicate areas with higher temperature than the 1998-2006 average, while blue colours indicate lower than average temperatures. Data source: [Goddard Institute for Space Studies](http://www.giss.nasa.gov) (GISS)

Lower troposphere temperature from satellites, updated to August 2009



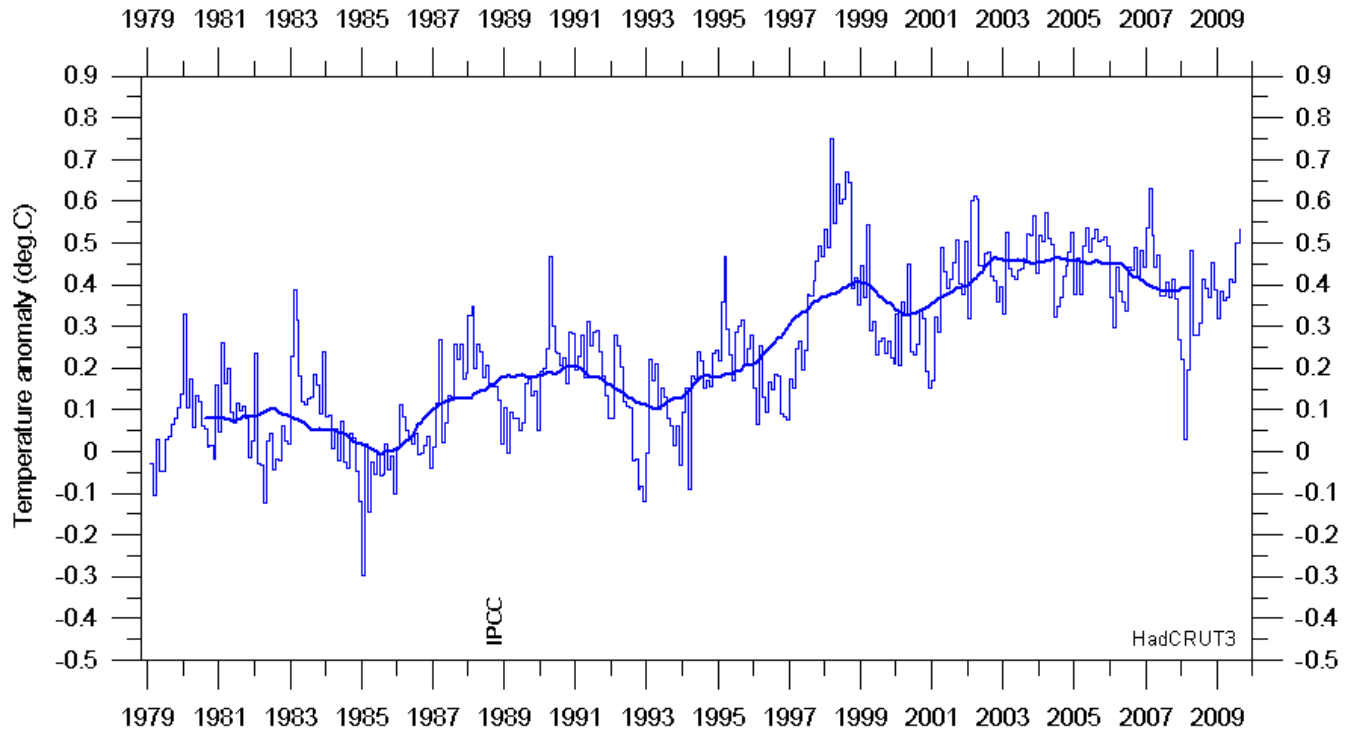
Global monthly average lower troposphere temperature (thin line) since 1979 according to [University of Alabama](#) at Huntsville, USA. The thick line is the simple running 37 month average.

2



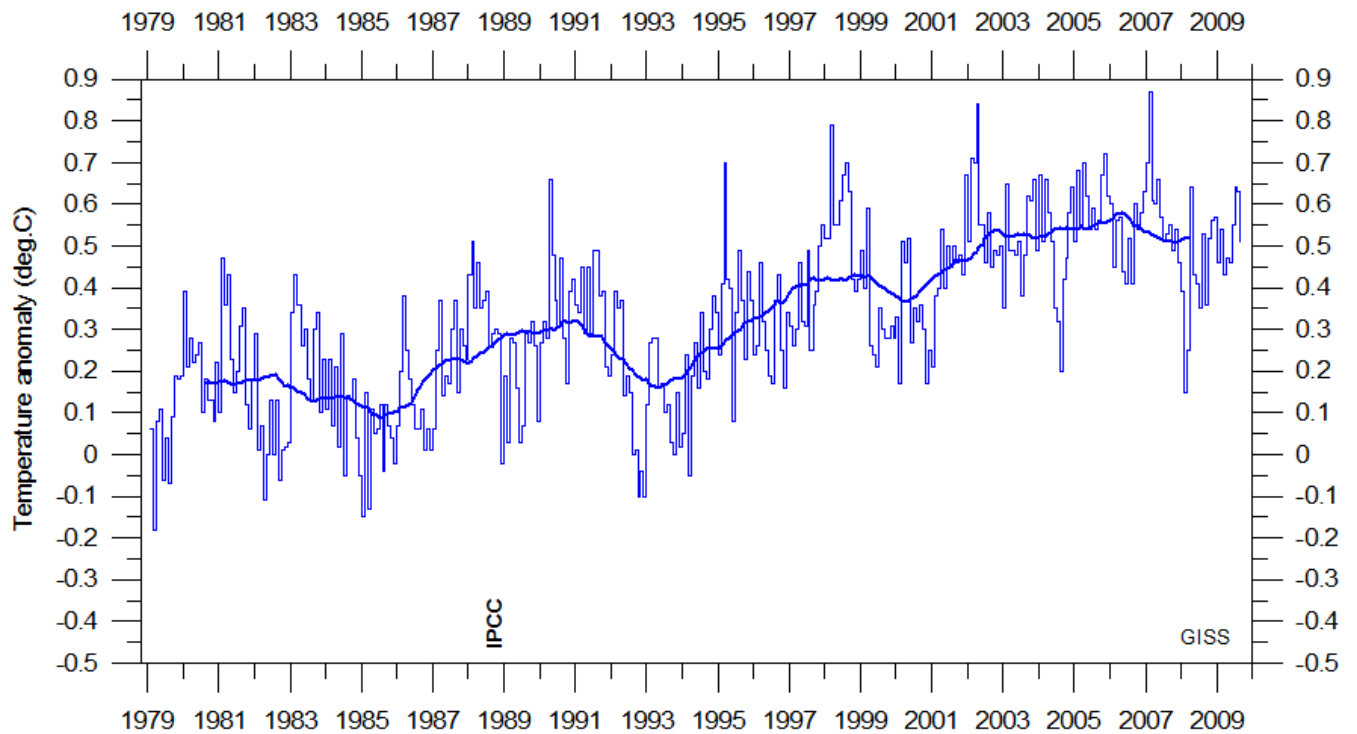
Global monthly average lower troposphere temperature (thin line) since 1979 according to according to [Remote Sensing Systems](#) (RSS), USA. The thick line is the simple running 37 month average.

Global surface air temperature, updated to August 2009

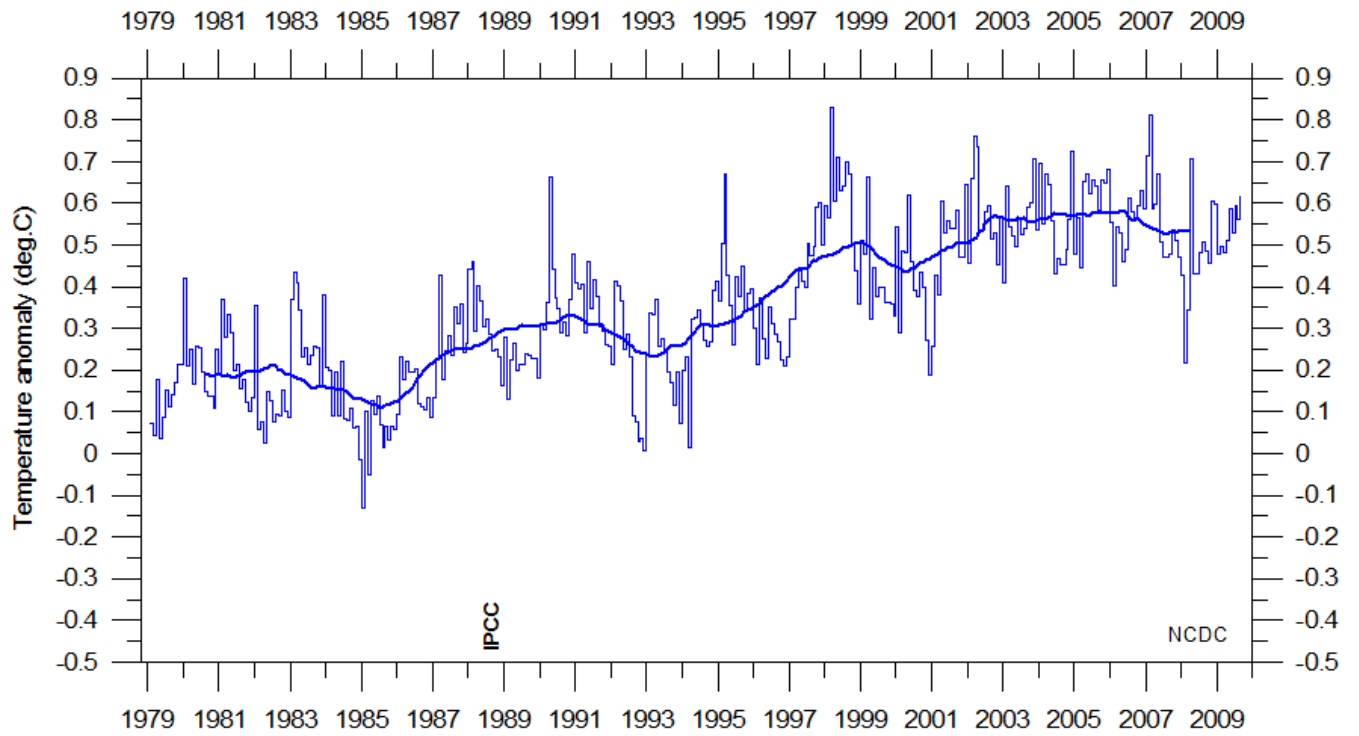


Global monthly average surface air temperature (thin line) since 1979 according to according to the Hadley Centre for Climate Prediction and Research and the University of East Anglia's [Climatic Research Unit \(CRU\)](#), UK. The thick line is the simple running 37 month average.

