

Chapter 24

Rebuttals to Climate Myths

Abstract Virtually all climate misinformation can be divided into five categories: fake experts, cherry picking, logical fallacies, impossible expectations and conspiracy theories. The most common climate myths are grouped into these five categories, examining the rhetorical techniques employed to mislead and explaining the science that puts the myths in proper context.

Keywords Climate denial • Fake experts • Petition Project • Oregon Institute of Science and Medicine • Scientific consensus • Climate sensitivity • Richard Lindzen • Cherry picking • Total heat content • Planetary energy imbalance • 1998 • HadCRUT • Hockey stick • Paleoclimate • Solar activity • Atmospheric CO₂ • Carbon cycle • Ice age • Non sequitor • Past climate change • CO₂ lag • Ice cores • Feedback • False dilemma • 1970s • Trace gas • Greenhouse effect • Climate models • James Hansen • Settled science • Uncertainty • Conspiracy theories • Climategate • Mike’s trick • Hide the decline • Kevin Trenberth • Missing heat

Things to Know

The following is a list of things to know from this chapter. It is intended, as it is in each chapter, to serve as a guide to points of emphasis for the student to keep in mind while reading the chapter. Before finishing with this and every chapter, the “Things to Know” should be understood and can be used for review purposes. The list may not include all of the terms and concepts required by the instructor for this topic.

Things to Know	
Scientific Consensus	OISM Petition Project
Climate Sensitivity	Planetary Energy Imbalance
Hockey Stick	Solar Activity
Carbon Cycle	Past Climate Change
CO ₂ Lag	1970s Predictions
Trace Gas Greenhouse Effect	Climate Models
Settled Science	Uncertainty
Climategate	

24.1 Introduction

This chapter is divided into five sections representing the five characteristics of climate denial. We examine a selection of the more popular climate myths on offer (with a much broader selection available at <http://sks.to/args>). As well as explaining the science that puts each myth into a broader context, we will also examine the rhetorical techniques associated with each myth. It is hoped the reader will adopt the critical thinking skills required to identify other myths employing the same rhetorical techniques.

24.2 Fake Experts

The tactic of fake experts is designed to prevent the public from correctly perceiving the scientific consensus. It is employed by citing dissenting non-experts who appear to be highly qualified while not having published any actual climate research or by magnifying the voices of a small minority of dissenting climate scientists. The goal is to give the impression of a scientific community still in strong disagreement.

24.2.1 *A Petition of Tens of Thousands of Non-experts*

As discussed in Sect. 23.2, there is scientific consensus that humans are disrupting our climate in various ways. There is an abundance of evidence with a strengthening consensus found in the peer-reviewed literature. There is a consensus among the world's most prestigious scientific organizations with agreement among National Academies of Science all over the world. There is a consensus among the

climate science community with 97% agreement among actively publishing climate scientists.

Given such agreement among an overwhelming majority of climate scientists, one way to portray a false picture of a divided community is to highlight scientists with supposedly impressive credentials who actually possess scant expertise in climate science.

The most prominent (and prolific) example of this strategy is the Petition Project, first published in 2008 by the Oregon Institute of Science and Medicine (OISM 2008). This petition lists over 31,000 scientists who dispute that human activity is disrupting our climate and is cited frequently, including by prominent conservative politicians such as U.S. Congressman Dana Rohrabacher, a Republican.

With 97% consensus among climate scientists, how is it 31,000 scientists disagree with the consensus? This is because around 99.9% of the signatories on the Petition Project are not climate scientists. Anyone with a Bachelor of Science or higher can be listed. This includes graduates of computer science, mechanical engineering, zoology and other fields unrelated to climate science. Given the lack of climate expertise, the Petition Project is a transparent ploy to foster the impression of ongoing debate among the climate science community where none exists.

24.2.2 A Contrarian Take on Climate Sensitivity

Climate sensitivity is a measure of how much global temperature will increase if atmospheric carbon dioxide is doubled from the pre-industrial concentration of approximately 280 ppm. There are many lines of evidence from Earth's history over the last 700,000 years indicating that climate sensitivity is around 3°C. In other words, the direct warming effect from CO₂ before feedbacks is 1°C but reinforcing feedbacks amplify this initial warming so that the total amount of global warming is 3°C; thus the sensitivity of the Earth's climate to a doubling of CO₂ is an increase in temperature of 3°C.

The consensus of 3°C on climate sensitivity is often denied by contrarians and skeptics by their focusing on the work of a single scientist to the exclusion of the full body of research conducted by the rest of the scientific community. This is despite the fact that the work of the particular scientist involved has been refuted repeatedly in the peer-reviewed literature.

The scientist is MIT's Richard Lindzen who analyzed satellite data of surface temperature and outgoing radiation in the tropics (Lindzen and Choi 2009). Examining surface warming over short periods, Lindzen found more outgoing radiation escaped to space after the surface temperature increased. He concluded that net feedback was negative, with a climate sensitivity of 0.5°C. This is significantly less than the scientific consensus of mainstream scientists that the climate sensitivity is 3°C.

