

# There Is No Evidence

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## Introduction

Let's break down the case for human-caused global warming:

- 1) There is plenty of evidence that global warming has been occurring recently.
- 2) There is ample evidence that carbon dioxide causes warming and that the level of atmospheric carbon dioxide is increasing.
- 3) But there is **no** evidence that carbon dioxide emissions are the **main** cause of the recent global warming.

The alarmists focus you entirely on the first two points, to distract you from the third.

Yes, every emitted molecule of carbon dioxide (CO<sub>2</sub>) causes some warming—but the crucial question is **how much** warming do the CO<sub>2</sub> emissions cause? If atmospheric CO<sub>2</sub> levels doubled, would the temperature rise by 0.1°, 1.0°, or by 10.0° C?

We go through the usual “evidence” offered by alarmists, and show that in each case either it:

- Is not evidence about what **causes** global warming. Proof that global warming occurred is not proof that CO<sub>2</sub> was mainly responsible.
- Is not empirical evidence; that is, it is not independent of theory. In particular, models are theory, not evidence.
- Says nothing about **how much** the temperature would rise for a given rise in CO<sub>2</sub> levels.

Despite spending \$50bn over the last 20 years looking for evidence of point (3) above, the alarmists have found none. In two instances they expected to find it, but in both cases they found only evidence of the opposite—and they have kept awfully quiet about those cases. If they had some evidence they could just tell us what it was—and end the debate. But the obvious explanation for the lack of evidence is simply that it is not true that CO<sub>2</sub> emissions are the main cause of the recent global warming.

There used to be some supporting evidence, but better data later reversed it. Instead, there are now at least three independent pieces of evidence that the temperature rises predicted by the IPCC due to CO<sub>2</sub> emissions are exaggerated by a factor of between 2 and 10, because the water vapor feedback is in fact not nearly as strong as assumed by the climate models. Finally, we will discuss some examples of what would constitute evidence.

## What is Evidence?

“Evidence” in this document means observations that prove or suggest that human emissions of CO<sub>2</sub> are the main cause of the recent global warming. Evidence includes the following information:

- Who made the observations?
- When were they made?
- What did they observe? (In general terms, we don't have to see the raw data.)
- How do the observations support the idea that rising CO<sub>2</sub> levels are the main cause of the recent global warming?

The evidence must of course be *empirical*, meaning that it is independent of theory.

## Typical Alarmist Offerings of “Evidence”

***Polar Bears, Glaciers, Arctic Melt, Antarctic Ice Shelves, Storms, Droughts, Fires, Malaria, Snow Melt on Mt Kilimanjaro, Rising Sea Levels, Ocean Warming, Urban Heat Island Effect***

Although each of these issues may say something about whether or not global warming is or was occurring, none of them say anything about the *causes* of global warming. It would make no difference to these issues if the recent global warming was caused by CO<sub>2</sub> or by aliens heating the planet with ray guns.

### ***The IPCC Said So***

So what is their evidence? Chapter 9 of their latest Assessment Report 4 (2007), “Understanding and Attributing Climate Change”, contains no evidence. That CO<sub>2</sub> is the main cause of the recent global warming is an *assumption* in much of what they say, and they find many ingenious ways of saying it and implying it using complex language. But repetition is not proof, and nowhere do they present any actual evidence. If you doubt me, read it yourself then say what the evidence is in your own words:

[ipcc-wg1.ucar.edu/wg1/Report/AR4WG1\\_Print\\_Ch09.pdf](http://ipcc-wg1.ucar.edu/wg1/Report/AR4WG1_Print_Ch09.pdf)

Often the assumption takes the form that nearly all the temperature rises since the start of industrialization are due to CO<sub>2</sub> rises, or that there are no other possible significant causes of global warming. See [It Cannot Be Anything Else](#), below.

### ***Computer Models are Evidence***

Computer models consist solely of a large number of calculations that, individually, you could do on a hand-held calculator. So models are theoretical, and cannot form part of any evidence.

### ***Computer Models Incorporate a Lot of Sound Empirical Science***

Yes they do. The climate models contain some well-established science that has been verified by empirical observations. But they also contain a myriad of:

- implicit and explicit assumptions

- omissions
- guesses
- gross approximations.

A single mistake in any one of these can invalidate the climate models.

Typical engineering models that mimic reality closely contain no untested assumptions, material omissions, guesses, or gross approximations. They are the result of mature understanding of the reality being modelled, and have been tested ad nauseum in a wide range of circumstances. On the other hand, climate science is in its infancy, individual models routinely fail most tests, the climate models are riddled with untested assumptions and guesses, they approximate the atmosphere with cells a hundred kilometres square and hundreds of meters high, and they do not even attempt to model individual cloud formations or any feature smaller than the cell size. Don't let the word "model" fool you into thinking climate models are better than they are.

