



The climate debate in the USA

Judith Curry

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About the author

Judith Curry is professor of climatology at the Georgia Institute of Technology.
This is the text of a speech given at the House of Lords on 15 June 2015.

1 Introduction

Good evening everyone, it's a great pleasure to be here, and I would like to thank the GWPF for inviting me. Tonight I will be talking about the state of the climate debate in the US. This is a story of a sharp partisan divide between the Democrats and Republicans regarding what, if anything, we should do about climate change. Unfortunately, climate science is caught in the crossfire.

2 The climate debate in the USA

The president's plan

President Obama has made very strong statements about climate change:

We will respond to the threat of climate change, knowing that failure to do so would betray our children and future generations.

No challenge--*no challenge*--poses a greater threat to future generations than climate change.

There's one issue that will define the contours of this century more dramatically than any other, and that is the urgent and growing threat of a changing climate.

The basis for these strong statements has evolved from the UN Framework Convention on Climate Change Treaty, which established a goal of stabilization of atmospheric greenhouse gases to prevent dangerous climate change.

For the past 25 years, the Intergovernmental Panel on Climate Change has been conducting comprehensive assessments. Each of these has successively increased in confidence that:

1. Human-caused climate change is real.
2. Human-caused climate change is dangerous.
3. Action is needed to prevent dangerous human-caused climate change.

In its current round of negotiations, the United Nations Framework Convention on Climate Change is seeking to limit emission through voluntary Intended National Determined Contributions, or INDCs. The key elements of the U.S. INDC are to:

- reduce emissions by 26–28% below 2005 levels by 2025
- produce economy-wide emission reductions of 80% by 2050.

President Obama is coordinating the U.S. response through the Environmental Protection Agency (EPA). Under the Clean Power Plan by 2030, the US will:

- cut carbon power sector emissions by 30% nationwide below 2005 levels
- cut particle pollution, nitrogen oxides, and sulfur dioxide by more than 25%
- avoid asthma attacks in children
- shrink electricity bills 8% by increasing energy efficiency and reducing demand.

The basis for these actions under the EPA is the Endangerment Finding, which found that greenhouse gas pollution endangers public health. In 2007 the US Supreme Court held that greenhouse gases are pollutants under the Clean Air Act.

Building support for the plan

Now President Obama can't accomplish all this on his own; he needs the cooperation of the states. Figure 1, redrawn from ClimateProgress, illustrates the commitment to acting on climate change from various states. The green states are on board with President Obama's plan, and already making significant headway with emissions reductions. The yellow states have a mixed record, and the red states are not making progress, with the black checkerboard states characterized as 'denier' states. My home state of Georgia is in the middle of denier land.

So President Obama clearly has his work cut out for him. He needs to build political support to actually implement his plan and realize emissions reductions. President Obama has tried several different arguments for building political and public support for his plan.

The first argument was the social cost of carbon, which is an economic argument that assesses the cost-benefit of regulatory actions that impact carbon dioxide emissions. This argument has been challenged because the costs and benefits, estimated over 300 years, are highly uncertain and contested. High costs now will damage the economy and development, and make us more vulnerable to climate surprises. At the heart of this debate is the social discount rate: how much should we value potential damages to future people?

The second argument that President Obama has been using relates to extreme weather. Particularly following hurricanes Katrina and Sandy, the US public was more concerned about climate change if it was making storms worse or more frequent.

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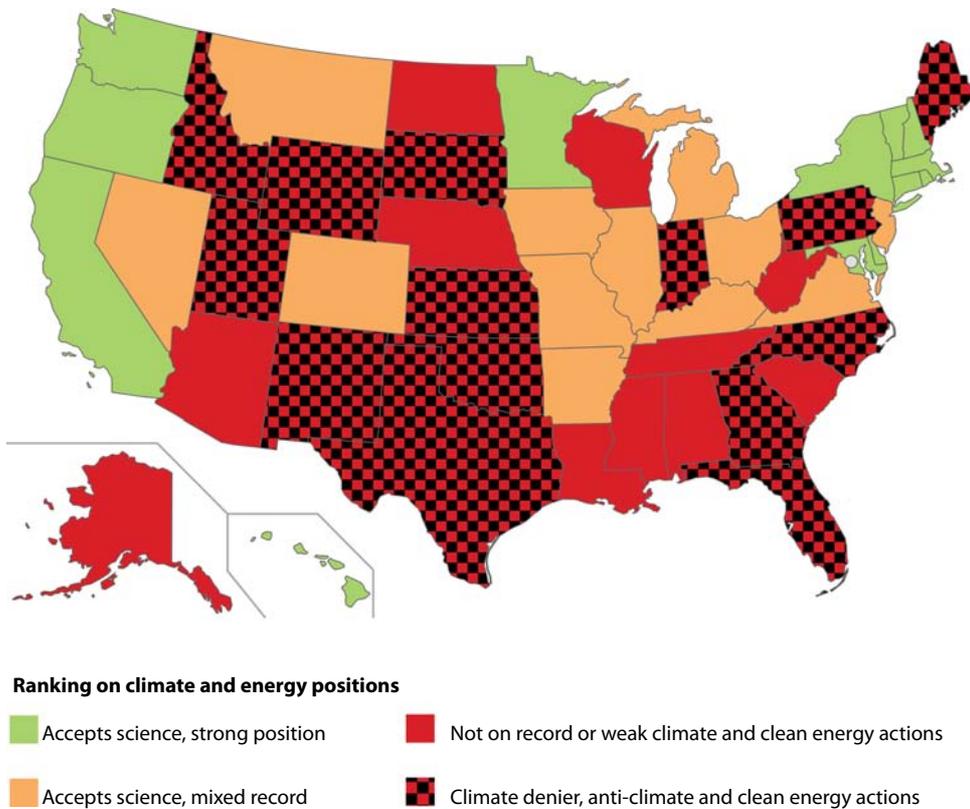


Figure 1: State governors' perspectives on climate change

Redrawn from ClimateProgress.