3

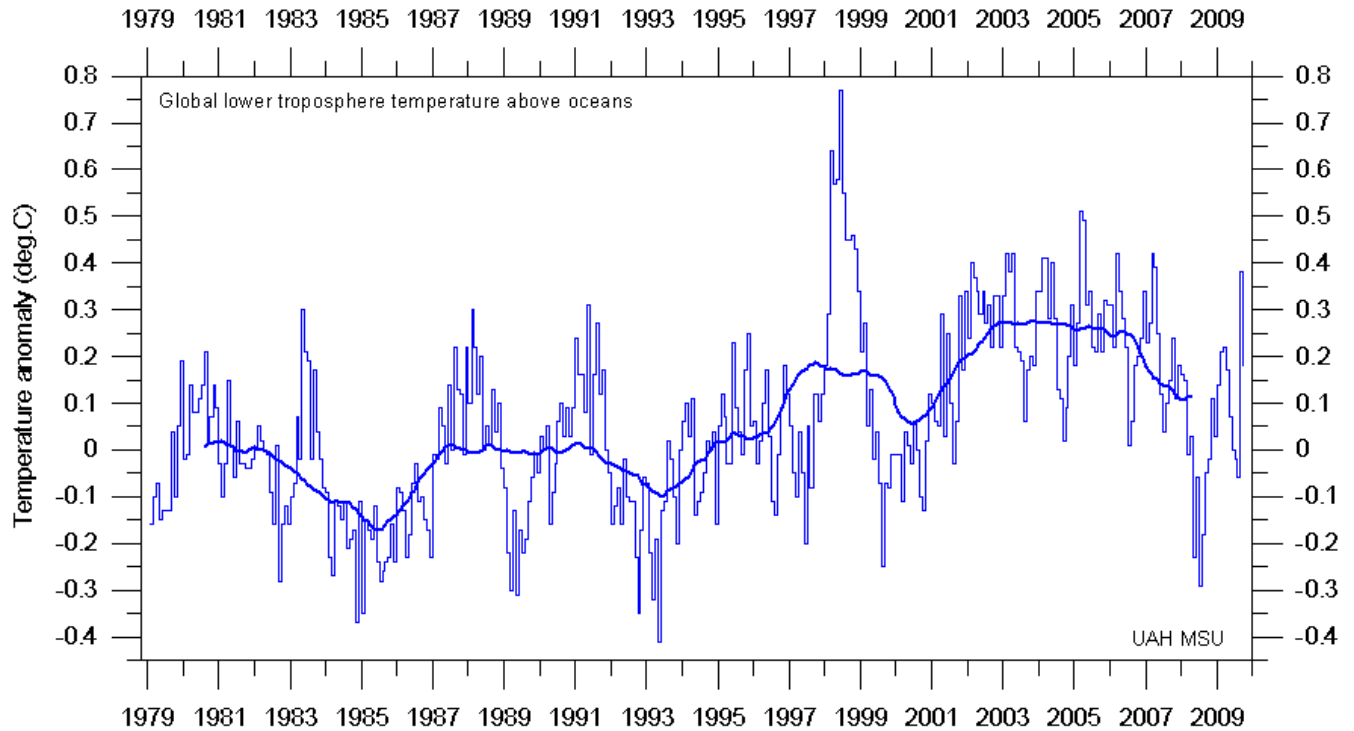


Global monthly average surface air temperature (thin line) since 1979 according to according to the [Goddard Institute for Space Studies \(GISS\)](#), at Columbia University, New York City, USA. The thick line is the simple running 37 month average.



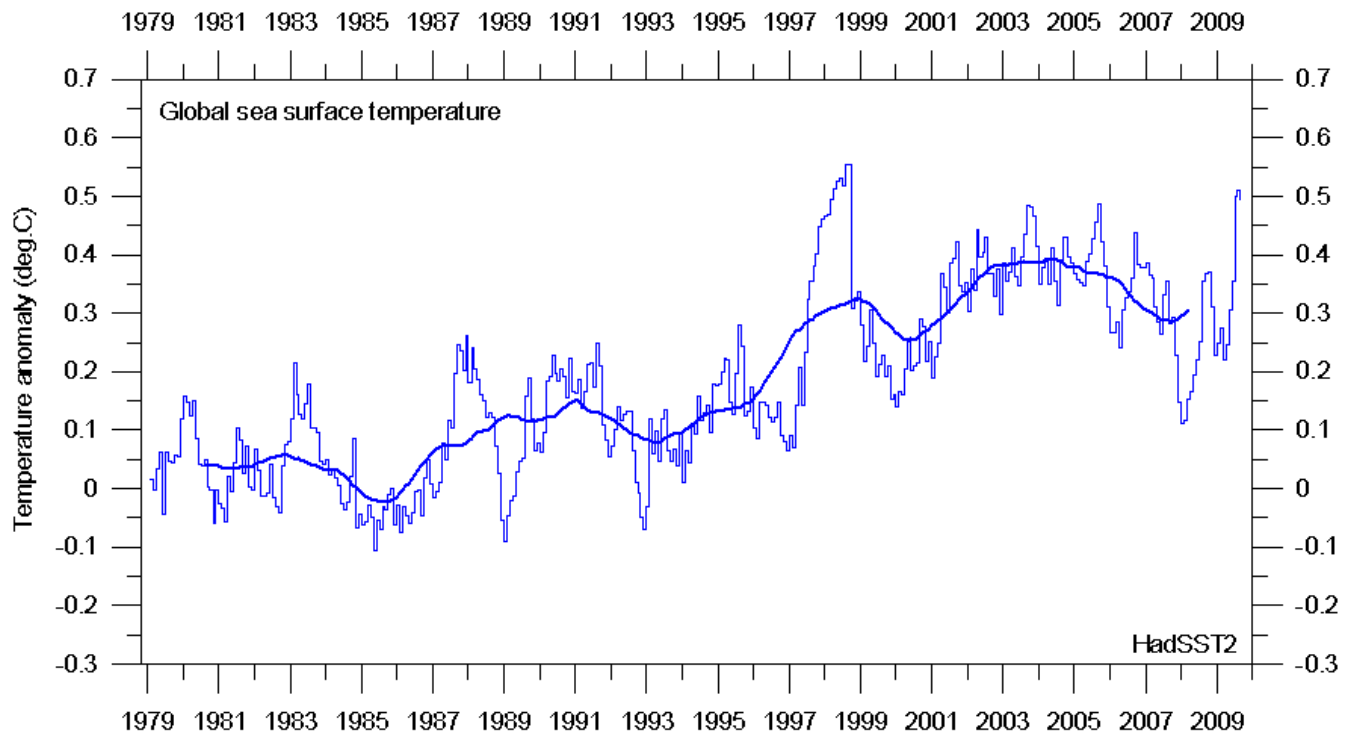
Global monthly average surface air temperature since 1979 according to according to the [National Climatic Data Center \(NCDC\)](#), USA. The thick line is the simple running 37 month average.

Global sea surface temperature, updated to August 2009

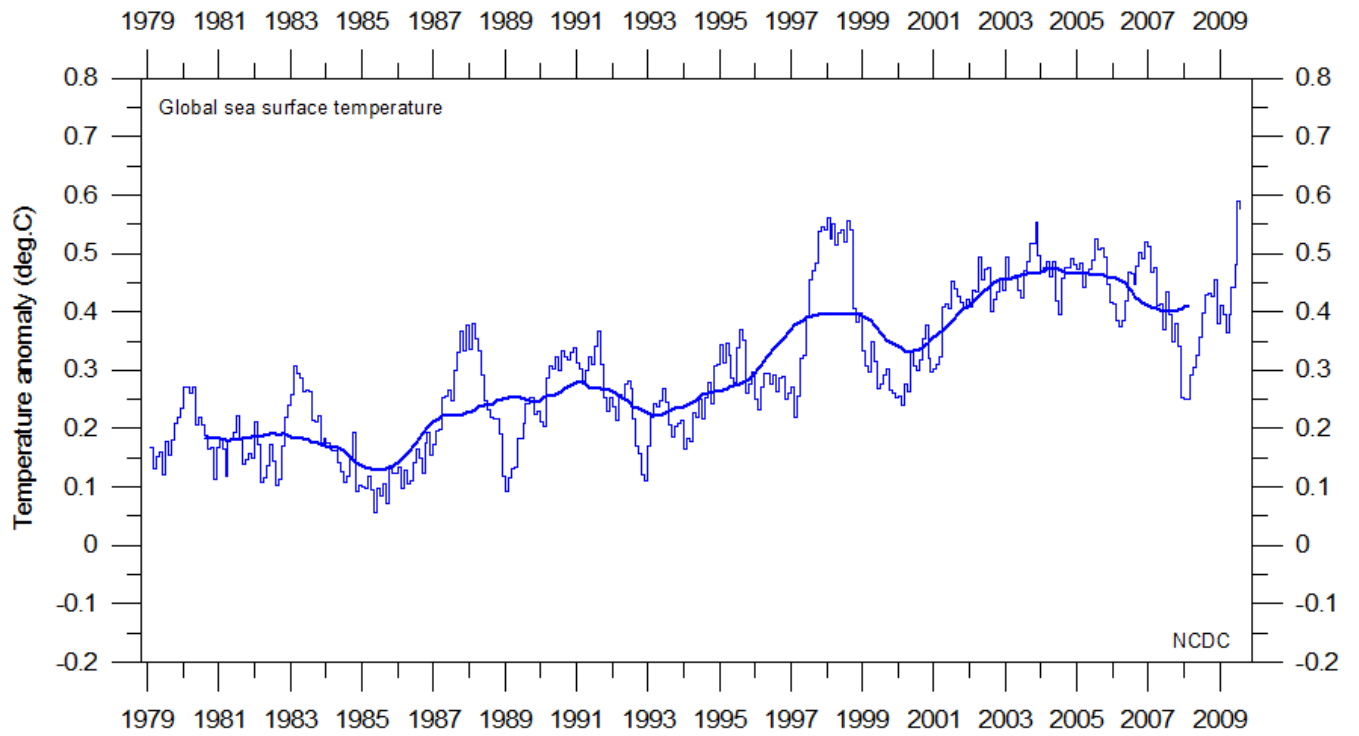


Global monthly average lower troposphere temperature over oceans (thin line) since 1979 according to [University of Alabama](#) at Huntsville, USA. The thick line is the simple running 37 month average.

