

Colloquium Marcel Crok at KNMI

The State of the Climate

De Bilt, December 13, 2010

I want to thank KNMI for inviting me to speak today. I am aware that it's not very common that a science journalist is giving a 'scientific' talk for a group of specialists like you have at KNMI. So before we start this needs some explanation. How did I end up right here in front of you?

Most of you know that back in 2005 I published a long article¹ in *Natuurwetenschap & Techniek* about the criticism of the Canadian outsiders Stephen McIntyre and Ross McKittrick on the now infamous hockey stick graph. In retrospect, this was the beginning of a very interesting period in the global warming debate. In December 2004, just before McIntyre's and McKittrick's article was published in *Geophysical Research Letters*, a group of mainstream climate scientists, among which Michael Mann and Gavin Schmidt, started the now well-known blog RealClimate.

In the early days Real Climate published a series of posts criticizing the work of McIntyre and McKittrick. Although in general climate scientists tend to rely on peer reviewed literature, in this case many scientists based their views about the hockey stick controversy on Real Climate. Mann himself never published a reply against the GRL-paper other than on Real Climate. To defend himself against these criticisms McIntyre started his own blog, Climate Audit, in February 2005.

The blogosphere

McIntyre, who was semi-retired at the time, enjoyed writing for the blog. He gained a very large readership, even larger than Real Climate, with over 6 million visitors a year. Many of the readers of Climate Audit, like Jeff Id and Lucia Liljegren started their own blogs and the success of Climate Audit encouraged Anthony Watts to start his blog Watts Up With That. This blog now receives an incredible 2 million visitors a month. These blogs are regarded as skeptical, although bloggers like Steve McIntyre or Lucia Liljegren don't call themselves climate skeptics. On the Pro AGW side you also have many blogs nowadays. Dutch climate scientists are not very active, although Bart Verheggen of ECN with his interesting blog Our Changing Climate² is a noteworthy exception.

McIntyre started by analyzing different temperature reconstructions for the past millennium. Later on he and many of his readers investigated the three global average surface temperature datasets of CRU, NASA and NOAA. McIntyre also made an in depth study of the IPCC-process. His blog became very influential and I believe that without Climate Audit we wouldn't have had Climategate. Not many people know that most of the climategate emails are about the hockey stick controversy and McIntyre is the person that is most often mentioned in the emails. Most of the times in a not so friendly manner. They call him moron³, bozo⁴ and Mr Fraudit⁵. The link to the climategate files was first posted on Climate Audit on November 17th although nobody saw that until two days later.

¹ <http://climategate.nl/wp-content/uploads/2009/12/NWT-feb-2005-hockey-stick-English.pdf>

² <http://ourchangingclimate.wordpress.com/>

³ www.eastangliaemails.com/emails.php?eid=686&filename=1147435800.txt

⁴ www.eastangliaemails.com/emails.php?eid=683&filename=1146062963.txt

In the blogosphere scientists like Michael Mann, Phil Jones and Keith Briffa were very well known. This explains why climategate went viral in the blogosphere so quickly. Many bloggers and blog readers knew how influential these scientists were in their field and in IPCC. The mainstream media however were reluctant to report on Climategate in the beginning. But when a few weeks later a relatively minor error was found in Working Group 2 of the IPCC report about the melting of Himalayan glaciers, the British media jumped on the story. More errors were discovered and IPCC as a whole came under attack. Many climate scientists are outraged by what they call a vicious attack on climate science.

Victim or culprit?

But without studying what happened in the blogosphere or by just following what is written by *Science* or *Nature* one can get away with a wrong impression of what is really going on. Both *Nature* and *Science* for example tend to portray Phil Jones and Michael Mann as the victims of attacks by skeptics that have last for many years. For example they reported that in the summer of last year, Phil Jones was flooded by Freedom of Information Act-requests from McIntyre and many of his blog readers. The impression one gets from this is that these requests by 'sceptics' are totally unreasonable. However, it was Jones who already in 2005 wrote this infamous sentence to the Australian skeptic Warwick Hughes [Slide 3]: "We have 25 or so years invested in the work. Why should I make the data available to you, when your aim is to try and find something wrong with it?" Since that email he refused to make his raw temperature data available for many years.