However, numerous studies have examined Lindzen's research and found fatal flaws in his methodology. His low sensitivity result is heavily dependent on the choice of start and end points in the time periods analyzed (Trenberth et al. 2010). One can tweak the start and end points to obtain any feedback one wishes. Lindzen also restricted his data to only tropical measurements. However, to calculate global climate sensitivity, one needs global data. Several independent studies have found that the tropics do not provide an adequate data set from which to calculate global climate sensitivity; using a global dataset calculated higher climate sensitivity consistent with mainstream estimates (Chung et al. 2010; Murphy 2010). A more complete picture of climate sensitivity can be found by considering the entire body of research by the scientific community, not just a single scientist, especially one with discredited methods and results.

24.3 Cherry Picking

As many lines of evidence lead to the inevitable, consistent conclusion that humans are causing climate change, one way to circumvent the full body of evidence is cherry picking. This involves focusing on select pieces of data while excluding any data that conflicts with the desired conclusion.

24.3.1 *Warming at Over Two Hiroshima Bombs per Second*

When scientists add up all the heat building up in the oceans, warming the land and atmosphere and melting ice on land and in the sea, they find that our planet has been building up heat at a rate of over two (2) Hiroshima bombs per second. This rate of heat build-up has continued past 1998 (when some skeptics say global warming stopped) with our planet continuing to accumulate heat into the twenty-first century. Over 90% of global warming is going into the oceans (Fig. 24.1).

To deny the inevitable fact of a planetary energy imbalance, the technique of cherry picking is employed by deniers, skeptics, and contrarians to focus on narrow pieces of data at the exclusion of the full body of evidence. For example, some argue that global warming stopped in 1998 by selecting temperature records that find 1998 is the hottest year on record (Fig. 24.2).

How could 1998 be the hottest year on record if the planet is still accumulating and storing heat? It is possible for surface temperature to drop over a few years even during a longer period of global warming. This is because surface temperature shows much variability from year to year as heat is exchanged between the ocean and the atmosphere. Nevertheless, the long-term trend in the temperature record is that of warming due to the steady build-up and storage of heat content in the World Ocean.

Most surface temperature records actually show either 2005 or 2010 as the hottest years on record. The most cited record by climate deniers was an earlier version

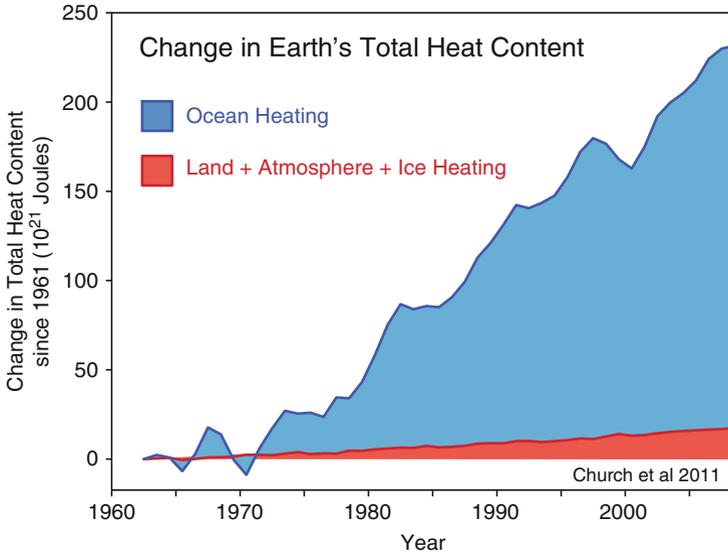


Fig. 24.1 Total heat content accumulating in the ocean (*blue*) and warming the land, atmosphere and melting the ice (*red*) (Figure adapted from Church et al. 2011)

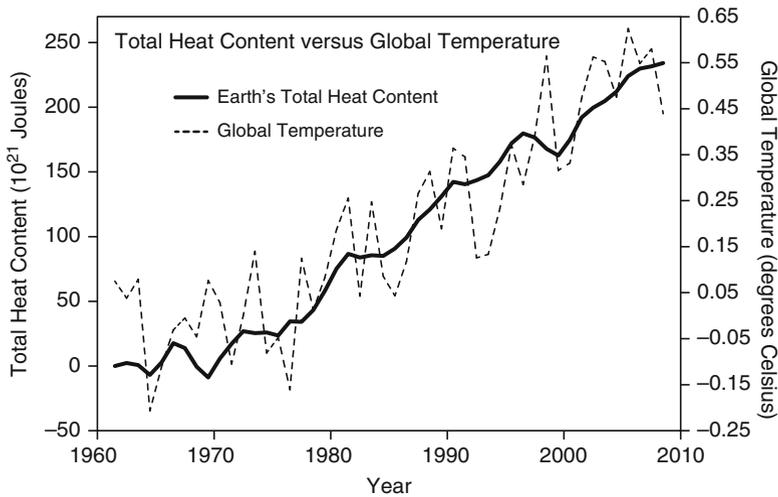


Fig. 24.2 Total ocean heat content (Church et al. 2011) versus global surface temperature (NASA/GISS 2012, Public Domain)

of the HadCRUT temperature record (HadCRUT3), which did show 1998 as the hottest year on record. However, this was due to the fact that the HadCRUT record didn't include regions such as the Arctic where warming is three times faster than