5

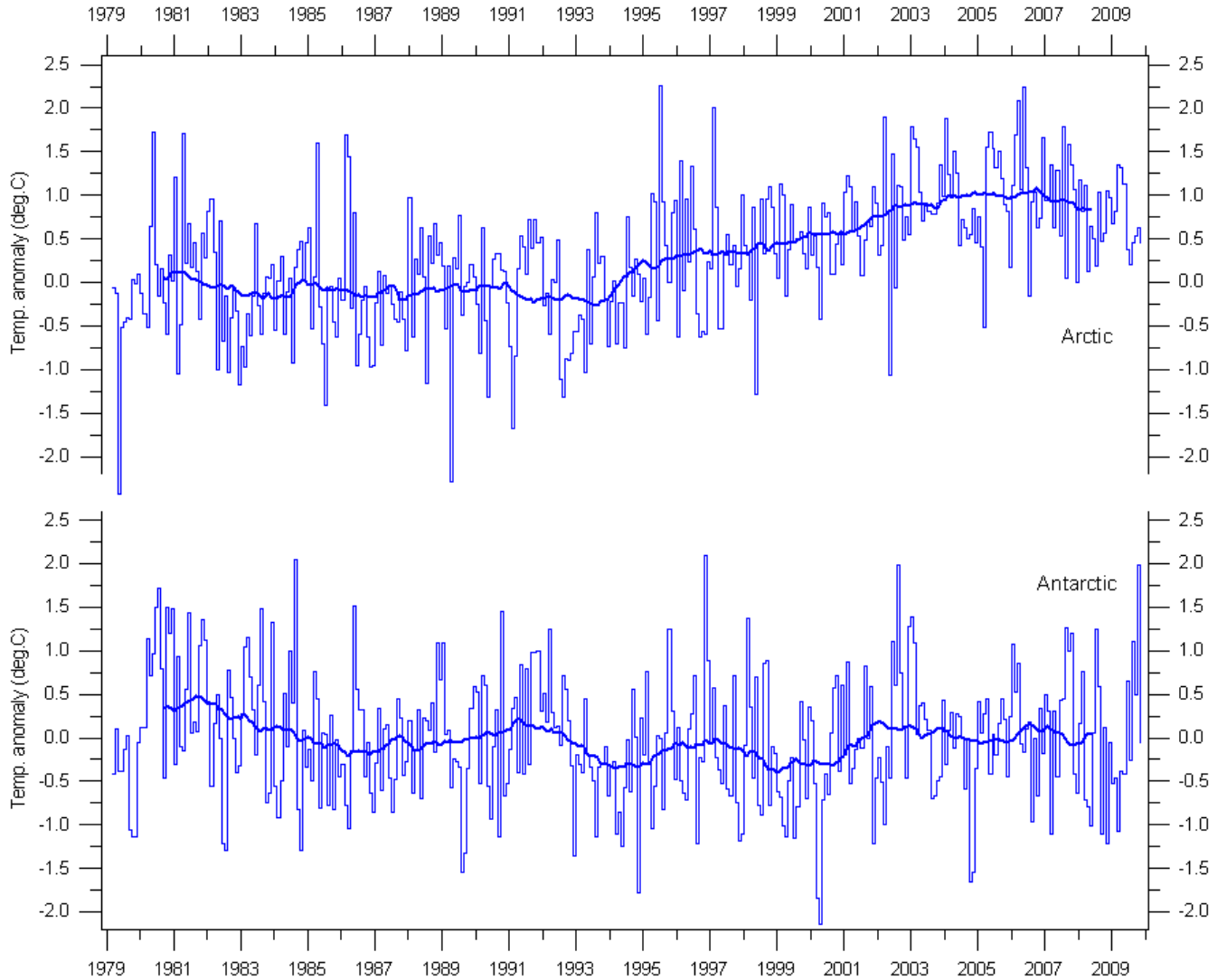


Global monthly average sea surface temperature since 1979 according to University of East Anglia's [Climatic Research Unit \(CRU\)](#), UK. Base period: 1961-1990. The thick line is the simple running 37 month average.



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. Diagram updated to July 2009.

Arctic and Antarctic lower troposphere temperature, updated to August 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 August 2009

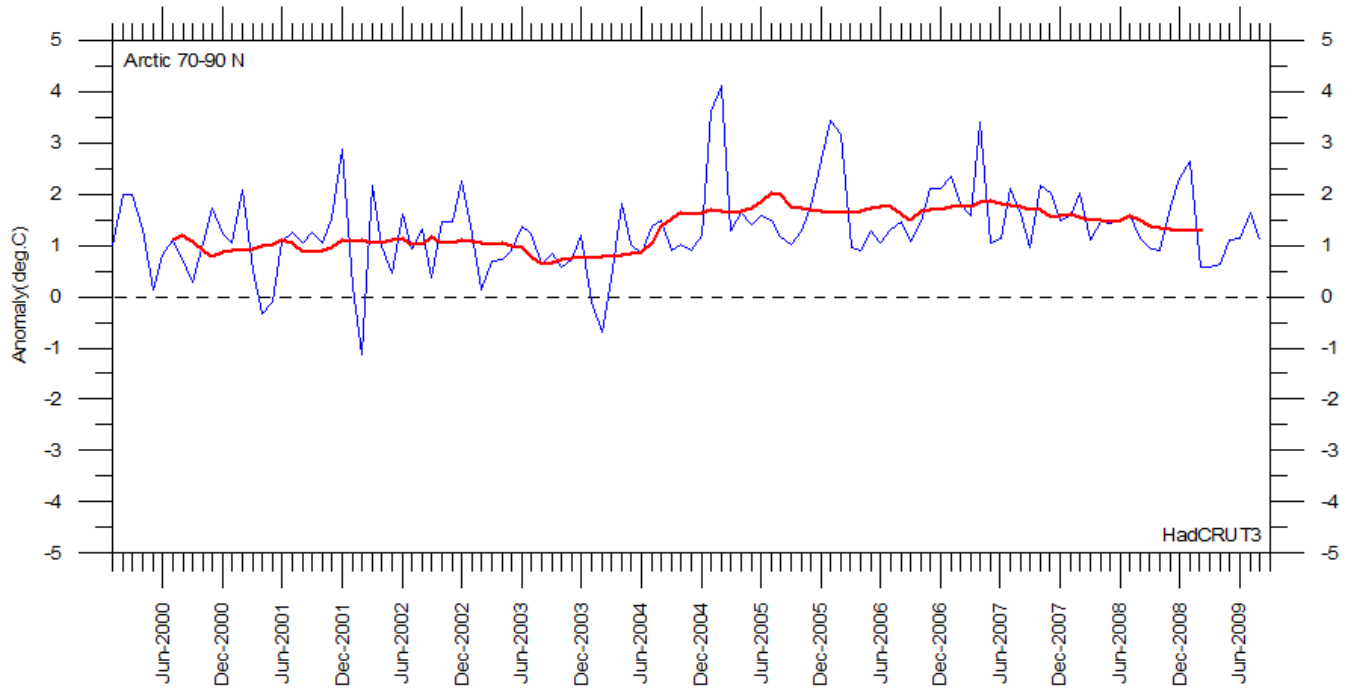


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley Centre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

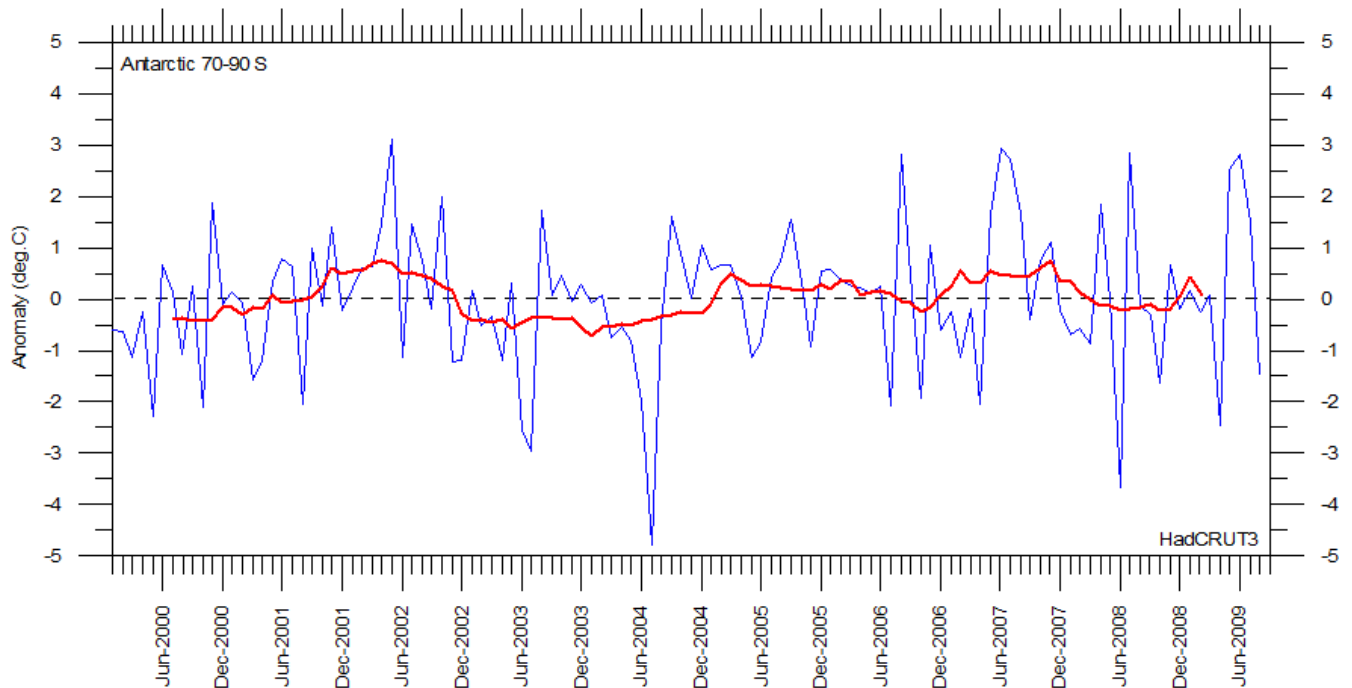


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 2000, in relation to the WMO reference "normal" period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. Data provided by the Hadley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