In the climategate emails we read that already in 2003 members of the Hockey Team decided it's better not to give them [the skeptics] anything:

Mann to Osborn, July 2003: I'm providing these [MBH residuals] for your own personal use, since you're a trusted colleague... This is the sort of "dirty laundry" one doesn't want to fall into the hands of those who might potentially try to distort things.

*Mann to Jones, Feb 2004: I wouldn't send him [McIntyre] anything. I have no idea what he's up to, but you can be sure it falls into the "no good" category... I would not give them *anything*. I would not respond or even acknowledge receipt of their emails. There is no reason to give them any data, in my opinion, and I think we do so at our own peril!*

Jones to Mann, Feb 2005: The two MMs have been after the CRU station data for years. If they ever hear there is a Freedom of Information Act now in the UK, I think I'll delete the file rather than send to anyone.

It's this obstruction to a healthy and transparent scientific process that has been the motivation for people like McIntyre, McKittrick, Watts and Willis Eschenbach to continue asking for data. The scientists under scrutiny claim this is all motivated though by funding from the fossil fuel industry. Michael Mann recently said in an interview⁶:

Unfortunately, there are powerful special interests in the fossil fuel industry for whom the prospect of climate change policy—a price on carbon emissions—would be extremely costly. They have invested millions of dollars in well-honed disinformation campaigns to convince the public and policy makers

⁵ www.eastangliaemails.com/emails.php?eid=973&filename=1242132884.txt

⁶ <http://bos.sagepub.com/content/66/6/1.full>

that human-caused climate change is either a hoax, or not nearly the threat that the scientific community has established it to be. In many respects, it comes straight from the same playbook used by the tobacco industry to cast doubt on the health threat of tobacco smoking. Indeed, many of the same players are involved.

The criminal theft, release, and misrepresentation of private emails from the University of East Anglia immediately prior to the Copenhagen Climate Summit last December was part of a carefully orchestrated smear campaign against the climate science community timed to thwart any binding international agreement to limit greenhouse gas emissions. Climate-change denial outfits collaborated closely with conservative media outlets to manufacture a fake scandal that would distract the public and policy makers at this crucial juncture. Historians will look back at this as a low point of intellectual dishonesty in the corporate-funded, climate-change denial campaign.

The problem with Mann's reasoning is that for most of the well known skeptics or critics of the IPCC-process today the accusations are just not true. People like Lindzen, Spencer, Christy, Pielke sr. but also outsiders like McIntyre and McKittrick don't receive money from the fossil fuel industry. Astrophysicist Willie Soon does receive money from the industry. I recently asked him why. He told me that for the past seven years all of his applications for grants from NSF and NASA were rejected, probably because he is openly skeptic. So he accepts money from the industry but also from multimillionaires like Richard Branson for example.

All this talking about funding from the denial industry is keeping the attention away from the science itself. The American climate scientist Judith Curry is one of the few mainstream scientist who openly speaks out against the behavior of scientists like Mann and Jones. As a result of this she is now enemy number one on sites like Real Climate and Joe Romm's Climate Progress. Last week she wrote on her blog as a follow up on her testimony for Congress⁷ [Slide 4]:

While free market fundamentalism and "big oil" may have been a major source of skepticism in the past, the current dominant group of skeptics, enabled by the blogosphere, seeks accountability. Many of these skeptics have professional backgrounds and extensive experience with the practical application of science and regulation, without any particular political motivations and certainly without funding from "big oil." Failing to recognize this new breed of climate skeptics, and dismissing them as politically motivated deniers or merchants of doubt, led to the events that were revealed by the CRU emails.