At the start of this year's hurricane season, President Obama made the following statement:

The best climate scientists in the world are telling us that extreme weather events like hurricanes are likely to become more powerful. Climate change didn't cause Hurricane Sandy, but it might have made it stronger.

Chris Landsea, a hurricane expert at the National Hurricane Center, retorted with the following statement:

How is it that the White House links changes in hurricanes today to global warming when WMO, NOAA, and IPCC cannot?

This is an argument that seems to work in terms of influencing public opinion on climate change, but it isn't supported by research and the main assessment reports.

Lets take a look at the hurricane data. Figure 2 shows the time series of US landfalling hurricanes since 1900. Apart from the horrendous years of 2004 and 2005, the number of landfalls has been relatively low over the past two

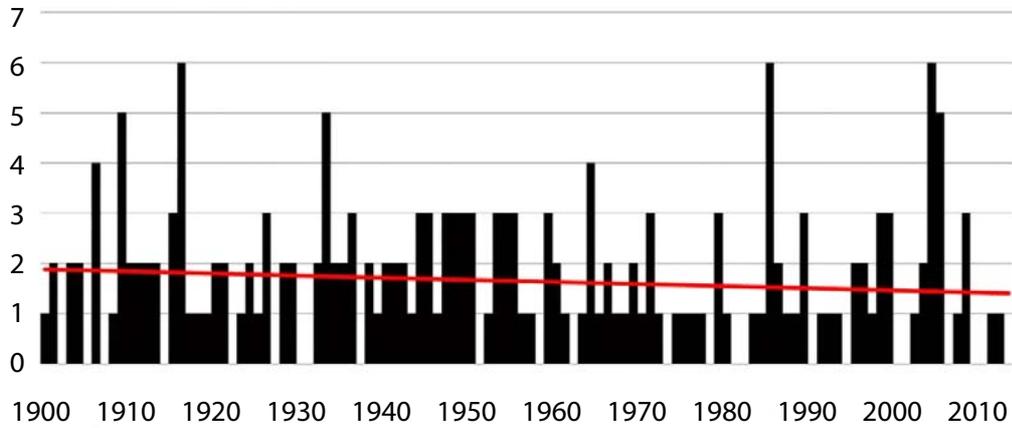


Figure 2: US hurricane landfalls, 1900–2013

Number of landfalling hurricanes per year. Source: rogerpielkejr.blogspot.com, 22 November 2013.

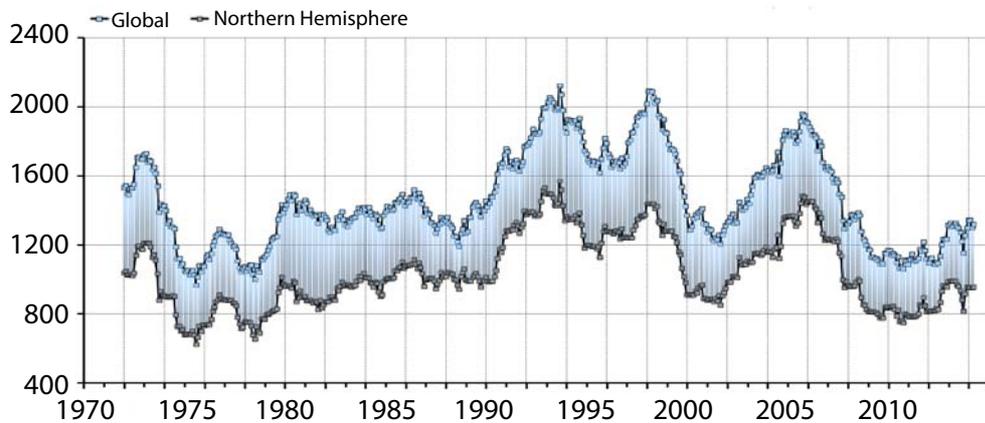


Figure 3: Global tropical cyclone energy 1972–2014

Accumulated cyclone energy, 24-mth running sums, data measured up to 31 March 2014 (10⁴knots²). Source: Ryan Maue.

decades. If you look at global hurricane activity, represented by accumulated cyclone energy (Figure 3), you also see that global hurricane activity has been relatively low in recent years, although 2015 is off at a record-breaking pace, with intense early-season activity in the Pacific.

With regards to hurricane intensity, there has been an increase in the percentage of Category 4 hurricanes since 1980, particularly in the north Atlantic

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and north Indian Ocean, but it is not clear whether this is natural variability or global warming. But the punch line is this. Any impact of human-caused global warming is lost in the noise of natural climate variability.

The third argument that President Obama has been using is the public health benefits of reducing carbon pollution. The president recently stated:

Carbon pollution causing climate change is contributing to health risks for many children. Over the past three decades, the percentage of Americans with asthma has more than doubled and climate change is putting those Americans at greater risk of landing in the hospital.

However, the fact of the matter is that carbon dioxide does not impact air quality and breathing. US air quality (ozone and particulates) has improved substantially over the past three decades.