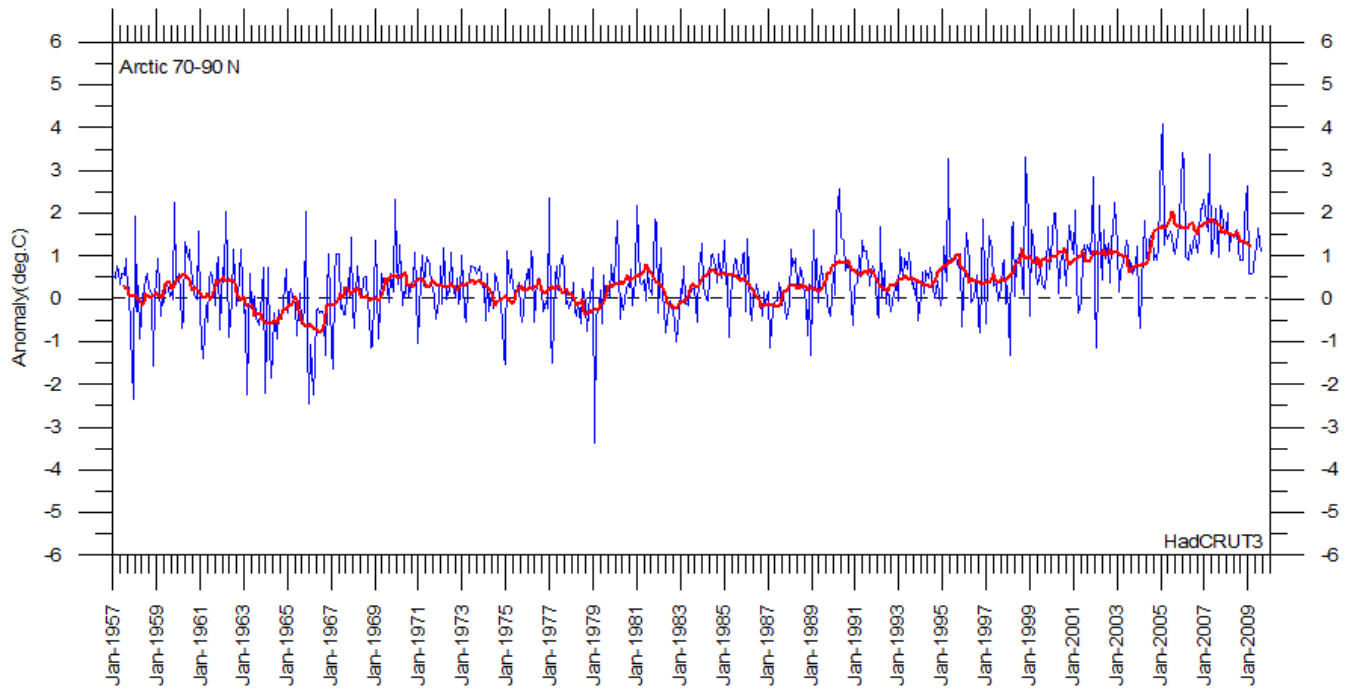


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1957, in relation to the WMO reference “normal” period 1961-1990. The year 1957 has been chosen as starting year, to ensure easy comparison with the maximum length of the realistic Antarctic temperature record shown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

9

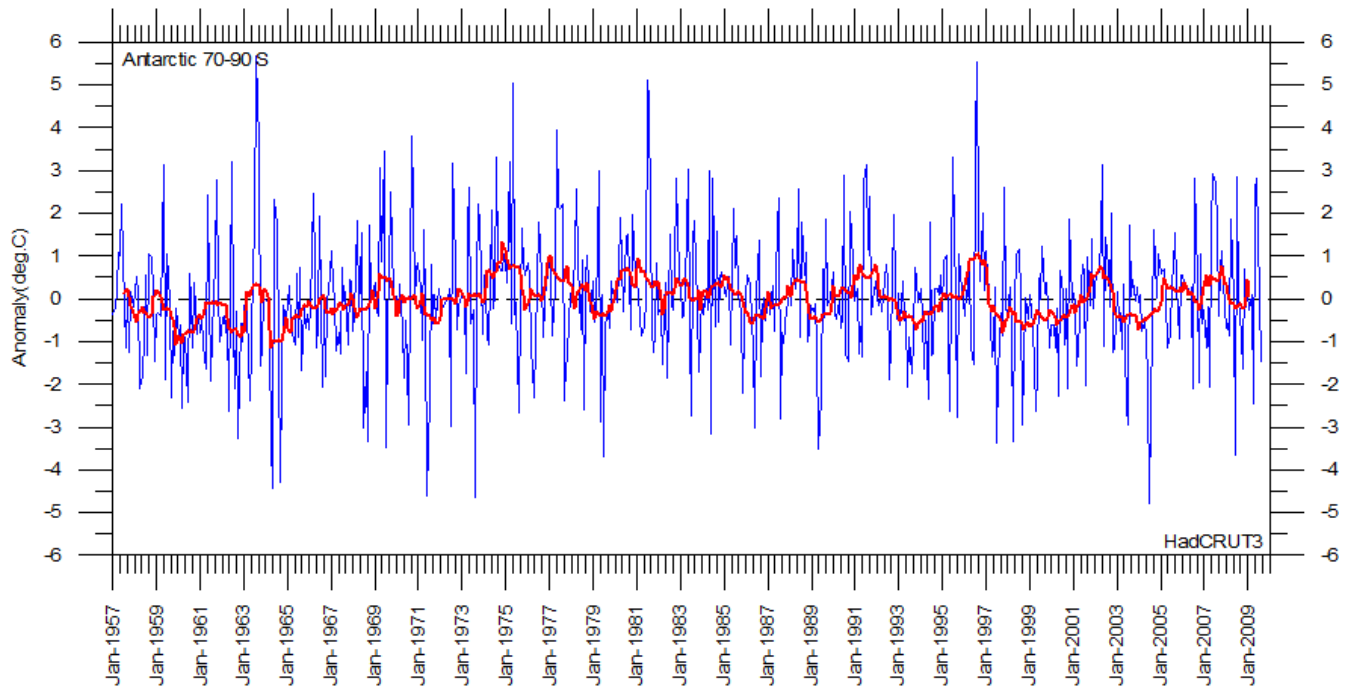


Diagram showing Antarctic monthly surface air temperature anomaly 70-90°S since January 1957, in relation to the WMO reference “normal” period 1961-1990. The year 1957 was an international geophysical year, and several meteorological stations were established in the Antarctic because of this. Before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