I fully agree with what Curry is saying here and this is what I've tried to show in my book. So the book is based on a mixture of the peer reviewed literature, the IPCC reports, blog articles, the climategate emails and interviews. Only with this heterogeneous mixture of information you can start to understand what is happening right now in the global warming debate.

My funding

After my hockey stick article in 2005 I started following the global warming debate on a daily basis. I wrote a series of articles for NWT and in 2008 I decided to start working full time on a book. As the money question seems to be so relevant all the time, how did I finance the book? Well, I won the Glazen Griffioen in 2005 for the Hockey Stick article which was 10,000 euro. Next the Fonds voor

⁷ <http://judithcurry.com/2010/12/09/testimony-followup-part-ii/#more-1469>

Bijzondere Journalistieke Projecten gave me a grant of 12,000 euro, half of which is a loan by the way. The rest of the funding came from my bank savings.

The research phase for the book ended late 2009 but then climategate broke out. After reading the emails for a couple of days I decided this could be a turning point in the debate. More people would realize that the good guys were not so good after all. I decided to postpone the book and start blogging about climategate first. So with some colleagues I started the blog climategate.nl. In March of this year I started writing the book. Some commentators have said the book is about climategate, but I disagree with that. Climategate only plays a minor part in the book, for the reason I gave earlier: most of the climategate emails deal with the hockey stick controversy and this debate is of course only a small part of the global warming debate as a whole.

No debate

The global warming debate is so polarized that there are only few direct exchanges between the mainstream scientists and skeptics, even at large meetings like the AGU and EGU. A notable exception by the way was the colloquium that Stephen McIntyre gave here at KNMI in 2006. When Judith Curry invited McIntyre for a talk in 2008, she was heavily criticized by many of her colleagues.

This lack of exchange is also visible in the climategate emails. How often are Jones, Trenberth and Mann having a constructive exchange with the skeptics? The same applies of course for the skeptics. A great advantage of being a science journalist is that you can cross borders between the camps and have interviews with scientists at both sides of the spectrum.

I cannot emphasize enough how important it is to talk with the scientists face to face. My interviews with mainstream climate scientists were in general as pleasant as with more skeptical scientists. In Zürich I talked for 5 or 6 hours with Reto Knutti, someone of my age. He sincerely believes in a climate sensitivity of at least 3 degrees and after my lengthy conversation with him I better understand why. However there are other good scientists out there, like Roy Spencer and Richard Lindzen, who believe climate sensitivity could be as low as half a degree Celsius for a doubling of the CO₂ concentration. This is far below the lower range of IPCC, which is about 2 degrees, and this in my opinion shows the problem of IPCC. Why isn't their range going all the way down to at least half a degree? And why are scientists like Spencer and Lindzen not involved in the crucial IPCC chapter on detection and attribution?

Still no proof

Some commentators say my book is one-sided. I can understand that. My rather straightforward approach in the book was this: is there serious criticism on major IPCC conclusions and if so, how did IPCC deal with this critique? It turns out that there is a lot of valid criticism on the IPCC view and that in most of the cases IPCC did not fully acknowledge this criticism. So when you read example after example how IPCC failed to give credit to skeptical views, this gives the impression of one-sidedness. Is this my fault?

In the concluding chapters of my book I write that the CO₂ hypothesis is still a plausible hypothesis but nothing more than that. There is no convincing proof yet that the recent warming is caused by greenhouse gases. Interestingly, this view was supported in a interview I had with a well known mainstream climate scientist, Graeme Stephens of Colorado State University. He said something like 'sooner or later the CO₂ signal will be visible'. This of course is a much weaker conclusion than the

iconic statement of IPCC that it's very likely that most of the warming in the last 50 years is due to anthropogenic greenhouse gases.

Pillars

Now what are some central pillars behind the greenhouse hypothesis and why are some scientists skeptical about one or more of these pillars? In the remainder of my talk I want to give you some examples that helps you to understand why there is informed skepticism about AGW.