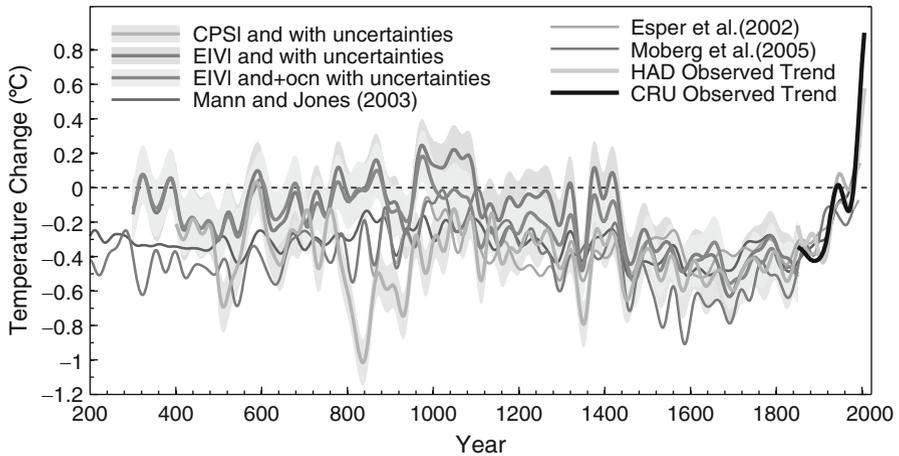


Fig. 24.3 Composite Northern Hemisphere land and land plus ocean temperature reconstructions and estimated 95% confidence intervals (Mann et al. 2008)

the rest of the planet. The latest version of the HadCRUT record (HadCRUT4) includes more data from the Arctic and consequently finds the hottest years on record are 2005 and 2010.

24.3.2 *Hockey Stick Versus Hockey Team*

Over a decade of paleoclimate research has produced a series of independent studies finding that the last few decades are the hottest in at least the last 1,000 years. The research employs a variety of sources including ice cores, ocean sediments, cave deposits, tree-rings and boreholes. A number of independent statistical techniques have been employed to analyze the data, arriving at the consistent conclusion that current global warming is unusual over the past millennium. The temperature record is often referred to as the ‘hockey stick’ but a more appropriate characterization of this body of evidence is a “hockey team” (Fig. 24.3).

While the evidence for anthropogenic global warming does not depend on the paleoclimate record, the ‘hockey stick’ is a compelling visual tool and has been much attacked by climate change deniers. But how does one attack over a decade’s worth of research by scientists all over the world? The deniers accomplish this by concentrating their attack on the very first ‘hockey stick’ diagram and paper, published in 1998 by Michael Mann, Ray Bradley and Malcolm Hughes.

The original ‘hockey stick’ research reconstructed temperatures over the last 600 years (Mann et al. 1998) and a follow-up paper extended the analysis to the past 1,000 years (Mann et al. 1999). The IPCC Third Assessment Report (TAR) published in 2001 reproduced the Mann et al. ‘hockey stick’ and as a result, it reached

a much larger audience than it would have otherwise. A critique of the ‘hockey stick’ was published in 2004, falsely claiming that the ‘hockey stick’ shape was an artifact of the Mann et al. statistical method of principal component analysis (McIntyre and McKittrick 2005).

However, an independent assessment of the 1998 ‘hockey stick’ method by the National Center for Atmospheric Research (NCAR) used several different statistical techniques (with and without principal component analysis) to confirm the principal results of the original ‘hockey stick’ (Wahl and Ammann 2007). Since then, a number of studies using independent methods and data have confirmed that temperatures over the last few decades are unprecedented over at least the last 600 years.

24.3.3 Sun and Climate Moving in Opposite Directions

Over the last few decades of global warming, solar activity and climate have been moving in opposite directions. While global temperatures have been increasing and the planet has been building up heat, solar activity has shown a slight cooling trend. In 2009 during an unusually deep solar minimum, solar activity reached its lowest levels in over a century. Thus, while changes in the Sun’s brightness have a strong impact on Earth’s climate, any effect from the Sun currently would be a slight cooling (Lockwood 2008) (Fig. 24.4).

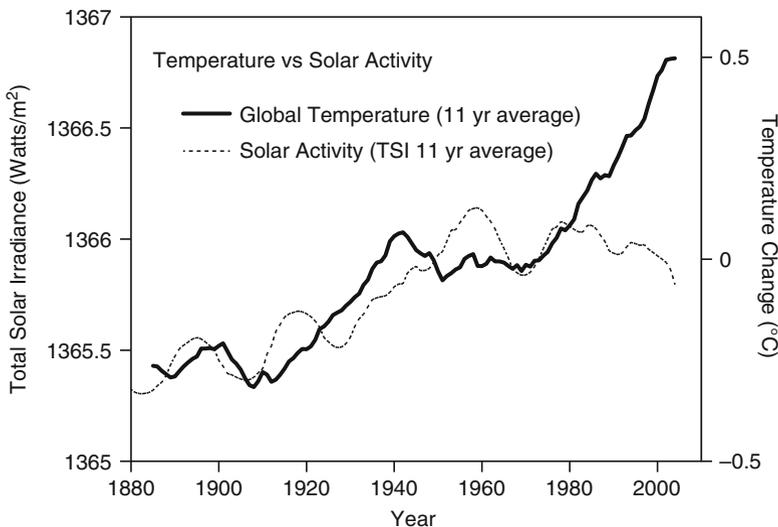


Fig. 24.4 Change in annual global temperature (NASA GISS 11 year moving average) and total solar irradiance (11 year moving average from Krivova et al. 2007 and Frohlich 2006)