### ***Computer Model Projections Agree with Something that Actually Happened***

This only shows that a particular model predicted a particular outcome.

It might be because the model accurately mimics reality, or it might be an accident. Given that all climate models contain a myriad of implicit and explicit assumptions, omissions, guesses, and gross approximations (see the last section), it's probably a fair bit of the latter. Even a broken clock is right twice a day.

None of the climate models in 2001 predicted that temperatures would not rise from 2001 to 2009—they were all wrong. All of the models wrongly predict a huge dominating tropical hotspot in the atmospheric warming pattern—no such hotspot has been observed, and if it was there we would easily have detected it.

While it may give us more confidence that that model might make further successful predictions, the current climate models are so uncertain and leave out so many natural factors that even the IPCC does not call their outputs "predictions".

### ***CO<sub>2</sub> is a Greenhouse Gas***

Yes, CO<sub>2</sub> was proven to be a greenhouse gas in laboratories over a century ago.

Furthermore, we know what the absorption frequencies of CO<sub>2</sub> are, and we can calculate *how much* outgoing radiation the CO<sub>2</sub> in the atmosphere reflects back to the earth. (CO<sub>2</sub> molecules absorb radiation at their absorption frequencies, which are all in the infra-red range, and later re-emit radiation with the same energy at those same frequencies but in random directions. So a cloud of CO<sub>2</sub> acts like a blanket at those frequencies, ultimately reflecting most of the radiation at those frequencies back to earth.)

The CO<sub>2</sub> absorption frequencies are already saturated, meaning that they are already reflecting close to 100% of the radiation at those frequencies. As the level of CO<sub>2</sub> in the atmosphere increases, the band of frequencies at which they reflect radiation widens. This band widening is logarithmic—the amount of radiation reflected by the

CO<sub>2</sub> is the logarithm of the level of atmospheric CO<sub>2</sub>—so the warming effect of each extra quantum of atmospheric CO<sub>2</sub> is much less than the effect of the previous quantum. (Each doubling of CO<sub>2</sub> has the same effect once beyond about 100 ppmv, at which concentration the CO<sub>2</sub> band is already saturated.)

These calculations are validated by laboratory experiments, and are not in dispute.

The IPCC climate models use these calculations to predict how much warming will occur as the CO<sub>2</sub> level increases. This is called the *no-feedbacks warming*, a “baseline” warming. The no-feedbacks warming causes changes, which in turn cause further warming or cooling. This extra warming or cooling is called the *temperature change due to feedbacks*, and it amplifies or dampens the baseline warming:

- If the feedback is “positive” then the temperature change due to feedbacks is a warming: the feedbacks *amplify* the original no-feedbacks warming and the net effect is a larger warming than the no-feedbacks warming.
- If the feedback is “negative” then the temperature change due to feedbacks is a cooling: the feedbacks *dampen* the original no-feedbacks warming and the net effect is a smaller warming than the no-feedbacks warming.

This method for analysing the effects of rising CO<sub>2</sub> levels is not in dispute.

But here’s why these calculations of the warming effect of extra CO<sub>2</sub> are not evidence. The calculated warming effect of the extra CO<sub>2</sub> is the no-feedbacks warming, but the actual warming that occurs is the *combination* of this no-feedbacks warming and the consequent temperature change due to feedbacks. We cannot observe just the no-feedbacks warming; we can only observe the combination of the no-feedbacks warming *and* the temperature change due to feedbacks.

Unless we also know the temperature change due to feedbacks, knowing the no-feedbacks warming due to increased CO<sub>2</sub> only tells us whether the net effect is warming or cooling, because we do not know how much the feedbacks will amplify or dampen the no-feedbacks warming. The temperature change due to feedbacks makes all the difference: is the no-feedbacks warming due to extra CO<sub>2</sub> amplified or dampened by the climate feedbacks, and by how much?

As it happens, the temperature change due to feedbacks in our climate is immensely complicated and no one even claims to have a complete understanding of it. Certainly there are no calculations of it that are generally accepted or empirically verified; it is unproven and unknown. So all we really know for sure from the calculations of how much warming the extra CO<sub>2</sub> causes by reflecting radiation, is that the net effect of the extra CO<sub>2</sub> is warming! (Well who would have guessed?) Which is why those calculations are not evidence.