The first and one of the most influential pillars of course is the global average surface temperature [Slide 5]. In interviews I noticed that mainstream climate scientists have great faith in this dataset, mainly because three independent groups, CRU, GISS and NOAA, ended up with more or less the same result. Although everyone is aware of potential problems with temperature data, like siting problems, lack of metadata, difficulty with homogenizing time series and the urban heat island effect, most climate scientists and IPCC thinks these potential problems have no serious impact on the end result. Both in the blogosphere and in the peer reviewed literature though there is a whole lot of criticism on the global average temperature graphs. First, the three datasets used by CRU, GISS and NOAA are not independent at all. Over 95 percent of their data is coming from the Global Historical Climatology Network, GHCN.

Second the number of stations in the GHCN network has greatly declined since 1990 [Slide 6]. Lots of stations are not updated any more into monthly average values and these monthly values are used for the global datasets. The number of stations is now around 1200 which is less than we had in 1919. In a recent analysis of temperature data Ross McKittrick showed the difference between the adjusted and unadjusted GHCN-data. You can see the magnitude of the adjustments getting much bigger after 1990.

Anthony Watts with volunteers from all over the country investigated the quality of the 1221 USHCN weather stations in the US. More than 90 percent of them fell in category 3, 4 or 5 which means that errors of more than 2 degrees Celsius are to be expected [Slide 7]. Many of the stations are badly sited, on parking lots [Slide 8], too close to buildings, and next to waste water treatment plants. Despite all these problems, the USHCN network is regarded as one of the best in the world, due to its high density of stations and its relatively large number of rural stations.

US were warmer in the 30-ies

However, as we can see here in this graph [Slide 9], the thirties were as warm in the US as it is now, even according to GISS, although they introduced a new adjustment between 1999 and 2001 which made the record years of 1934 and 1998 now as warm. The well known climate scientist Roger Pielke sr. told me during an interview he is sure that the thirties were even warmer in the US than it is today. The number of heat records also point into this direction [Slide 10].

The question bloggers like Watts and McIntyre have is whether this situation is unique for the US? [Slide11] Globally it is now 0.5 degrees warmer than the peak around 1940, says IPCC [Slide 12], so where is this warming and can we trust it? Here is a graph [Slide 13] from Igor Polyakov for the land regions north of 62.5 degrees. In his 2003 paper⁸ he states [Slide14]:

⁸ <http://www.gi.alaska.edu/~bhatt/publications/polyakov.etal.2003a.pdf>

“Two distinct warming periods from 1920 to 1945, and from 1975 to the present, are clearly evident...compared with the global and hemispheric temperature rise, **the high-latitude temperature increase was stronger in the late 1930s to the early 1940s than in recent decades.**”

Where is Waldo?

McIntyre went on to play a game on his blog that he called Where is Waldo? Waldo in this case is warming now compared to the earlier warm period. He selected from the GISS website for different continents those stations labeled “rural” that extended back in time to at least 1930. Here I show the results for South America [Slide 15]. As one can see there are only seven stations and the average of these stations do not show a trend. And here is Africa [Slide 16 and 17], where the situation is even worse and one cannot conclude anything. So the question is, is the warming that IPCC shows for these continents the effect of blending in urban stations?

In Antarctica there is no proof of Waldo for the simple reason we have no temperature measurements going back to the thirties.

In New Zealand there is a trend of about 1 degree Celsius for the last century but recently skeptics found out that the trend in the raw data is only 0.3 degrees Celsius [Slide 18]. NIWA refuses to explain what the basis is for the upward corrections of most of the stations and now the case is brought to court. The affair has been dubbed kiwigate in the media. In Australia the same discussions about adjustments are going on although here the effect of the corrections is smaller than in New Zealand.