Despite these facts, many denialists ignore the last few decades of divergence between solar activity and climate and argue that the Sun is the major cause of recent global warming. They argue this by highlighting the fact that during the twentieth century, the Sun was at its highest levels for the past 1,150 years (Usoskin et al. 2005). However, this argument ignores the divergence between Sun and climate since 1975, leading the authors of Usoskin and colleagues in 2005 to conclude that “this most recent warming episode must have another source.”

The patterns observed in the current global warming trend indicate what that other source must be. Warming caused by the Sun predicts a warming trend throughout the atmosphere, in both the upper (stratosphere) and lower (troposphere) atmosphere. Instead, we see cooling in the upper atmosphere and warming in the lower atmosphere. This is the pattern expected from greenhouse warming. Similarly, solar warming would cause summers to warm faster than winters. Instead, we see winters warming faster than summers – another fingerprint of greenhouse warming. The observed patterns in the current global warming not only rule out the Sun as the major cause, they also provide additional evidence for greenhouse warming.

24.3.4 Human Emissions Upsetting the Natural Balance

Over the last 10,000 years, atmospheric CO₂ levels remained relatively steady until the industrial revolution in the mid-1700s. At that point, humans began emitting significant amounts of CO₂, upsetting the natural carbon cycle where natural emissions (sources) were roughly balanced by natural absorptions (sinks). Since pre-industrial times, atmospheric CO₂ levels have increased by around 40%. Current levels are close to 400 ppm, the highest in over 3 million years.

Carbon isotope fingerprints provide more evidence that human activity is responsible for the rise in CO₂. Nevertheless, some deny even the fundamental fact that humans are responsible for the dramatic rise in carbon dioxide seen in Fig. 24.5. This is accomplished by the deniers ‘cherry picking’ the data and arguing that human CO₂ emissions are only 3% of natural CO₂ emissions (Fig. 24.6).

Annual human emissions are around 9 tonnes of carbon. This is small compared to natural CO₂ emissions from plant decomposition, plant respiration and the ocean which add up to 210 tonnes of carbon. However, natural emissions are balanced by natural absorptions with plants and oceans absorbing around 215 tonnes of carbon each year. By failing to consider natural absorptions, this act of ‘cherry picking’ distracts from the fact that human CO₂ emissions have upset the natural balance.

24.4 Logical Fallacies

Logical fallacies are false arguments that lead to an invalid conclusion. They are based on erroneous logic, misdirection or false characterization. There are a number of different logical fallacies, such as non sequitur, misrepresentation and false dilemma.

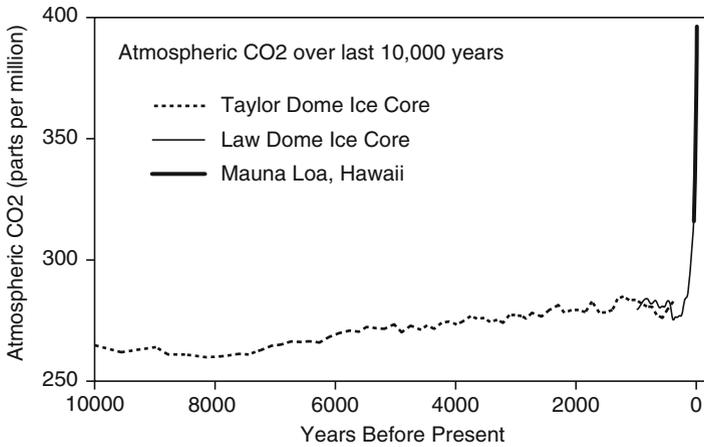


Fig. 24.5 Atmospheric CO₂ levels taken from Antarctic ice core records (Taylor Dome and Law Dome) and Mauna Loa instrumental measurements

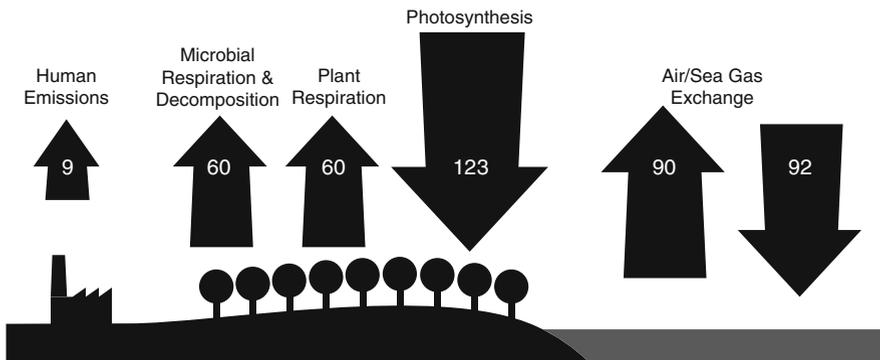


Fig. 24.6 Carbon flux amounts in units of carbon (from skepticalscience.com, 2012)