President Obama made this issue personal, since his daughter suffers from asthma. However, this rather backfired on him, since he is a smoker and since secondhand smoke is more likely to exacerbate asthma than is carbon dioxide.

The fourth argument that President Obama has been using is related to national security. He recently stated:

Climate change constitutes a serious threat to global security, an immediate risk to our national security, and, make no mistake, it will impact how our military defends our country.

The challenge to this argument is that the main security issue is the impact of extreme weather events, which is better addressed by adaptation. Carbon dioxide mitigation is an ineffective national security tool. More significantly, President Obama's opponents criticize him for focusing on climate change while ISIS is on the march.

One argument that President Obama *hasn't* tried to make explicitly is that the US commitments to emissions reductions will actually slow down warming in a meaningful way. If you believe the climate models, US emissions reductions would reduce the warming by a fairly trivial amount, which would get lost among the natural variability of climate.

The president's opponents

So President Obama has been rather frustrated in his attempts to build political and public support for his Climate Action Plan. He has taken to labeling his opponents as 'deniers', and earlier this year, his website* organized a 'Climate Change Fantasy Tournament', asking who would be crowned the worst climate change denier. This was unseemly, particularly since the candidates for this accolade were his opponents in Congress. The award went to Senator

* www.barackobama.com

James Inhofe, chair of the Environment and Public Works Committee. Senator Inhofe is author of the book *The Greatest Hoax: How the Global Warming Conspiracy Threatens Your Future* and his main concern is over-regulation of business. Last year the Republican members of the Senate Environment and Public Works Committee issued a report on climate change, subtitled 'Empirical evidence to consider before taking regulatory action and implementing economic policies'. This is actually a pretty good report.

The most influential of President Obama's foes in the House of Representatives on the climate change issue is Representative Lamar Smith, Chair of the Science, Space, and Technology Committee. He has recently written two influential op-eds entitled 'Overheated rhetoric on climate change hurts the economy' and 'The climate-change religion'. His main point was that climate change is an issue that needs to be discussed thoughtfully and objectively. Unfortunately, claims that distort the facts hinder the legitimate evaluation of policy options.

The President and the Senate

What the Senate thinks about climate change and the proposed policies to deal with it is of great relevance to the fate of President Obama's efforts, particularly in context of the United Nations. The U.S. Constitution includes the Treaty Clause:

The President shall have Power, by and with the Advice and Consent of the Senate, to make Treaties, *provided two thirds of the Senators present concur...*

What the Senate thinks about climate change was clarified last January by the sense of the resolutions it took on the subject.

The first resolution was 'Climate change is real and not a hoax', which received only one 'no' vote. The second resolution was that 'Climate change is real; and human activity contributes significantly to climate change'. It received a split vote that was almost, but not quite, along strict party lines.

The media portrayed this as a schizophrenic, anti-science vote. Actually, the Senate resolutions highlighted the differences and confusion between the scientific and political definitions of climate change. The scientific definition emphasizes that climate change can be due to natural processes, or persistent human-caused change. The political definition of climate change is that it is human-caused. The UN Framework Convention on Climate Change established the political definition in the 1990s, and this is the definition that also seems to have been adopted by the Obama administration. The political definition effectively defines natural climate change out of existence. However,

natural climate change versus human-caused climate change is at the heart of the scientific and policy debate.

After Obama

Recall that approving a treaty requires a Senate supermajority of 66%. It is clear from the recent resolutions that there is no supermajority in support of climate change policies. So President Obama apparently intends to sign a UN climate agreement *without* Senate approval. This lack of Congressional support is influencing the strategies being undertaken by the UN Framework Convention on Climate Change. The issue was succinctly stated at the recent G7 meeting in Bonn by the French Foreign Minister Laurent Fabius:

We must find a formula which is valuable for everybody and valuable for the US without going to the Congress.

The key concern of the UNFCCC is the extent to which President Obama's climate commitment is enforceable. In the absence of state and Congressional support, the plan is being enforced through the Executive Branch via the Environmental Protection Agency (EPA). There are ongoing legal challenges, but so far the Supreme Court has supported the president.

Moreover, President Obama has about 18 months remaining in his term of office and the next president may choose not to enforce, or even to abolish the EPA: during the recent Bush administration, the Enforcement Division of the EPA was largely unfunded.

The Democratic Party presidential candidates, led by Hillary Clinton, are expected to generally support President Obama's strategies regarding climate change. The Republican candidates are quite a different story. Currently 14 candidates are expected to run and that number may rise to 20. Several of them have recently made statements about climate change, and the following excerpts illustrate the range of their positions:

JEB BUSH: I don't think the science is clear of what % is man-made and what percentage is natural. It's convoluted. For the people to say the science is decided on this is really arrogant. The climate is changing. We need to adapt to that reality.

TED CRUZ: Specifically, satellite data demonstrate there has been no warming over the past 17 years. And I would note whenever anyone makes that point, you immediately get vilified as a 'denier' without anyone actually refuting the facts.

MARCO RUBIO: The question is, what percentage of that is due to human activity? If we do the things they want us to do, cap-and-trade, you name it, how much will that change the pace of climate change versus how much will that cost to our economy?

CARLY FIORINA: The only answer to this is innovation, and in that America could be the best in the world.

CHRIS CHRISTIE: ... when you have over 90% of the world's scientists who have studied this stating that climate change is occurring and that humans play a contributing role, it's time to defer to the experts.