So where is Waldo? Which parts of the globe warmed up compared to the warm thirties? According to the global datasets there is strong warming in Siberia. But if you look closer, than most of the trend there seems to be the effect of urbanization. Here some examples for the cities Bratsk and Irkutsk and the rural sites Cara and Barguzin.

It's easy to blame the bloggers cherry picking, however I invite anyone here to find rural stations that go back to the thirties and show a strong warming compared to the warmer period we had earlier in the twentieth century. A notable exception seems to be Western Europe where I think the evidence for warming since 1940 is convincing. I make compliments in the book for the work that has been done at KNMI to produce the Central Netherlands Temperature [Slide 19].

However even there it's interesting to see what happens internationally. GISS doesn't use the corrected De Bilt-series [Slide 20], but applies its own corrections to the raw data. As one can see the homogenization process fails to correct for the large step change in 1950 [Slide 21]. So a time series that is really trustworthy thanks to the good work done here at KNMI is not used in a correct way in an important international dataset that climate scientists rely on.

Urban Heat Islands

One of the biggest concerns remains that most of the trend in the global dataset could be due to the urban heat island-effect. GISS at least tries to correct for the Urban Heat Island-effect, but outside the US GISS uses obsolete population data for this and strangely enough in 50% of the cases GISS corrects cities upwards, that means the warming trend for the cities becomes even bigger! So outside the US the net effect for UHI corrections is close to zero.

Phil Jones is not correcting for UHI at all, he only increases the uncertainty range by a small amount. To defend this he refers to a couple of papers by himself, David Parker and Thomas Peterson. McIntyre analysed all these papers and showed they are not very convincing. In the book I describe the problems in detail.

So Jones is claiming that his dataset is free of urban and other human influences and is giving solely a climate signal. What would be a logical way to test whether this claim is true? Right, you take the pattern of warming around the globe and see if it correlates with all kind of economical and industrial parameters. This is what Michaels/McKittrick did back in 2004 and also Jos de Laat and Maurellis in two separate papers. De Laat was working at SRON at the time. Both papers showed a highly significant correlation between the pattern of warming on land and economical activity, a clear indication that the temperature network is polluted. In one of the most famous climategate emails Jones, the lead author of chapter 3 of AR4 wrote to Mann [Slide 22]:

I can't see either of these papers being in the next IPCC report. Kevin and I will keep them out somehow – even if we have to redefine what the peer-review literature is !

This was already in 2004, a year before Jones started working on the IPCC-report. He held promise and didn't mention the papers in both the first and second order draft, although McKittrick as an expert reviewer made a comment on the first draft that these papers should be included. In the final report the papers are mentioned – note this wasn't reviewed by anyone – but the authors then reject the conclusions of the papers with an unpublished ad hoc argument. It would be interesting when Jos de Laat would give his view on this episode in a separate colloquium.

Discrepancy between satellite and surface measurements

Another very interesting paper about the potential bias in the surface land record is Klotzbach 2009, including as coauthors Pielke sr. and jr. and John Christy. They showed a growing discrepancy between the satellite and surface temperature measurements [Slide 23]. Based on climate models we expect the atmosphere would warm up 1.2 times as fast as the surface. But in reality the surface warmed up much faster than the atmosphere and the difference is already 0.5 degrees in 30 years.

There is no time to discuss the ocean temperatures but here there are also issues that are far from settled. Since 2003 we have the ARGO network, in which KNMI is also involved. This is a great network from which we can calculate the trend in Ocean Heat Content. The heat content of the oceans is 1000 times larger than that of the atmosphere, so if there is global warming (or cooling) the best way to detect it is by measuring the Ocean Heat Content. Roger Pielke is having a lot of discussions on his blog about the recent trend in Ocean Heat Content, which is flat since 2003 or 2004. It is at least not something we would expect. The emissions were growing sharply, there were no big volcanic eruptions? The models expect a linear increase in Ocean Heat Content. The lack of warming in the oceans is one of the reasons why Trenberth said in a climategate email:

“The fact is that we can't account for the lack of warming at the moment and it is a travesty that we can't. The CERES data published in the August BAMS 09 supplement on 2008 shows there should be even more warming: but the data are surely wrong.” [Kevin Trenberth to Mike Mann (Oct 2009)]

Unequivocal

A second pillar in the AGW theory is that the current warming is unprecedented or unequivocal as IPCC uses to say. This has two parts. The first is that the current warming trend as measured by weather stations is highly significant. That means it cannot be the result of random fluctuations. However several scientists have questioned the statistical methods that have been used by the climate science community. The issue is quite technical but boils down to the question whether you can use classical statistical methods or whether you need statistical methods that explicitly take into account the fact that climatic time series show long term persistence. The most well known paper criticizing the mainstream view is *Nature's Style: Naturally Trendy*⁹ published by Cohn and Lins in *Geophysical Research Letters*. In this paper they show that the warming trend is not statistically significant if you use more complex statistical methods that deal with both short term and long term persistence. They write:

For example, with respect to temperature data there is overwhelming evidence that the planet has warmed during the past century. But could this warming be due to natural dynamics? Given what we know about the complexity, long-term persistence, and non-linearity of the climate system, it seems the answer might be yes.

The second claim in the IPCC report is that the current warming is unique in the last 1300 years. This is based on the hockey stick and other proxy reconstructions. Here the critique is coming mainly from McIntyre and McKittrick. Their technical point is that the current proxy data are not good enough to draw any firm conclusions about whether it's now warmer than during the Warm Medieval Period. Their criticism was ignored though by the IPCC in AR4. Andrew Montford wrote a very interesting book about this affair called *The Hockey Stick Illusion*.

Do models match the observations and why?

The next pillar is this very influential picture in the IPCC report [Slide 24], where you see that models are unable to reproduce the recent warming by natural forcings alone. This is the main basis for the claim that the recent warming is caused by greenhouse gases. Skeptics like Lindzen and Spencer call this circular reasoning. IPCC assumes natural forcings are quite small as can be seen from this table in AR4 [Slide 25]. The models fed with these assumptions are not able to reproduce the recent warming unless there is a strong contribution from greenhouse gases. IPCC then concludes it must be the greenhouse gases that caused the warming.

IPCC is almost silent about what caused the warming between 1910 and 1940, although IPCC admits that it's too early for greenhouse forcing to play a major role. Earlier this year Phil Jones admitted in an interview with the BBC that the recent warming since 1975 is not different from the early warming. AR4 writes that the sun and a lack of volcanic eruptions could play a role, but this crucial issue is far from settled.

The 21 models that IPCC used in AR4 seem very consistent in reproducing the recent warming, suggesting that the models are quite trustworthy. But a paper by Jeff Kiehl in 2007¹⁰ showed that models with a high climate sensitivity use a lot of cooling by aerosols and models with a low climate sensitivity use little aerosol cooling. As Kiehl put it:

⁹ http://water.usgs.gov/osw/pubs/Naturally_Trendy-Cohn-Lins_GRL_2005.pdf

¹⁰ <http://www.agu.org/journals/ABS/2007/2007GL031383.shtml>

*These results explain to a large degree why models with such diverse climate sensitivities can all simulate the global anomaly in surface temperature. **The magnitude of applied anthropogenic total forcing compensates for the model sensitivity.***

So the models end up reproducing the late twentieth century warming due to different combinations of the total anthropogenic forcing and climate sensitivity. The total anthropogenic forcing can basically only change by changing the forcing due to aerosols, which have a much larger uncertainty than the forcing due to greenhouse gases.

Aerosols probably cool less

Aerosols play therefore a crucial role in understanding and attributing the recent warming. Unfortunately the uncertainties in both the historic emissions of aerosols and its effects are huge as is also shown in the table with forcings of IPCC. In my book I present evidence that the recent literature tends to incline towards much smaller cooling effects of aerosols. Myhre 2009¹¹ estimates that the direct aerosol effect is a only 0.3 W/m². And Graeme Stephens told me in an interview last year that based on the first CloudSat and Calipso measurements the indirect aerosol effect is close to zero. These results have been presented at a conference¹² but not yet published in a peer reviewed paper. If true this would suggest climate sensitivity is at the low side of IPCC estimates.