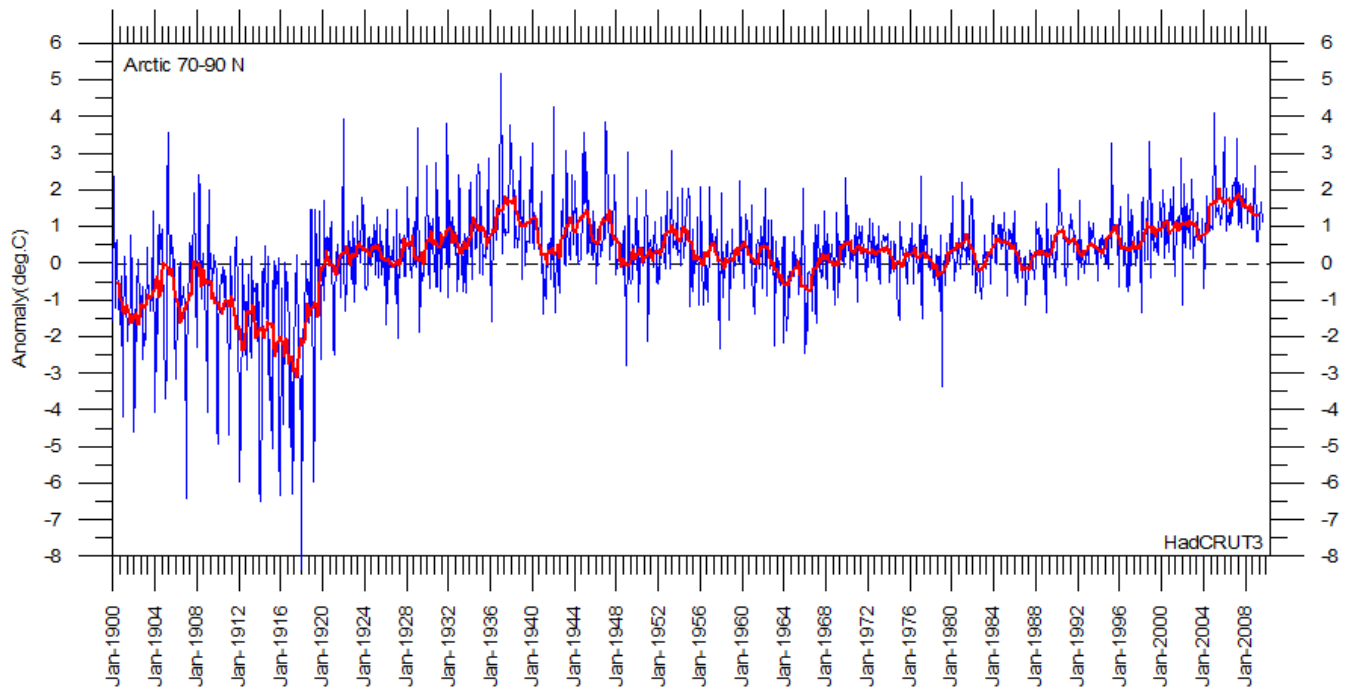
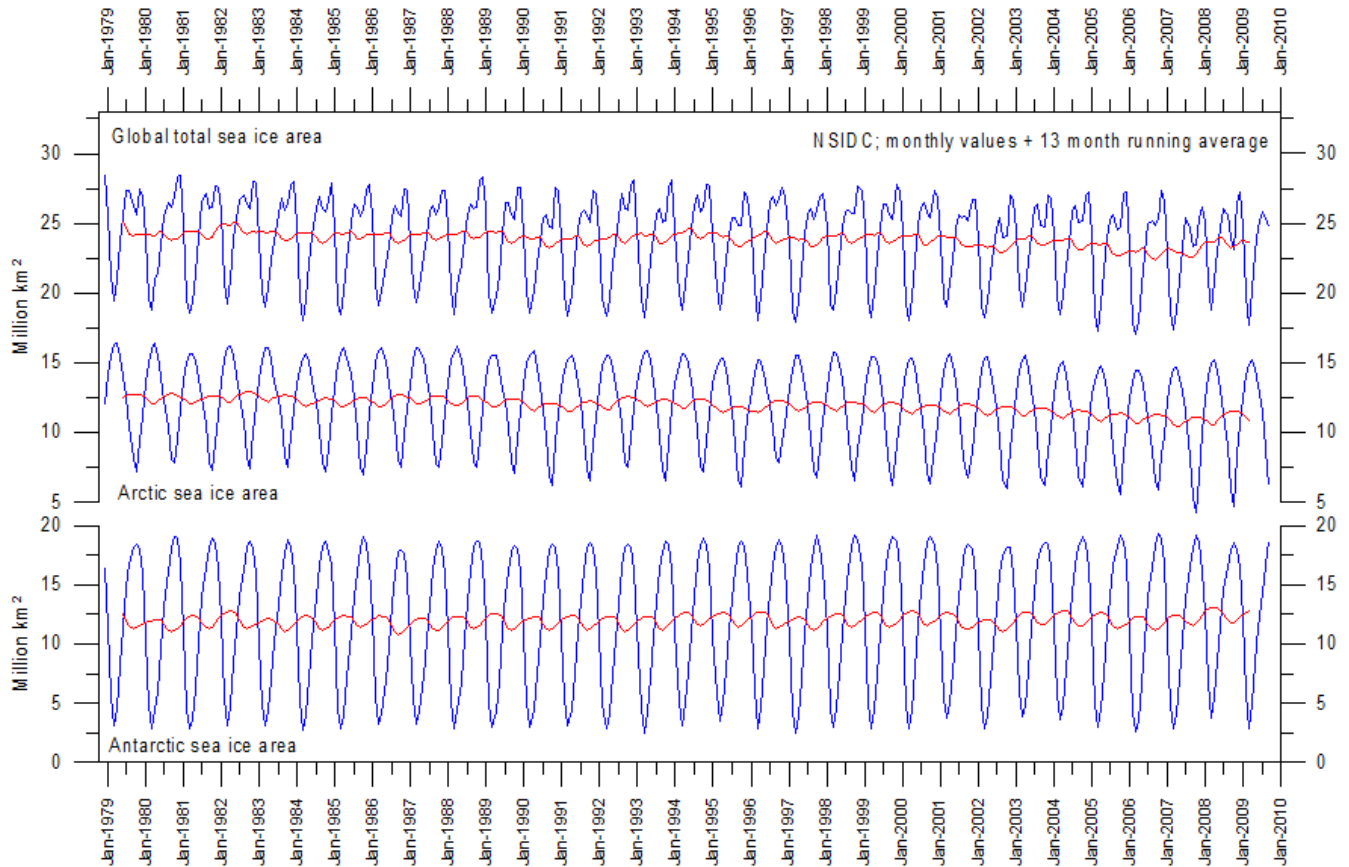


Diagram showing Arctic monthly surface air temperature anomaly 70-90°N since January 1900, in relation to the WMO reference “normal” period 1961-1990. The thin blue line shows the monthly temperature anomaly, while the thicker red line shows the running 13 month average. In general, the range of monthly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

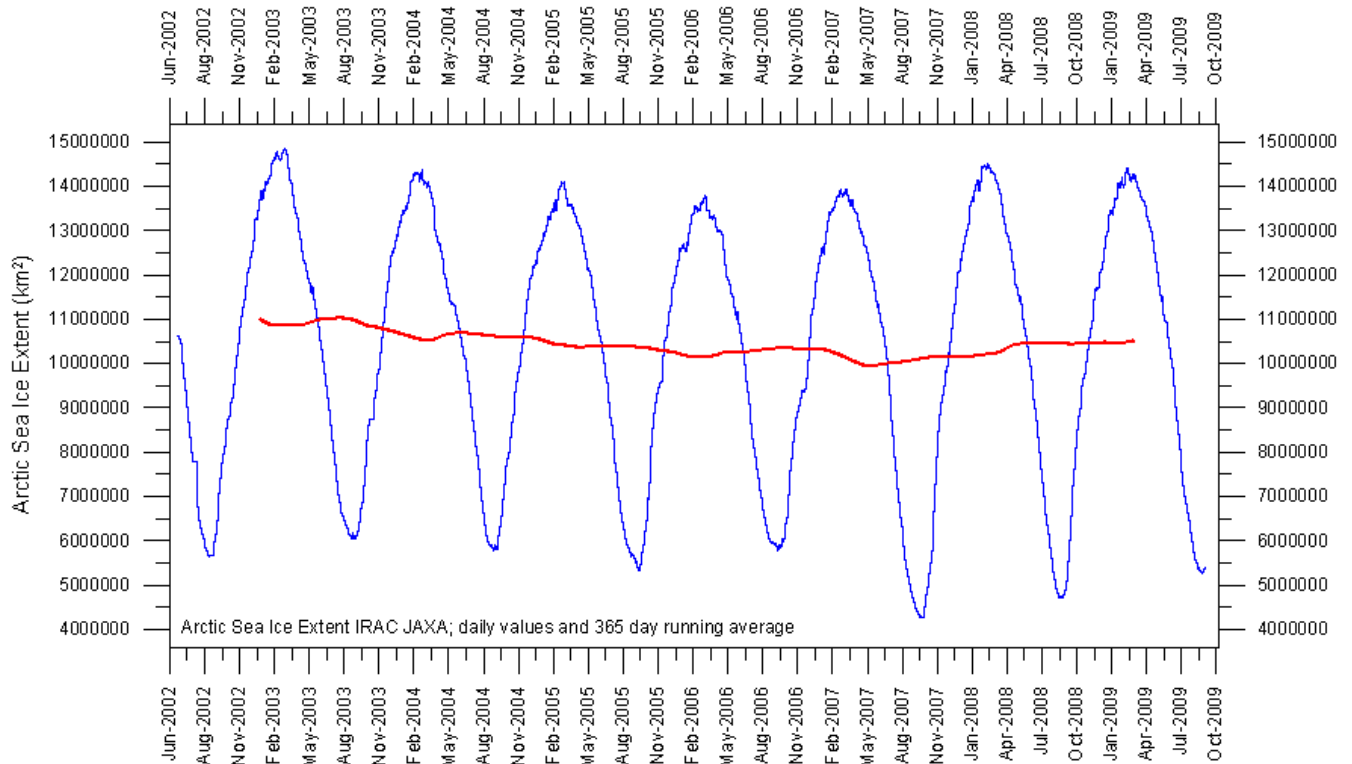
In general, the Arctic temperature record appears to be less variable than the contemporary Antarctic record, presumably at least partly due to the higher number of meteorological stations north of 70°N, compared to the number of stations south of 70°S.