JOHN KASICH: I am just saying that I am concerned about it, but I am not laying awake at night worrying the sky is falling.

RICK SANTORUM: I for one never bought the hoax. To suggest that man's contribution is the determining ingredient in the sauce that affects the entire global warming and cooling is just absurd on its face.

I don't think any of the Republican candidates would support the extent of President Obama's climate change agenda, with the possible exception of Lindsay Graham, a longshot candidate.

The UN Framework Convention on Climate Change is correct to be concerned about whether the US commitment to reduce emissions will be met.

The Republican candidates are all portrayed as 'deniers' by the Democrats and by the liberal media. But this portrayal of the Republicans as deniers is a cartoonish one. There is widespread agreement on these basic tenets:

- Surface temperatures have increased since 1880.
- Humans are adding carbon dioxide to the atmosphere.
- Carbon dioxide and other greenhouse gases have a warming effect on the planet.

However, there is disagreement about the most consequential issues:

- Whether the warming since 1950 has been dominated by human causes
- How much the planet will warm in the 21st century
- Whether warming is 'dangerous'
- Whether we can afford to radically reduce carbon dioxide emissions, and whether reduction will improve the climate

Science in the crossfire

In the midst of all this disagreement among policy makers, US climate research has been caught in the crossfire. Congressional Republicans have been pushing for substantial reductions to funding levels for climate research. President Obama and the Democrats are not much better. The President's Climate Action Plan is pushing for more research on climate impact assessments and new energy technologies. Since they regard climate dynamics as essentially settled science, the funding is not very good for basic research in climate dynamics,

dataset building and quality assessment. Funding goes into climate modelling to better understand human-caused climate change; there is very little funding for improving our understanding of natural climate variability.

The climate wars

I am very concerned that climate science is becoming biased, owing to biases in federal funding priorities and the institutionalization by professional societies of a particular ideology related to climate change. Many scientists are becoming advocates for UN climate policies, which is leading scientists into overconfidence in their assessments and public statements and into failures to respond to genuine criticisms of the scientific consensus. In short, the climate science establishment has become intolerant of disagreement and debate, and is attempting to marginalize and delegitimize dissent as corrupt or ignorant. Uncertainty and disagreement drive scientific progress. Stifling uncertainty and disagreement stifles scientific progress.

I would like to provide some context for my position in the public debate on climate change. Prior to 2005, I was comfortably ensconced in the ivory tower of academia, and I paid little attention to the public debate on climate change. I became caught up in the that public debate on climate following Hurricane Katrina, and the uncanny timing of publication of our paper on hurricanes and climate change. I am sure you all remember the hurricane and global warming wars circa 2005/2006. Peter Webster and I were on the front lines. I got badly burned by a misquote by a reporter, and I backed away from interacting with media. While I backed away from engaging with the mainstream media, I started experimenting with the climate blogosphere, including participating in skeptics' blogs, particularly *Climate Audit*. So I was on the front lines when the Climategate emails hit. The cartoon in Figure 4 pretty much describes how I felt while I was reading the emails. I started speaking out about my concerns about the integrity of climate science, inadequate treatment of uncertainty, lack of transparency, and the need for publicly available data. I figured that these were motherhood and apple pie statements, and that other scientists would also start speaking out on these topics. But there was only silence. One of the story lines from this episode became me, and the ostracism by my colleagues. *Scientific American* did a six-page spread, with the rather astonishing title 'Climate heretic Judith Curry turns on her colleagues'.

With time, I have become increasingly skeptical of the IPCC consensus on climate change and critical of their entire approach, most particularly their overconfidence and intolerance of dissent.



Figure 4: The IPCC hits trouble

Source: antioligarch.files.wordpress.com

3 Current issues

For the remainder of my talk I'm going to give you my perspective on several topics that I regard as central to scientific debate on climate change.

The hiatus

The first of these is the hiatus or slowdown in global warming. Figure 5 shows the global average temperature anomaly since 1850. Apart from an overall rising trend, you see a flattening of the temperatures in the recent part of the record, which is referred to as the hiatus (or slow down) in global warming. You also see a flat period between 1940 and 1980.

Figure 6 shows a closer look at the recent hiatus period. The results, from five different global surface temperature data sets, give you some sense of the uncertainty. There was a big warm spike in 1998 from a super El Niño; since then the temperatures have been pretty flat. 2014 was a warm year, tied with several other years for the warmest in the record. Clearly there is a lot of year-to-year variability.

Why does this slowdown since 1998 matter? The significance of the hiatus is illustrated by comparing the observed temperature anomalies with climate

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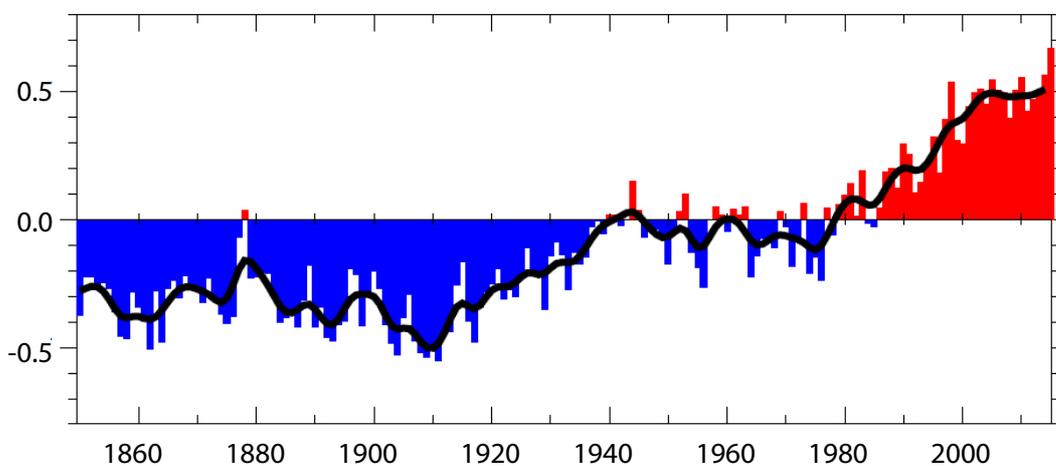


Figure 5: Global temperature anomaly 1850–2015

Source: Climatic Research Unit, UEA.