This was confirmed by Stephen Schwartz who earlier this year published a paper¹³ with the rather provocative title *Why hasn't earth warmed as much as expected?* In this paper he explains that based on a climate sensitivity of 3 degrees Celsius and the rise in greenhouse gas emissions one already expects a warming of 2 degrees Celsius. We have only had 0.8 degrees of warming or even less if you take into account the problems with the temperature measurements. The gap between the expected warming and the real warming can only for a small part be explained by heat accumulation in the oceans, says Schwartz. The rest of the gap is either the result of large aerosol cooling or climate sensitivity is just lower than expected.

There is still another possibility though that the traditional picture of aerosol cooling compensating for greenhouse warming in the period 1940-1970 should be left altogether. In recent years two mathematicians, Swanson and Tsonis, published two papers that showed that all the recent shifts in the climate, in 1910, 1940 and 1977 are the result of natural oscillations in the climate system [Slide 26]. For their analysis they used four major climate indices, the Pacific Decadal Oscillation (PDO), the North Atlantic Oscillation (NAO), the El Niño/Southern Oscillation (ENSO), and the North Pacific Oscillation (NPO). According to their analysis these four modes of natural climate variability together are able to cause shifts in the climate system. As they put it in their first paper [Slide 27]:

The standard explanation for the post 1970s warming is that the radiative effect of greenhouse gases overcame shortwave reflection effects due to aerosols. However, [our result] suggests an alternative hypothesis, namely that the climate shifted after the 1970s event to a different state of a warmer climate, which may be superimposed on an anthropogenic warming trend.

¹¹ <http://www.sciencemag.org/content/325/5937/187>

¹² <http://pielkeclimatesci.wordpress.com/2009/10/09/major-issues-with-the-realism-of-the-ipcc-models-reported-by-graeme-stephens-of-colorado-state-university/>

¹³ <http://journals.ametsoc.org/doi/abs/10.1175/2009JCLI3461.1?journalCode=clim>

In their second paper they claim to have found a shift in 2001 as well and they hypothesize that this could suggest that *the new global mean temperature trend may persist for several decades.*

Hot spot in the tropics

There are not many specific fingerprints one expects for a greenhouse world. One notable exception is what is called a hot spot in the tropics. This can be seen in this figure [Slide 28] from IPCC where in figure C you see the expected hot spot in the tropics at a height of about 10 kilometers. The warming there should be 2 to 3 times faster than at the surface. Even this you could say is not very specific for a greenhouse world. If you had a large increase in solar forcing in the tropics you would expect the same pattern. However this is not the case, we have a large increase in CO₂ and other greenhouse gases and according to the models that would generate the shown hot spot. The forcing is for the period 1890-1999. So with satellite and radiosonde data we can check what happened in the tropics. That is what David Douglass, Fred Singer and John Christy did and their result is here [Slide 29]. This was published online in December 2007. In a press release co-author John Christy said [Slide 30]:

*“Satellite data and independent balloon data agree that atmospheric warming trends do not exceed those of the surface. Greenhouse models, on the other hand, demand that atmospheric trend values be 2-3 times greater. **We have good reason, therefore, to believe that current climate models greatly overestimate the effects of greenhouse gases. Satellite observations suggest that GH models ignore negative feedbacks, produced by clouds and by water vapor, that diminish the warming effects of carbon dioxide.**”*

It is obvious that what is called The Team must react on this paper. The climategate emails provide interesting reading¹⁴ how Ben Santer arranged with the editor of the International Journal of Climatology that their reaction on this paper would appear in the same edition of the journal as the Douglass-paper. As a result it took more than 11 months before the Douglass paper appeared in print. Santer and 17 co-authors came up with this result [Slide 31]. They used slightly different datasets and accused Douglass et al of not using the Raobcore 1.4 dataset. Douglass replied that Raobcore 1.4 contained a spurious warming trend. Another critique of Santer et al is that Douglass et al underestimated the uncertainty bands around the model trend and that they didn't show the uncertainties around the observations.