Arctic and Antarctic sea ice, updated to August 2009



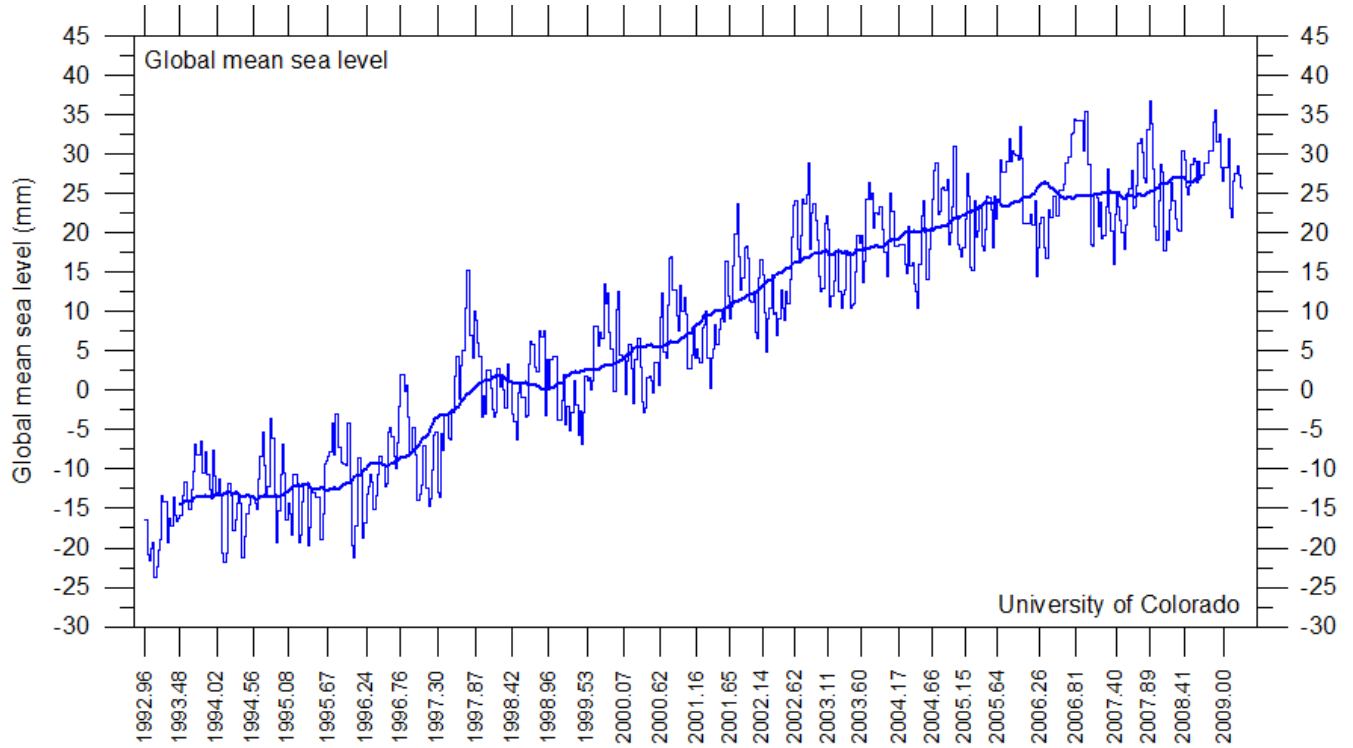
11

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



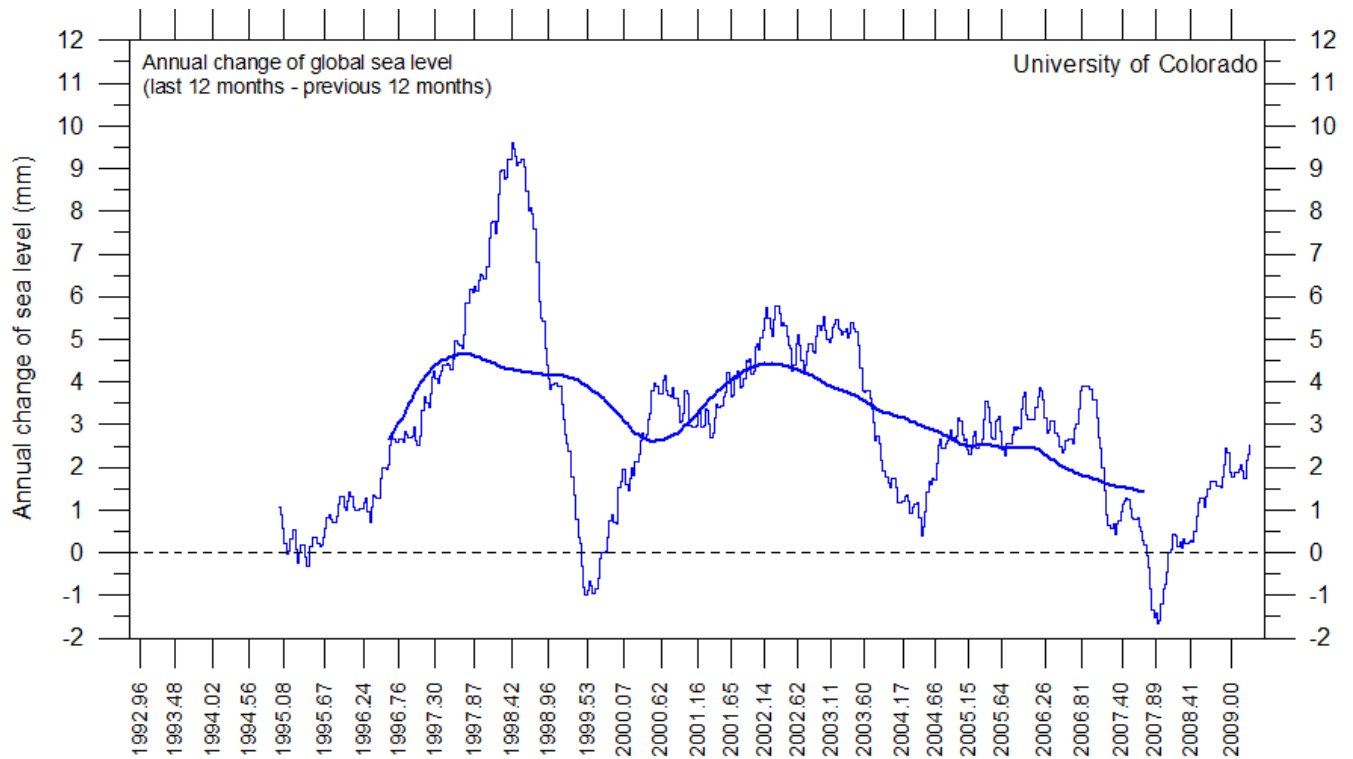
Graph showing daily Arctic sea ice extent since June 2002-21/9 2009, by courtesy of [Japan Aerospace Exploration Agency \(JAXA\)](#).

Global sea level, updated August 2009



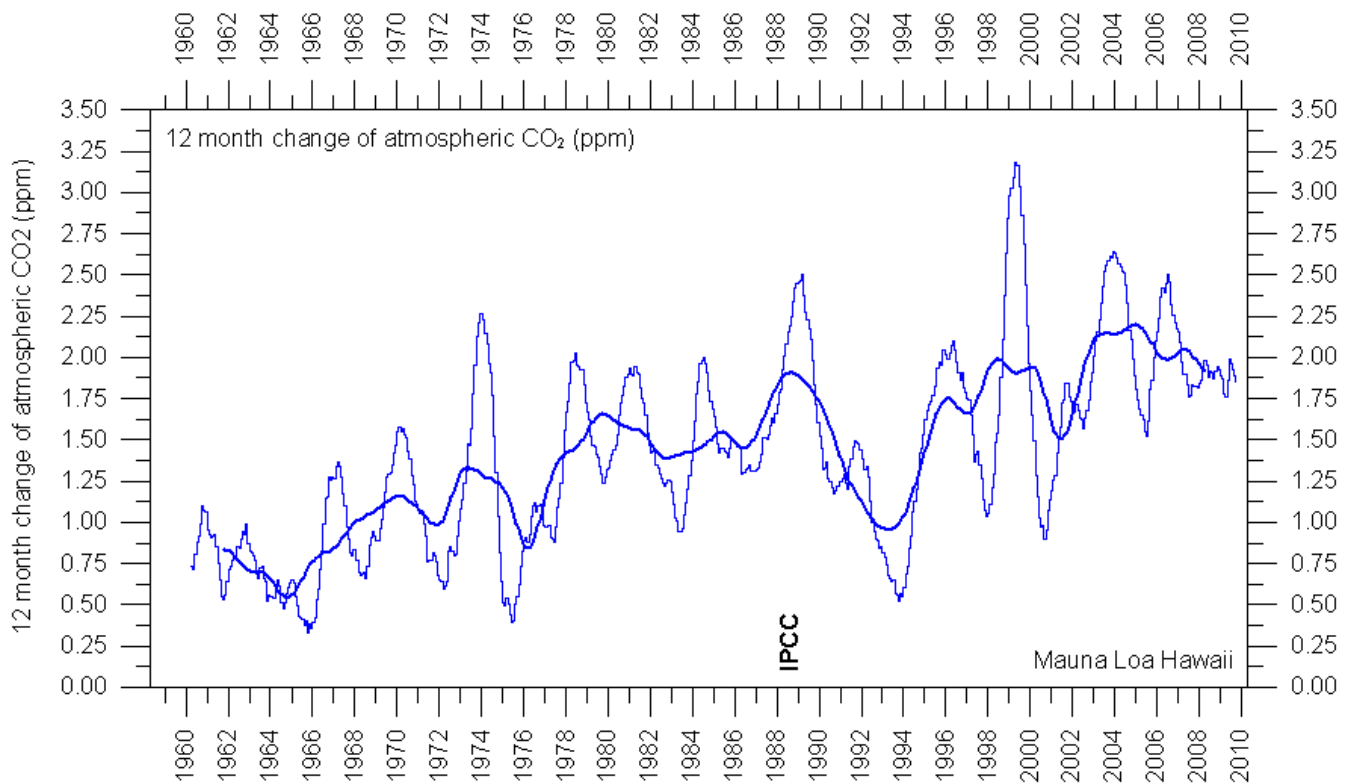
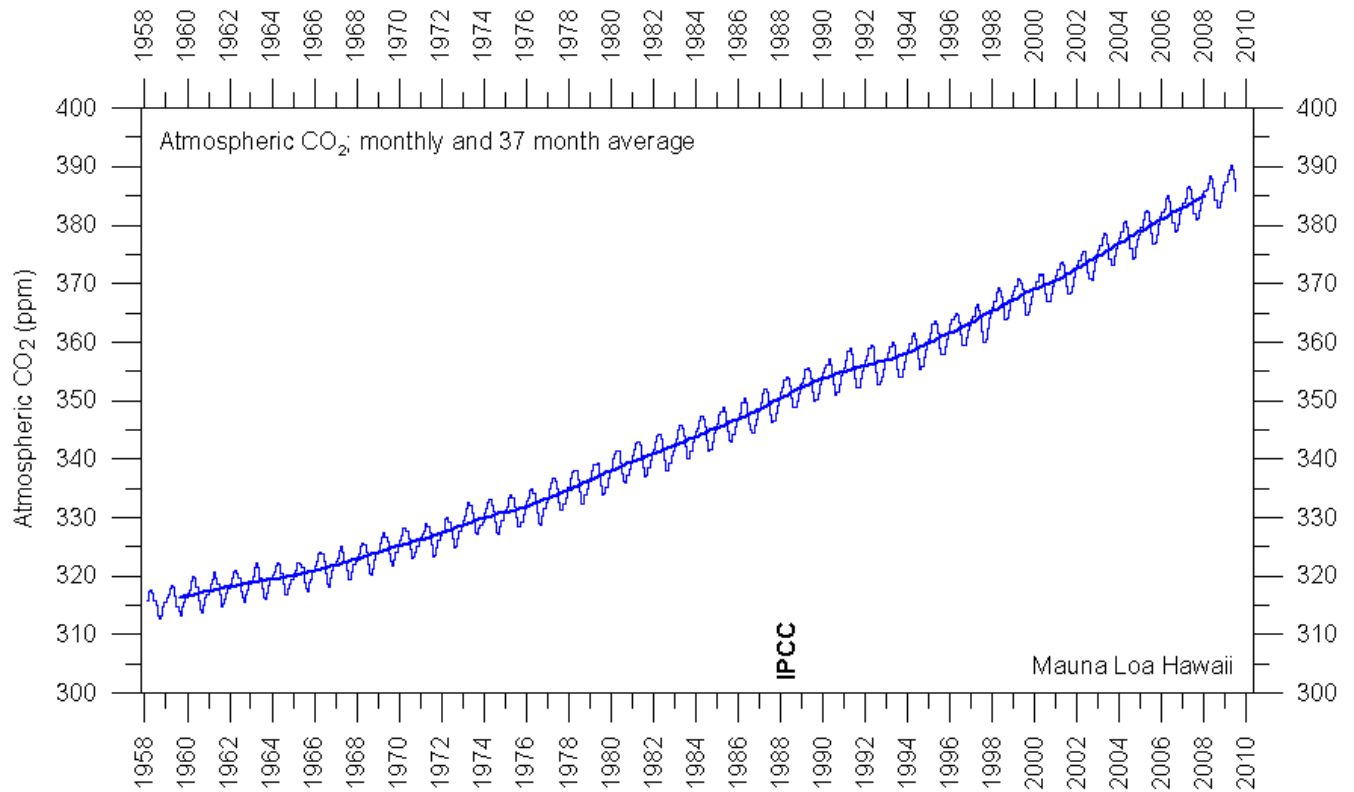
Global monthly sea level since late 1992 according to the Colorado Center for Astrodynamic Research at [University of Colorado at Boulder](#), USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.