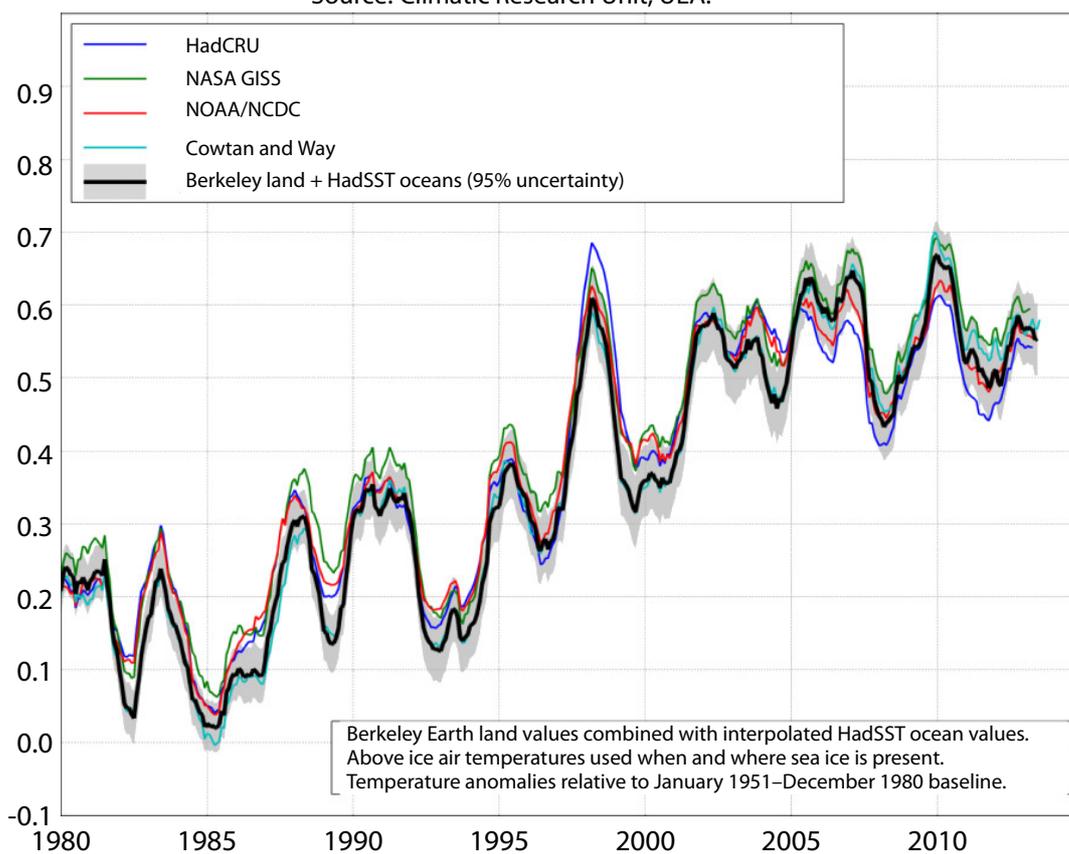


Figure 6: The hiatus in detail

Global surface temperature anomaly ($^{\circ}\text{C}$). Source: Robert Rohde.

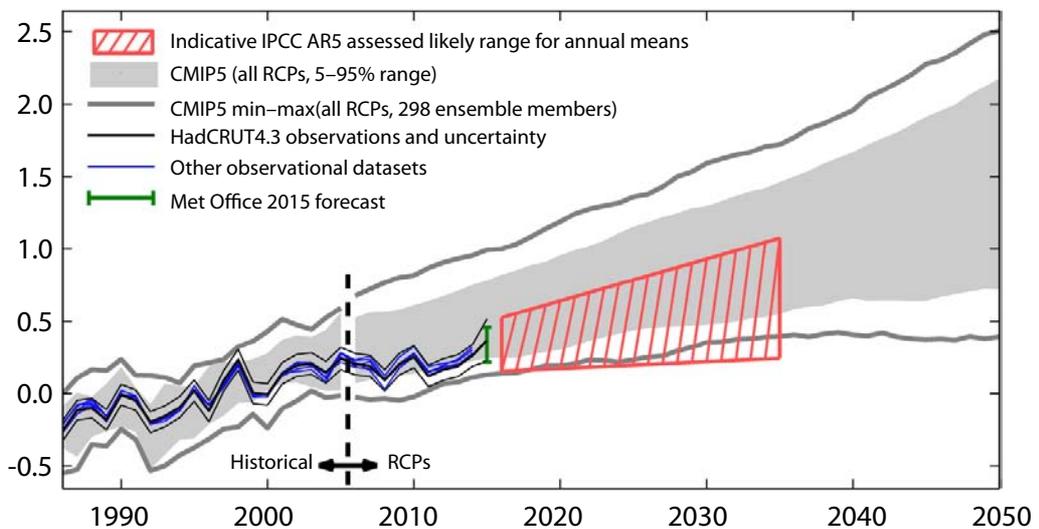


Figure 7: The hiatus and climate model predictions

Temperature anomaly ($^{\circ}\text{C}$) versus 1986–2005 mean. Source: Ed Hawkins.

model simulations (Fig. 7). You can see that the observations are at the bottom of the envelope of climate model simulations.