24.4.1 What Does Past Climate Change Tell Us?

Throughout Earth’s history, we see dramatic changes in global temperature. Slow, subtle changes in the Earth’s energy balance cause dramatic climate change, including the plunging in and out of ice ages. Our sensitive climate is best characterized by paleoclimatologist Wallace (“Wally”) Broecker who said “The paleoclimate record shouts out to us that, far from being self-stabilizing, the Earth’s climate system is an ornery beast which overreacts to even small nudges.”

Some succumb to the logical fallacy of non sequitor (Latin for “it does not follow”) in coming to the opposite conclusion of the paleoclimatologists who study past climate change. They assume that because climate has changed naturally in the past, then current climate change must be natural also. This is equivalent to

examining a dead body with a knife protruding from its back and concluding “people have died naturally in the past therefore this death must also be caused by natural causes.”

The overall influence from natural forcings over the last few decades has been a slight cooling. If the planet was in its natural equilibrium state, the forcings that are currently acting on Earth’s global climate should and would cause the Earth to be cooling. Solar activity has been dropping, the Earth’s orbit is configured to have a cooling influence and volcanic activity has been relatively active in the latter twentieth century, again imposing a cooling effect. At the same time, human activity is now the dominant driving force of climate, outpacing natural drivers. We’ve seen from the geologic past that climate reacts strongly to small nudges but our current nudging is much stronger than a small nudge. Past climate change is not a cause for comfort but a cause for concern.

24.4.2 CO₂ Lag – The Chicken and Egg Dilemma

Of course as every paleontologist and evolutionary biologist knows, the amniote egg preceded the chicken by millions of years, having freed the first amphibians from the aquatic environment and allowed them to become reptiles. However, it is a useful analogy to use as a “which came first” analogy. Most people get the message even though those most erudite already know the answer.

Over the past half million years, the Earth has cycled between ice ages and warm periods called interglacials. The main driving force behind the “ice age” glacial and interglacial cycles appears to be subtle changes in Earth’s orbit. The ice core record shows that the small temperature changes from orbital variations are magnified by reinforcing feedbacks. One of the dominant feedbacks is carbon dioxide, which outgases from the oceans, amplifies the initial warming and spreads warming across the planet. We have previously identified carbon dioxide as the “Earth’s thermostat.”

However, the ice core records are misunderstood by those who commit the logical fallacy of false dilemma. In the Antarctic ice core records, temperature rises first followed by an increase in CO₂ around 800 years later. The logical fallacy is to assume that one must choose between either CO₂ driving temperature or temperature driving CO₂. This is the logical equivalent of observing a chicken hatching from an egg and concluding “chickens come from eggs therefore eggs cannot come from chickens.”

In reality, we observe both CO₂ driving warming and warming driving CO₂. The evidence that CO₂ causes warming is provided by satellites and many other lines of evidence. The ice core record also indicates that warming causing an increase in atmospheric CO₂. When the Southern Ocean warms, it outgases carbon dioxide into the atmosphere. When we put the two together, the result is a reinforcing feedback that magnifies the small warming effect of orbital changes and brings our planet out of an ice age.

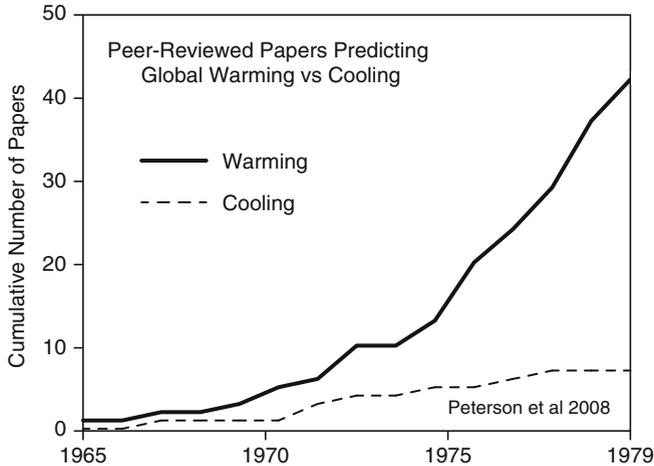


Fig. 24.7 Number of papers classified as predicting global warming (*solid line*) versus cooling (*dotted line*). In no year were there more cooling papers than warming papers (Peterson et al. 2008)

24.4.3 What Were Scientists Predicting in the 1970s?

The best indication of what scientists were saying about climate change in the 1970s is found in the peer-reviewed literature. A survey of peer-reviewed papers from 1965 to 1979 found that significantly more papers (42) predicted global warming than the minority that predicted cooling (7) as shown in the illustration above (Fig. 24.7). The majority of climate research in the 1970s predicted global warming as a consequence of greenhouse gas emissions.