McIntyre, McKittrick and Chad Herman wondered why Santer et al ended his analysis in 1999. They updated the analysis to 2009 and their article had recently been accepted¹⁵. Here are the results for the lower and the mid troposphere [Slide 32]:

We find that the model trends are 2x larger than observations in the lower troposphere and 4x larger than in the mid-troposphere, and the trend differences at both layers are statistically significant ($p < 1\%$), suggestive of an inconsistency between models and observations.

How are model predictions going?

The famous mathematician John von Neumann once said: **With four parameters I can fit an elephant, and with five I can make him wiggle his trunk.** Translated to the global warming debate,

¹⁴ <http://climategate.nl/2009/12/22/een-klimatologisch-complot/>

¹⁵ <http://climateaudit.org/2010/08/09/mckitrick-et-al-2010-accepted-by-atmos-sci-lett/>

what conclusions can we draw from the fact that with a few parameters, like climate sensitivity, greenhouse and aerosol forcing we can fit the past global temperature.

If the models are really good, they can predict the future. How good are the models in predicting the future? This question was answered last year in a testimony for Congress by US skeptic Patrick Michaels. He used model projections for the period 2001-2020 and the HadCru3 temperature data and compared trends. Here are the results [Slide 34]. The grey area is the 95% confidence band for the models. As you can see the observed trends are at the low end of the expected range. As Michaels put it¹⁶: the rates of warming, on multiple time scales, have now invalidated the midrange suite of IPCC climate models. Or put differently: the models are overestimating the warming.

Conclusions

Time is running out and you are probably tired of all these examples that question the mainstream view on climate. I have tried to make clear why many scientists are skeptical about the IPCC view. The skepticism is based on a whole lot of peer reviewed literature. So the standard argument that skeptics do not publish but only shout on blogs or in the media is not true.

The skill of models is already questionable on a global scale back in time. On a local scale back in time the performance of models becomes worse, as was recently shown by Anagnostopoulos et al in a peer reviewed paper¹⁷.

It is not surprising then that we have to be cautious when using climate models for projections 50 or 100 years in the future. This is a central criticism of Roger Pielke on his blog and in his papers. Regional models have no skill and therefore it is misleading to present regional climate scenarios to policy makers for policy purposes. The Dutch climate scenarios are also used for this purpose.

According to Pielke, one of the shortcomings of models is that not all the relevant forcings are incorporated yet in the models. Some influences that he mentions are land use changes, nitrogen deposition, soot deposition and the biogeochemical effect of CO₂. Unless all relevant forcings are build into the models we can never have trust in the outcome of models, thinks Pielke.

Gerbrand Komen gave a very constructive reaction on my book. He was quite critical though about the part in my book that deals with the climate scenarios. KNMI warned for all the problems and uncertainties there are, was his point. Fair enough, but I doubt that the users of these products are aware of all these shortcomings of the scenarios. Recently the Bond der Verzekeraars used the scenarios to calculate future insurance premiums on the spatial scale of provinces. So my question to him is 'is this a useful calculation to do with the current state of climate models and is it the responsibility of KNMI to inform users of the scenarios again and again about the limitations?'

This seems to me an interesting point of discussion. Thanks again for giving me the opportunity to speak about my research of the past six years.

¹⁶ <http://www.worldclimatereport.com/index.php/2009/02/13/committee-on-energy-and-environment-testimony/>

¹⁷ <http://www.informaworld.com/smpp/content~db=all?content=10.1080/02626667.2010.513518>