This growing divergence between models and observations raises some serious questions:

- Are climate models too sensitive to greenhouse forcing?
- Is the modelled treatment of natural climate variability inadequate?
- Are climate model projections of 21st century warming too high?

Several weeks ago, a new paper was published by NOAA – a US government agency – that argues that the hiatus was an artifact, and that it disappears with a new analysis of the ocean temperature data. In Figure 8 the red curve is the new NOAA dataset, and the blue curve is the UK dataset. This paper has been greeted with a fair amount of cynicism: the paper is too convenient for Obama’s climate policies, and it has been characterized as ‘bespoke science’. Does that mean that the paper is wrong? Not necessarily. But the paper raises a whole host of issues about the credibility of the ocean surface temperature data.

The future evolution of climate

The issue of greatest concern is how the climate will evolve during the 21st century. There are two different views on this.

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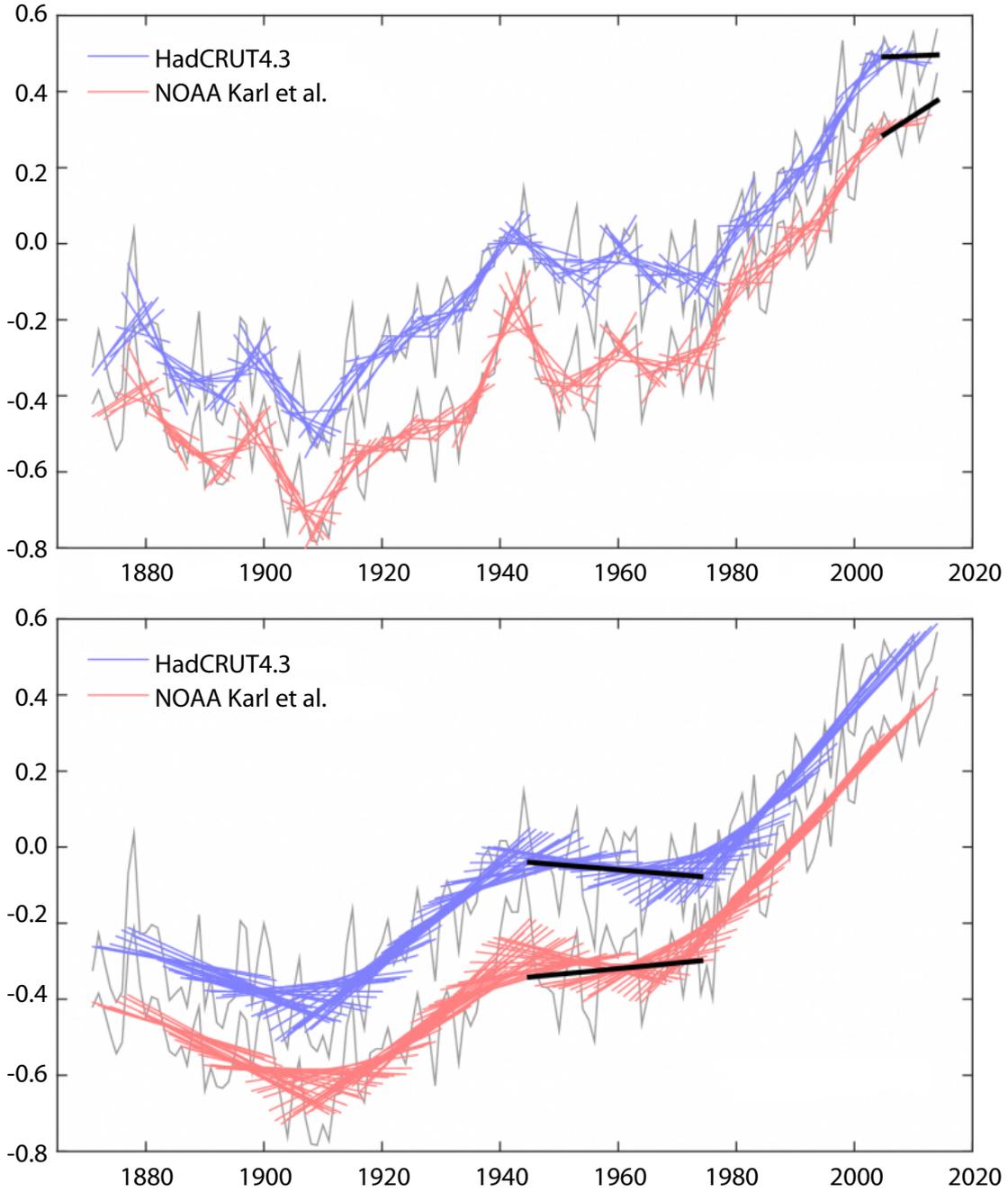


Figure 8: Trends in the Karl et al. paper

Top, 10-year trends; bottom, 30-year trends. Temperature anomalies ($^{\circ}\text{C}$).