However, some deniers misrepresent the state of the science in the 1970s by claiming that the scientific consensus at the time was that of imminent cooling. This is achieved by citing media articles from the 1970s, misrepresenting them as the scientific consensus at the time. Cited examples are a 1974 *Time* magazine article ‘Another Ice Age?’ or a 1975 *Newsweek* article ‘The Cooling World’ that suggested global cooling may cause a “drastic decline for food production.”

However, the most comprehensive study in the 1970s was the 1975 report by the U.S. National Academy of Sciences and National Research Council that concluded, “... we do not have a good quantitative understanding of our climate machine and what determines its course.” This qualified statement is in strong contrast with the current position of the U.S. National Academy of Science: “The scientific understanding of climate change is now sufficiently clear to justify nations taking prompt action.” To compare the handful of cooling predictions in the 1970s (predominantly from media sources, not peer-reviewed literature) to the current scientific consensus endorsing human-caused global warming, is both inappropriate and misleading.

24.4.4 How a Trace Gas Has Such a Significant Effect

The warming effect of CO₂ has been empirically confirmed by multiple lines of evidence. Airplanes and satellites measure heat escaping to space, observing a significant ‘hole’ in outgoing radiation at the wavelengths that carbon dioxide absorbs energy. Surface measurements also measure downward infrared radiation emitted by the atmosphere and record heat returning to Earth at those same wavelengths. The greenhouse effect is an empirical reality and without it we would not be able to live on Earth’s surface.

Nevertheless, the drive to deny the human influence on climate change is strong and leads some to reject even basic physics and physical phenomena like the greenhouse effect. One argument employs the logical fallacy of non sequitor, arguing that as CO₂ comprises such a small percentage of the atmosphere, it cannot have a significant effect.

Atmospheric CO₂ currently comprises around 400 ppm or around 0.04% of the atmosphere. How can such a small percentage cause such a significant effect? Over 99% of the atmosphere consists of nitrogen and oxygen, both of which are not greenhouse gases. It is like holding an election in a town of 10,000 people where less than 10 people vote. The few people who vote will have a significant impact on the outcome of the election, even though they are a small fraction of the entire population.

24.5 Impossible Expectations

Impossible expectations involve the demand of unrealistic standards of proof before acting on the science. This often involves shifting the discussion away from what we know and focusing instead on uncertainty and areas of low understanding.

24.5.1 What Lessons Do We Learn from Past Model Predictions?

Climate models simulate many aspects of climate change and observations provide the opportunity to test model performance and glean insights from the comparison. A good example of testing model performance was the Mount Pinatubo volcanic eruption in 1991. The aerosol particles thrown into the atmosphere by the volcano had a cooling effect and the models forecast subsequent global cooling of 0.5°C. The temperature response as well as radiative, water vapor and dynamical feedbacks predicted by the models were matched by observations (Hansen et al. 2007).

Nevertheless, climate model uncertainties are often used as an excuse to reject both models and empirical evidence for human-caused global warming. Any discrepancy between model predictions and observations is used to argue that model results are worthless, when a more appropriate and enlightening approach is to discern what lessons can be learned from past model predictions.

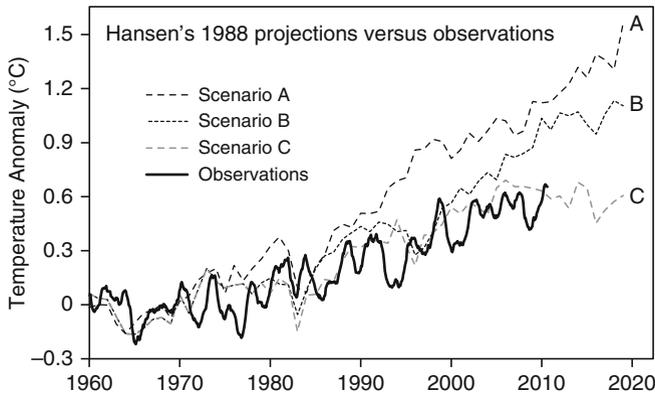


Fig. 24.8 Projections for Scenarios A (black dashed line), B (dotted line) and C (grey dashed line) by Hansen et al. (1988) compared to 12 month running average of NASA GISS global temperature (thick black line)

An example of using models to try and see future climate conditions is the 1988 projections used by James Hansen in a presentation before the U.S. Congress in 1988. Hansen used three (3) different greenhouse gas emission scenarios in his presentation (Hansen et al. 1988). Scenario A assumed accelerating greenhouse gas emissions, Scenario B assumed a slowing rate of growth and Scenario C assumed a rapid decline in emissions. Critics have pointed out that Hansen’s scenarios overestimated future warming and concluded that his climate model is invalid. However, this fails to ask the crucial question – why did Hansen’s model overestimate the warming trend? (Fig. 24.8).

The scenario that most closely matches actual greenhouse emissions is Scenario B. The reason that Hansen’s Scenario B overestimated the warming trend is because the model used a climate sensitivity of around 4°C for doubled CO_2 . However, if Hansen’s model had used a climate sensitivity of just over 3°C , it would have accurately predicted global warming since 1988. Hansen’s 1988 model projections are actually evidence for climate sensitivity consistent with current mainstream estimates (i.e., 3°C for a doubling of CO_2).