12



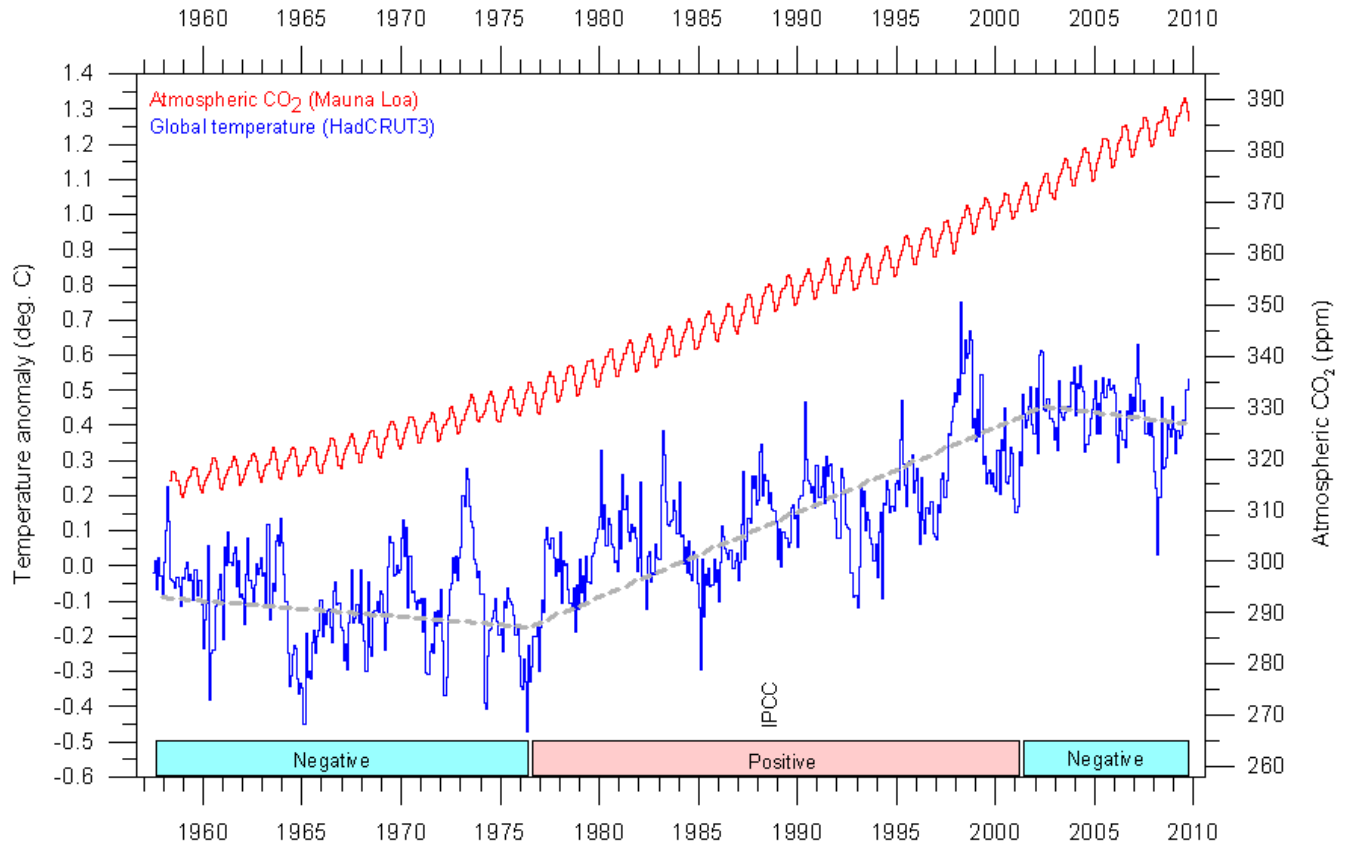
Annual change of global sea level since late 1992 according to the Colorado Center for Astrodynamic Research at [University of Colorado at Boulder](#), USA. The thick line is the simple running 3 yr average.