Source: Ed Hawkins.

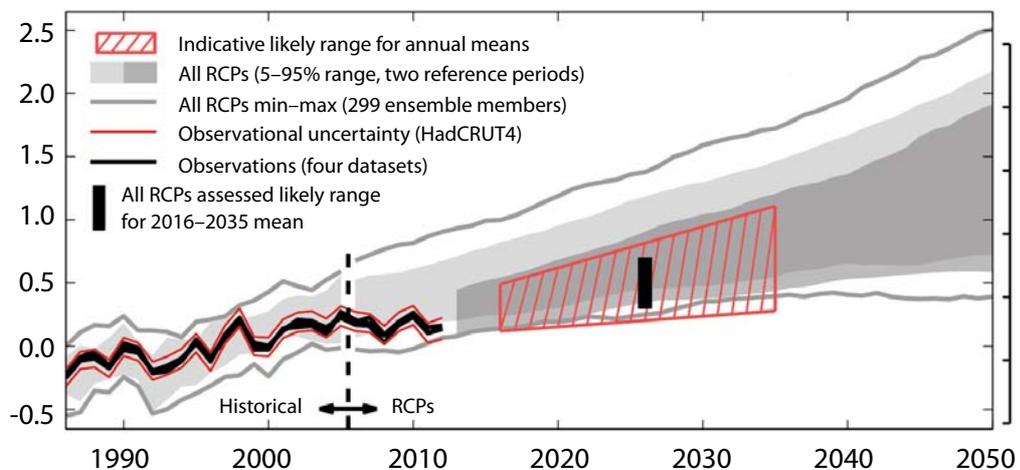


Figure 9: The IPCC's concession to the hiatus

Temperature anomalies (°C).

The first perspective is that of the IPCC. Figure 9 is from the IPCC Fifth Assessment Report published in 2013, which projects continued warming. Note the hatched red area, which seems to be a concession to the pause. The IPCC cites 'expert judgment' as the rationale for lowering the projections (indicated by the red hatching), to account for the apparent oversensitivity of the models. With regards to the pause, the IPCC expects that it will end with the next El Niño.

The other perspective emphasizes natural variability.

- Our understanding of circulation regimes in the Atlantic and the Pacific Oceans suggest that the pause will continue at least another decade, perhaps into the 2030s.
- Climate models are too sensitive to human forcing; 21st century warming will be at the low end of IPCC projections (or even below).
- Solar variations and volcanoes are a wild card. Some solar scientists are predicting solar cooling in the near term.
- We can't rule out unforeseen surprises.

A majority of climate scientists seem to support the IPCC perspective, with recent surveys of scientists suggesting 52–85% of are in agreement. Nevertheless, a great deal of uncertainty remains, and there is plenty of room for disagreement. So why do scientists disagree? Possible reasons are:

- insufficient observational evidence
- disagreement about the value of different classes of evidence

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- disagreement about the appropriate logical framework for linking and assessing the evidence
- assessments of areas of ambiguity and ignorance.

And finally, the politicization of the science can torque the science in politically desired directions.

None of the most consequential scientific uncertainties are going to be resolved any time soon; there is a great deal of work still to do to understand climate change. And there is a growing realization that unpredictable natural climate variability is important.

Dangerous climate change

I think most important looming issue in the climate debate is understanding to what extent climate change is 'dangerous'. Whether or not something is dangerous is a value issue, not a scientific issue. But depending on how you define 'dangerous', different scientific analyses come into play, and also different decision-analytic frameworks.

In 2010, the UN negotiators determined that an increase of 2°C over pre-industrial temperatures was the danger threshold, beyond which there was the possibility of consequences that are largely uncontrollable and beyond our management. The 2-degree threshold remains very controversial, and there is a movement afoot to drop it to 1.5°C.

The fat tail of climate sensitivity

What has been driving the economic concerns about global warming is the so-called 'fat tail' of climate sensitivity. Equilibrium climate sensitivity is defined as the amount of warming from a doubling of atmospheric carbon dioxide from pre-industrial values. There is a great deal of uncertainty in the values of climate sensitivity, and the most recent IPCC assessment says it is likely to be in the range of 1.5–4.5°C, which is indicated by the gray shading. If you look at the top figure, from 2007, you see the fat tail of climate sensitivity extending out to 10°C and beyond. The middle diagram, from 2013, shows sensitivity determined by climate models, with only one outlier beyond 6°C. In the bottom diagram are the latest climate sensitivity values provided by Nic Lewis, based on observations, with substantially lower values of climate sensitivity. Now there are arguments that the climate model values are too high, and that Lewis's values are too low. But the bottom line is that the fat tail is continuing to shrink.