24.5.2 Science Is Never Settled

Various areas of science are understood with different levels of understanding. For example, scientists understand how greenhouse gases trap heat with a high degree of certainty and can accurately calculate the radiative forcing from greenhouse gases. However, our understanding of how aerosols cool climate, by reflecting sunlight and contributing to cloud formation, is not as well understood. This contrast is reflected in Fig. 24.9.

Climate deniers presume that poor understanding in one area invalidates strong understanding in other areas. This is like arguing that if we don’t understand everything,

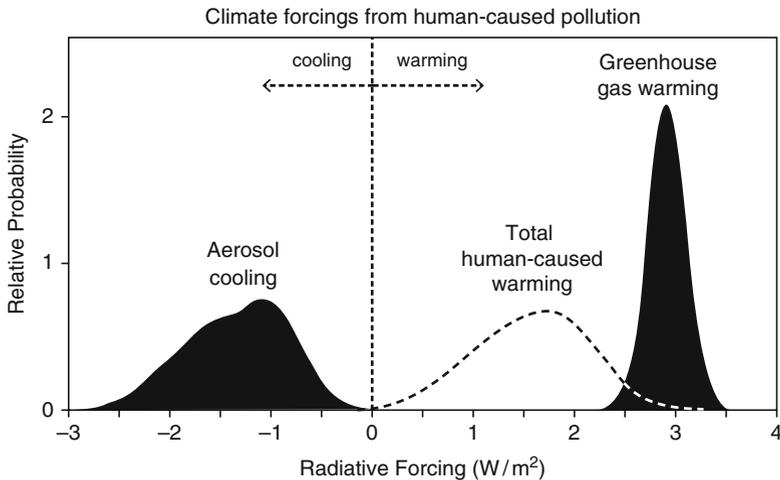


Fig. 24.9 Probability distribution function from human-caused forcings (Solomon et al. 2007). Relative probability is a measure of the level of confidence, indicating that greenhouse warming has a higher level of understanding than aerosol cooling

we understand nothing. Thus, areas of uncertainty in climate science such as the cooling effect of aerosols are used to argue “the science isn’t settled” and that we don’t know enough to act.

However, science is not about absolute proof, which is the domain of mathematics and logic. There is no invisible line where the science suddenly becomes ‘settled.’ Instead, science provides a range of estimated values and progresses by gradually reducing the range of uncertainty. Areas of climate science that are less understood do not invalidate the well understood areas, such as the warming effect of greenhouse gas emissions.

24.5.3 *Uncertainty Is Not Our Friend*

To scientists, uncertainty is related to calculating a best estimate within a likely range of values. For example, the climate response to doubled CO_2 is estimated to be anywhere between 2 and 4.5°C with a most likely value of 3°C . While there is a significant chance that the climate response will be less than 3°C , it is more likely that the response will be greater than expected. This is known as the “fat tail” of climate sensitivity, the inevitable consequence of a climate system with net positive feedback (Fig. 24.10).

In an ironic twist, climate deniers invoke scientific uncertainty to conclude with “certainty” that there isn’t a problem or at the least, we should act as if there is no problem. But inaction is not an option - we are already emitting billions of tonnes of carbon dioxide into the atmosphere every year. The logic behind “don’t act until we

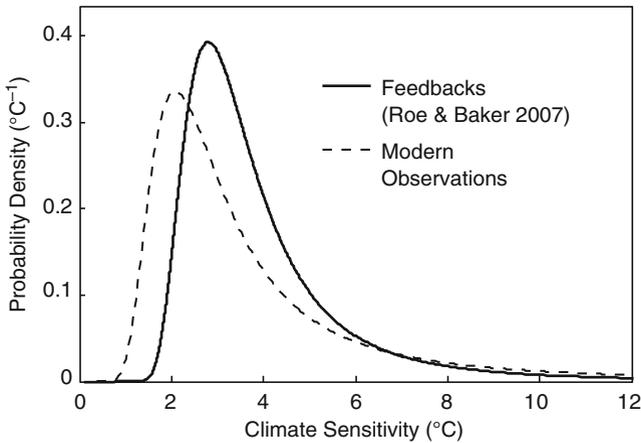


Fig. 24.10 Probability Density Function from Roe and Armour (2011) for climate sensitivity estimated from model-based climate feedbacks (*solid line*) and modern instrumental observations (*dashed line*)

have more certainty” is like being informed there are a range of possible side-effects from drinking poison, from slight illness to death – but persisting in taking the poison until the uncertainty range is further narrowed.

Intrinsic to climate science is the unavoidable fact that climate uncertainty is asymmetrical and more likely to be worse than expected. Another key point to realize is that higher uncertainty means the probability distribution in Fig. 24.10 is spread over a greater range leading to an increased chance of higher climate responses. A greater the range of possible climate responses means more likelihood of serious consequences. Uncertainty is not our friend.

24.6 Conspiracy Theories

Two identifying features of a conspiracy theorist are exaggerated claims about the power of the conspirators and immunity to new facts by claiming any counter evidence is all part of the conspiracy.