Atmospheric CO₂, updated to August 2009

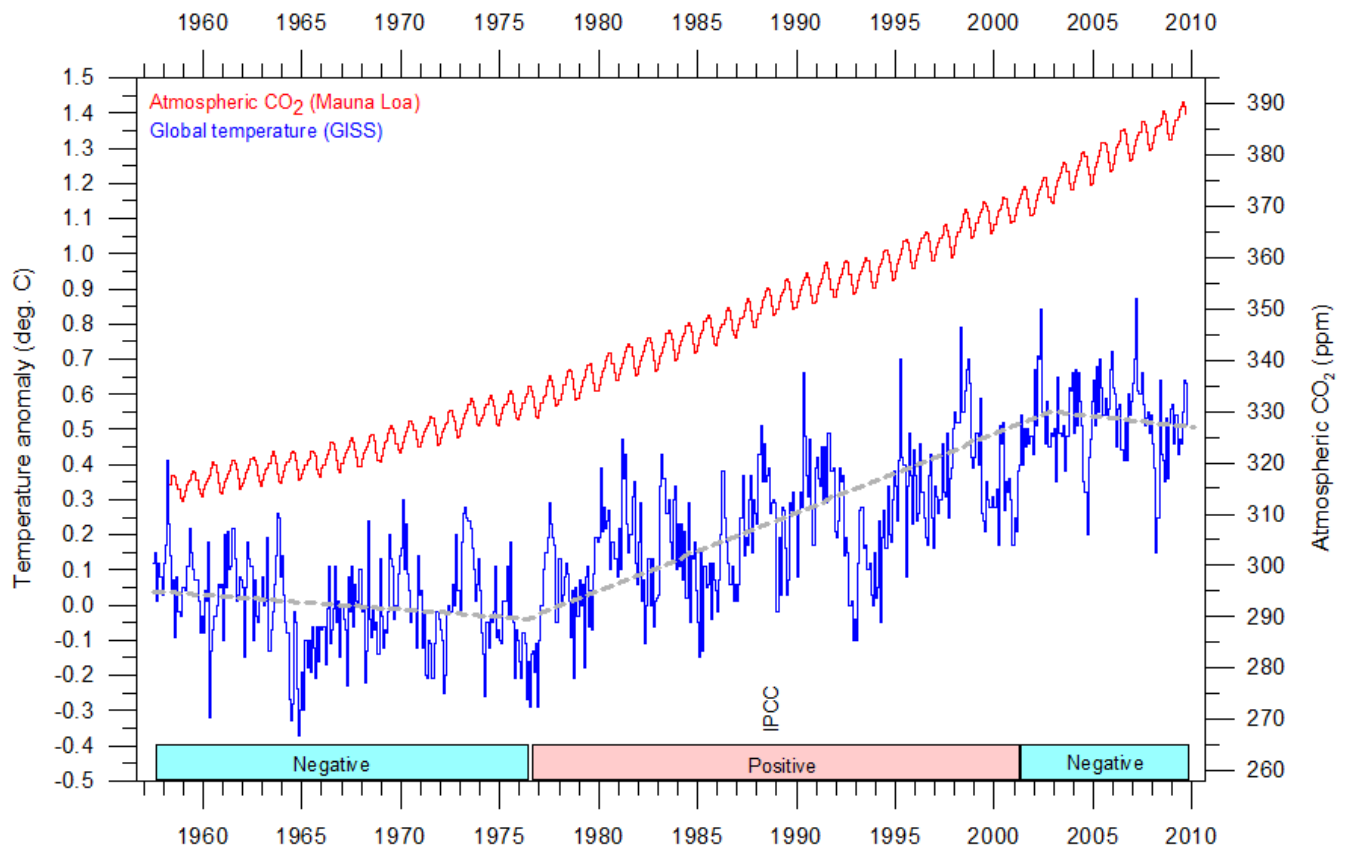


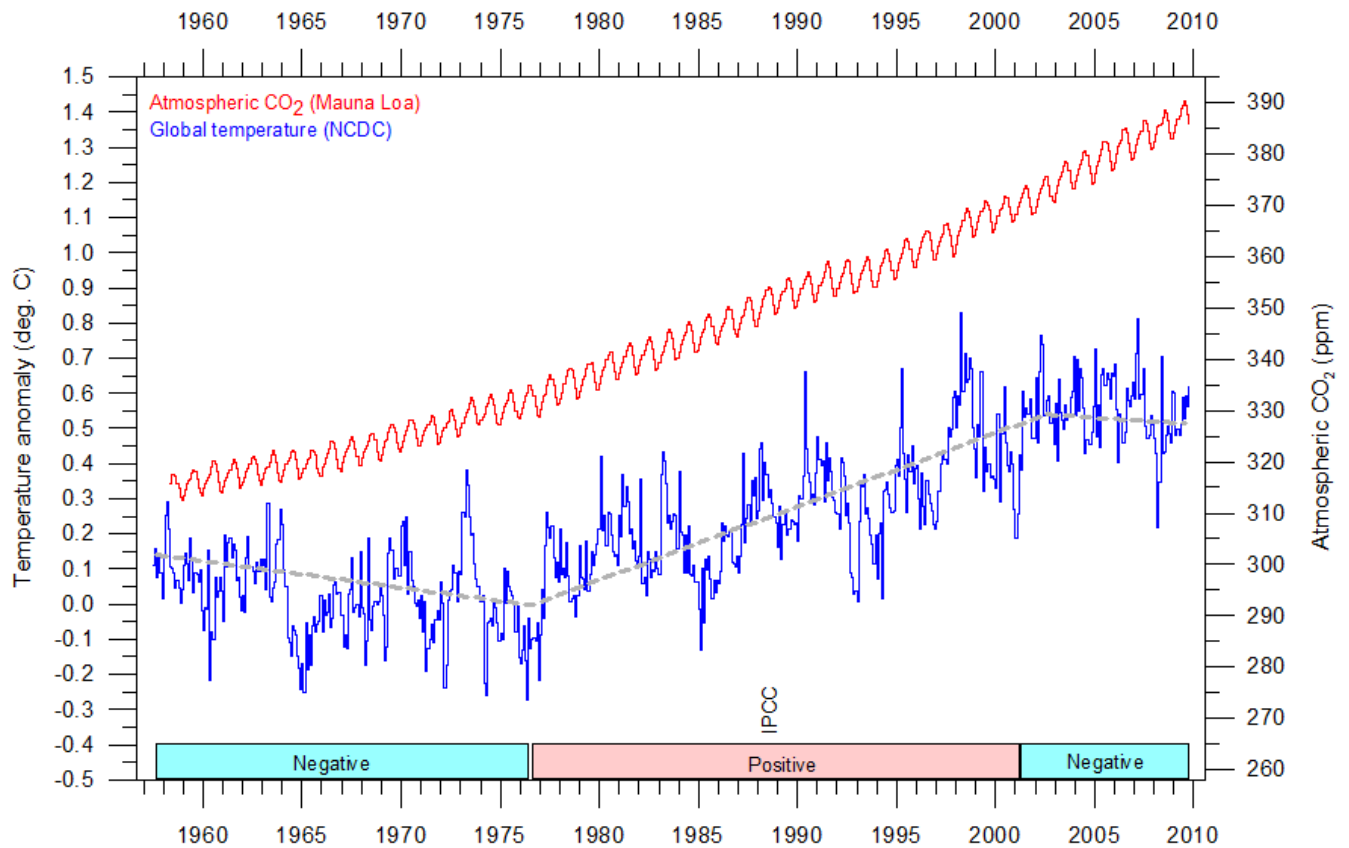
Monthly amount of atmospheric CO₂ (above) and annual growth rate (below; average last 12 months minus average preceding 12 months) of atmospheric CO₂ since 1959, according to data provided by the [Mauna Loa Observatory](#), Hawaii, USA. The thick line is the simple running 37 observation average, nearly corresponding to a running 3 yr average.

Global surface air temperature and atmospheric CO₂, updated to August 2009



14





Diagrams showing HadCRUT3, GISS, and NCDC monthly global surface air temperature estimates (blue) and the monthly atmospheric CO₂ 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 CO₂ concentrations (before 1958) are not incorporated in this diagram, as such past CO₂ 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 CO₂ and global surface air temperature, negative or positive.

Most climate models assume the greenhouse gas carbon dioxide CO₂ to influence significantly upon global temperature. Thus, it is relevant to compare the different global temperature records with measurements of atmospheric CO₂, 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 CO₂ on short time scales such as just a few years.

It is of course equally inappropriate to present new meteorological record values, whether daily, monthly or annual, as support for the hypothesis ascribing high importance of atmospheric CO₂ for global temperatures. Any such short-period meteorological record value may well be the result of other phenomena than atmospheric CO₂.

What exactly defines the critical length of a relevant time period to consider for evaluating the alleged high importance of CO₂ remains elusive, and is still a topic for debate. The critical period length must, however, be inversely proportional to the importance of CO₂ 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 CO₂-hypothesis 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 CO₂ has been indicated in the lower panels of the three diagrams above.

Climate and history; one example among many

1812: Napoleon's Russian summer campaign

22 June 1812 the Grande Armée invaded Russia, crossing the river Niemen. What officially was proclaimed as the Second Polish War had begun. The Russian army had spend a year and a half deploying for an offensive, but instead began retreating the moment operations began. To add to the general confusion, issues like command and strategy had not been decided because of chaos and intrigue at the Russian headquarters. As nobody and nothing was prepared, the Russian army commanded by general Barclay therefore continued their retreat without major resistance, looking for a suitable position in which to make a stand. Apparently such a position was not easily found, so the retreat continued for weeks. This development left people in Moscow and St. Petersburg bewildered about what was going on, and Tsar Alexander found himself in a difficult position. Already on 28 June Napoleon entered Vilna, 170 km east of Niemen.

In western Russia the weather July 1806 turned out to be exceedingly warm with daytime temperatures reaching 36°C (Zamoyski 2005). Many French soldiers who had previously campaigned in Egypt claimed that they had never marched in such a heat. Early July a heavy thunderstorm drifted across the area near Vilna, for a short time making all roads impassable. Worse, losses among the Grande Armée's horses were horrific. This left Napoleon's artillery in a difficult position, but the army's supply organisation was even harder affected. After the rainstorm, the warm weather continued. The remaining horses were having a terrible time. Unused to the kind of diet they were exposed to, they suffered from colic and diarrhoea or constipation. The overall supply situation therefore rapidly deteriorated, and most soldiers had to find something to eat and to prepare it themselves. Not surprisingly, under these circumstances, many soldiers died of dehydration, malnutrition and hunger, while others got dysentery. When the Grande Armée 28 July reached Vitebsk 400 km into Russia, the whole army had already been reduced by a third, without fighting a single major battle. The summer weather was beginning to turn the whole campaign into a nightmare.

The Russian army was no happier than the French, and its troops were in a state of dejection as they retreated towards Smolensk, 380 km southwest of Moscow. Napoleon was convinced that the Russian army would have to fight in defence of the wholly city of Smolensk. The Russian forces and general Barclay were, however, in a state of tactical confusion, and no strong defence of the city was organised. Smolensk went up into flames, and fell to Napoleon 17 August. The burnt-out city represented neither an effective bastion nor a hard-needed resource for his army. According to his secretary Baron Fain (Zamoyski 2005), Napoleon himself was presumably feeling disheartened and disgusted at the turn events had taken, and did not quite know what to do next.

The battle of Smolensk had also demonstrated the unpleasant fact to Napoleon, that the individual Russian soldier did not lay down his arms even in very difficult situations. 129 years later Adolf Hitler would make the identical observation. The French were dismayed by all this. This was not how war was supposed to be. In addition, these discomforts were added to by the fact that the Russians had adopted a new tactic now that the invaders were in the Russian homeland proper. They evacuated the entire population as they retreated, leaving towns and villages deserted and burnt down. It became increasingly difficult for the French army to find provisions.

Napoleon realised that he could not stop where he was, and as he would not retreat for political reasons, he could only advance in the hope of eventually obtaining a decisive military victory over the Russians. If not before, the Russians would surely make a stand in defence of their old capital Moscow. Based on existing knowledge on climate in western Russia, Napoleon at that time expected at least two months of decent campaigning weather ahead.

The mood at Russian headquarters was hardly better, even though the general situation was changing in their favour. The retreat was a good deal less orderly than before, and the Russian armies were now leaving behind them a trail of abandoned wagons and dead or dying men and horses. Like the French, the Russians were disturbed by the inhumane turn the campaign had taken. The ongoing retreat meant that discipline were fast breaking down, and everybody was on the lookout for traitors. All this was having a detrimental effect on the army and Barclay's authority.

In St. Petersburg Tsar Alexander found the general mood depressingly defeatist, and decided that the Russian army needed a new commander instead of Barclay. He was hard pressed by the public opinion to choose Field Marshal Mikhail Ilarionovich Kutuzov as Barclay's successor. Alexander himself was not to happy about this, as he considered Kutuzov both immoral and incompetent. His sister Catherine, however, urged him to bow to the inevitable, and Kutozov was appointed 20 August 1812. Kutuzov declared that he was going to save Moscow, and set off to find his headquarters.

After assessing the state of the Russian army Kutuzov suddenly felt that he could not face Napoleon, whose strength now was gauged at 165,000, down from the original 450,000. The Russian summer had taken its toll. Kutuzov therefore decided to continue the retreat initiated by Barclay two months before. Perhaps he also suspected Napoleon to be a superior general to himself. On 3 September Kutuzov inspected defensive positions found near the village of Borodino, about 100 km west of Moscow. Here he was going to make a stand.

Kutuzov took up entirely defensive positions without any tactical possibility of gaining the initiative. Luckily for him, Napoleon had just caught a cold with an associated attack of dysuria, and was in anything approaching his usual form. In fact, Napoleon was going to deliver probably the worst performance of his entire military career. The invading French army was now down to 126,000, while Kutuzov had about 155,00 men under his command.



The Battle at Borodino 6 September 1812 (oil painting by Hess), with Napoleon watching from the Shevardino Redoubt (oil painting by Vereschagin).

The first large battle during Napoleon's Russian campaign began in the morning of 6 September 1812. Before this battle, both armies had lost more than half their original strength during eight weeks of Russian summer. The battle of Borodino was a hard fought battle with several Russian counterattacks, but slowly the French was getting the upper hand due to its superiority on the tactical level, and the Russian army had to retreat. The battle of Borodino was the greatest massacre in recorded history, not to be surpassed until the first day of the battle at Somme in 1916. Recent estimates give a total of about 73,000 casualties, 45,000 Russian and 28,000 French including allies.

Kutuzov's army was now in no condition to give battle on any positions, however strong. He therefore fell back to the village Fili west of Moscow, initially announcing that he would fight in front of Moscow to the last drop of blood. At the following council of war in Fili, however, he took the decision to abandon Moscow to Napoleon, to preserve the Russian army in being, a scene memorably portayed in Tolstoy's War and Peace. The Russian army therefore continued its retreat through the Moscow to the consternation of the inhabitants. Kutuzov then turned south and later southwest, setting up a fortified camp for his army near Tarutino, about 120 km SW of Moscow.

The village Fili (now a suburb of Moscow) reappears later in history. Somewhat ironic, this was the location chosen by Trotsky in 1922 for cooperation with the German Junkers aircraft company for secret German-Russian production of aircrafts and engines, at a time where the German Reichwehr by the 1919 Versailles treaty was limited to 100,000 men and the development of military aircraft, tanks, battleships and other top-of-the-range military assets was limited (Bellamy 2007). In early December 1941, Fili also marks one of the the foremost position reached by the German Wehrmacht on their trust towards Moscow during Operation Barbarossa.

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Bellamy, C. 2007. Absolute War. Soviet Russia in the Second World War. Pan Books, Pan Macmillan Ltd., London, 814 pp.

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

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23 September 2009.