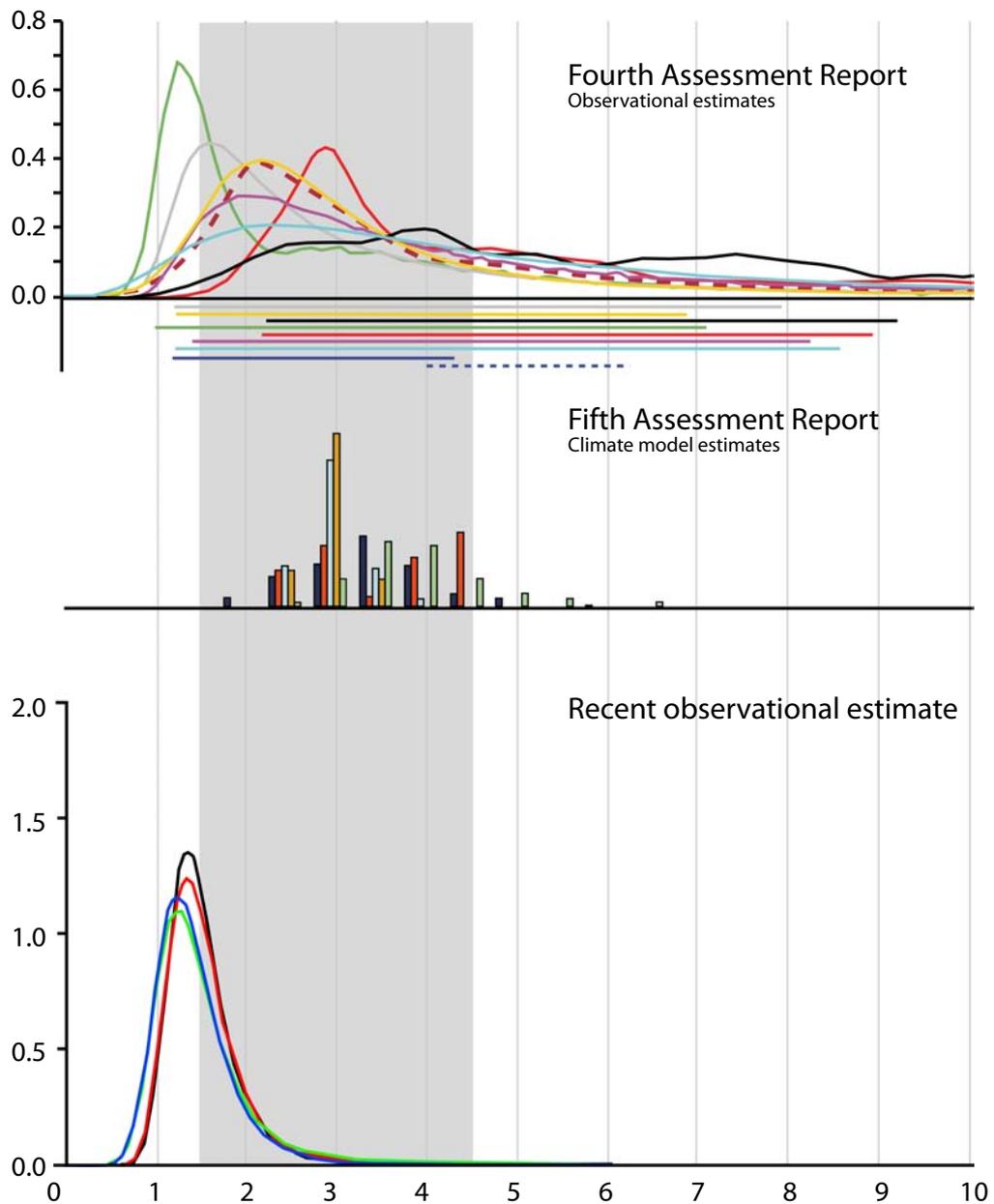


Figure 10: Losing the long tail

Effective climate sensitivity ($^{\circ}\text{C}$). The grey band indicates the current IPCC likely range for climate sensitivity. In 2007 (top), the possibility of higher values, to the right of the range, was considered significant. By 2013, climate model estimates (middle) were rarely above the range and empirical estimates (bottom) were often considerably lower. Sources: Top, IPCC AR4, WGI Fig. 9.2. Middle, IPCC AR5 Box 12.2 Fig.1, Bottom, Nic Lewis 2015. See sources for details of individual lines shown.

4 Conclusions

So how should we respond to the threat of climate change, given the uncertainties? There is increasing evidence that the threat from global warming is overstated. However, even if the threat is not overstated, there are major shortfalls in current and proposed solutions.

I regard climate change as a wicked mess. A wicked mess is a complex problem with multiple dimensions and interrelated issues, with suboptimal solutions that create additional problems. My concern is that we have oversimplified both the climate change problem and its solutions. This oversimplification has undercut the political process and dialogue necessary for real solutions in a highly complex world and torqued scientific research through politicization and funding priorities. I am seeking to broaden the dialogue on both climate science and the policy solutions. I encourage you to join the dialogue at my blog *Climate Etc.*, which provides a forum for technical experts and the interested public to engage in a discussion on topics related to climate science, its impacts and policy options.

I greatly appreciate the opportunity afforded to me by the GWPF to give this lecture, and I look forward to your questions.

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1	Andrew Turnbull	The Really Inconvenient Truth or 'It Ain't Necessarily So'
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5	Matt Ridley	The Perils of Confirmation Bias
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Our main focus is to analyse global warming policies and their economic and other implications. Our aim is to provide the most robust and reliable economic analysis and advice. Above all we seek to inform the media, politicians and the public, in a newsworthy way, on the subject in general and on the misinformation to which they are all too frequently being subjected at the present time.

The key to the success of the GWPF is the trust and credibility that we have earned in the eyes of a growing number of policy makers, journalists and the interested public. The GWPF is funded overwhelmingly by voluntary donations from a number of private individuals and charitable trusts. In order to make clear its complete independence, it does not accept gifts from either energy companies or anyone with a significant interest in an energy company.

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For further information about GWPF or a print copy of this report, please contact:

The Global Warming Policy Foundation
10 Upper Bank Street, London E14 5NP.
T 020 7006 5827
M 07553 361717

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