24.6.1 *Nine Climategate Investigations Across Two Countries*

In November 2009, emails were stolen from servers at the University of East Anglia and published on the Internet. A number of suggestive quotes were focused on as supposed evidence of a conspiracy among climate scientists, dubbed ‘Climategate’ by the news media. To determine if there was any wrongdoing, nine separate investigations across two countries have independently investigated the ‘Climategate’ emails. This includes the House of Commons Science and Technology Committee,

the University of East Anglia's Scientific Assessment Panel in consultation with the Royal Society, Pennsylvania State University, the U.S. Environmental Protection Agency, the U.K. Government, the U.S. Department of Commerce and the U.S. National Science Foundation. These government and educational bodies have unanimously concluded that nothing in the 'Climategate' emails affect the science.

Movements that deny a scientific consensus are prone to conspiracy theories and 'Climategate' presented an ideal opportunity for climate change deniers to indulge their fantasies (or tin foil hat tendencies). Emails were quote mined in order to accuse scientists of suppressing inconvenient results ("hide the decline," Trenberth's travesty) or corrupting data ("Mike's trick"). Little effort was made to put the quotes in context or understand the science discussed in the emails. After all, journalists are not required to have knowledge of science or the scientific method.

Two features of conspiracy theorists were apparent among 'Climategate' proponents. A characteristic of conspiracy theorists is immunity to contrary facts – any evidence against the conspiracy theory is assumed to be part of the plot. When investigation after investigation found no evidence of wrongdoing, each subsequent exoneration was assumed to be a whitewash. Another characteristic of conspiracy theorists is ascribing omnipresent, omnipotent powers to the conspirators. The climate conspiracy is so powerful that climate scientists have managed to engineer evidence for global warming in surface temperature records, glaciers, ice sheets, sea levels, ocean heat, atmospheric patterns, and the timing of the seasons. Even thousands of animal species and tree lines that are shifting towards cooler regions appear to be in on the conspiracy.

24.6.2 *Confusing 'Mike's Trick' with 'Hide the Decline'*

The most quoted phrase from the 'Climategate' emails comes from an email by Phil Jones of the U.K.'s Hadley Centre's Climate Research Unit discussing reconstructions of past temperatures, where Jones states:

I've just completed Mike's Nature trick of adding in the real temps to each series for the last 20 years (i.e. from 1981 onwards) and from 1961 for Keith's to hide the decline.

In this email, "Mike's Nature trick" and "hide the decline" refer to two separate techniques. The 'trick' is a technique employed by Michael Mann plotting recent instrumental data in the same graph as reconstructed temperatures predating the instrumental record (Mann et al. 1998). This places recent global warming trends in the context of temperature changes over longer time scales.

The first misconception about Phil Jones' email is that the "decline" refers to declining temperatures. It actually refers to a decline in tree-ring growth at certain high-latitude locations since the 1960s. This is known as the 'divergence problem', where tree-ring proxies diverge from the instrumental record after 1960. Rather than a secret climate conspiracy, the decline in tree-ring growth is an issue that has been publicly discussed in the peer-reviewed literature since 1995 (Jacoby and D'Arrigo 1995).

The second and most common misconception about this email is the conflation of "Mike's trick" with "hide the decline." Many climate change deniers believe that

hiding the decline was a technique employed by Michael Mann. However, there were no declining tree-rings in Mann's 1998 'hockey stick' and the decline had nothing to do with "Mike's trick." Despite the obsession with the word 'trick', it merely refers to the technique (as in 'trick of the trade') of plotting instrumental data in the same graph as reconstructed paleotemperatures.

24.6.3 Tracking Down Trenberth's 'Missing Heat'

The second most cited 'Climategate' email is from climate scientist Kevin Trenberth (a Distinguished Scientist at UCAR) who stated that:

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.

Trenberth is referring to a paper he had recently published that examined the planetary energy budget, how much energy is flowing into our climate system and where it's going (Trenberth 2009). It is a frankly worded paper that laments the limitations of our observation systems that are unable to comprehensively track all the energy flowing through our climate.

Trenberth's email was quote-mined so that the one sentence about 'lack of warming' was quoted out of context, thus hiding the fact that Trenberth was merely summarizing the conclusions of a published paper. Critics characterized the quote as if Trenberth was secretly admitting that global warming wasn't happening or that observations didn't match theoretical expectations.

However, the issues Trenberth raised are openly discussed in his published paper. Moreover, the conflict Trenberth discusses is not a discrepancy between observations and models. Rather, it is a discrepancy between two sets of observations. Satellite measurements indicate our planet is suffering an energy imbalance but observations are unable to track where all this energy is going. Once again, taking isolated quotes out of context without taking the time to or being able to understand the science being discussed have fed conspiracy theories when in reality, scientists are simply emailing about technical issues that have been discussed in publicly available peer-reviewed papers.

In any case, the illegal stealing of the emails, their selective editing and posting on internet sites frequented by skeptics, deniers, and contrarians about climate change has had a significant impact on the general public's confidence in science in general and climate science in particular.

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