So yes, CO<sub>2</sub> is a greenhouse gas and extra CO<sub>2</sub> causes global warming. But even though we can calculate how much warming the radiation reflected by the extra CO<sub>2</sub> would cause in the absence of climate feedbacks, this does not tell us *how much* global warming is caused by the extra CO<sub>2</sub>—because we do not know how much the climate system amplifies or dampens that no-feedbacks warming due to the extra CO<sub>2</sub>.

## **More on Climate Feedbacks**

The last topic is the nub of the real scientific climate debate. In this section we will go into more detail about the effect of climate feedbacks on the no-feedback warming effect of extra CO<sub>2</sub>.

The IPCC climate models have assumed certain feedbacks, but these assumptions amount to little more than intuitive guesses. These guesses were made around 1980 when the CO<sub>2</sub> theory of global warming was first seriously proposed, and people simply did not know what the effects of feedbacks were. The assumptions seemed reasonable at the time. Scientists have since made more observations on feedbacks, and we now have a better (though still imperfect) idea of the effect of feedbacks.

The IPCC climate models assume strongly amplifying positive feedback. But the evidence now points fairly strongly to the feedbacks being weakly negative, dampening the no-feedback warming due to the extra CO<sub>2</sub>. This is the heart of the scientific debate over how much warming is caused by rising CO<sub>2</sub> levels. Obviously the new evidence clashes badly with the current theory as espoused by the IPCC. This argument could go on for years, especially as the stakes are so high for those with vested interests in the current IPCC theory of strong positive feedbacks.

***This dispute will eventually be resolved by more evidence. But if you have to choose now between assumptions made thirty years ago and imperfect observational evidence gathered in the last decade, then I don't think you should bet the farm on the assumptions of thirty years ago.***

By the way, the stability of the earth's climate also depends on the climate feedbacks. If the climate feedbacks are as strongly positive as the ones programmed into the IPCC climate models, then the earth's climate is fairly unstable and it won't take much more pushing from higher CO<sub>2</sub> levels to push the earth past its tipping point and to experience a sudden and huge warming as runaway greenhouse warming takes hold. On the other hand, if the climate feedbacks are negative then the climate is stable and we are not near a tipping point. Geological history tells us that the earth has never gone into runaway greenhouse warming (unlike Venus), that CO<sub>2</sub> levels have been twenty times current levels while experiencing similar temperatures, and that CO<sub>2</sub> levels have been five times higher than today during some past ice ages. So geological history is strongly hinting that the feedbacks are negative.

To put some numbers on the situation, consider what happens when the level of atmospheric CO<sub>2</sub> doubles (on current trends, CO<sub>2</sub> will have doubled from its preindustrial level of 280 ppmv to around 540 ppmv by about 2070):

- The no-feedback warming due to a doubling of CO<sub>2</sub> is generally calculated to be about 1.2°C. That is, doubling the level of atmospheric CO<sub>2</sub> would, in the absence of climate feedbacks, heat the world by about 1.2°C.
- The global warming for a doubling of CO<sub>2</sub> is called the ***climate sensitivity***, and is the standard benchmark. The IPCC's current view is that the climate sensitivity is probably about 3.3°C, but definitely between 2.0°C and 4.5°C.
- The IPCC climate models assume total feedbacks such that they amplify the no-feedback warming due to CO<sub>2</sub> to about 3.3°C. The rise from 1.2°C to 3.3°C

is 275%, so the IPCC climate models are using positive feedback that amplifies any no-feedbacks warming by about 2.75.

- Observational evidence from satellite measurements of outgoing radiation from the earth suggests a climate sensitivity of 0.5°C (Lindzen and Choi, in press), while recent close observations of clouds (which both reflect outgoing radiation back to earth and reflect incoming radiation away from earth) suggest a climate sensitivity of about 0.6°C (Spencer, 2009). These are both recent cases of observed data, and both suggest that the climate has negative feedback that dampens any no-feedbacks warming by about a half.

The predominant feedback is the *water vapor feedback*. Water vapor is water in gaseous form in the air, from where it may precipitate into raindrops and form clouds, whence the water might get rained back to earth. Water vapor is a greenhouse gas, trapping outgoing radiation at different frequencies from CO<sub>2</sub> (though there is also some overlap). Water vapor is the main greenhouse gas, trapping far more heat than the rest of the greenhouse gases (CO<sub>2</sub>, methane, etc) put together. The water vapor absorption bands are often not saturated, so small changes in water vapor can have a relatively large effect on climate. Understanding water vapor is the key to understanding climate feedbacks and thus the key to understanding climate, and it is also the area where our understanding is most immature.

IPCC climate theory assumes that any no-feedback warming heats the ocean, which causes more evaporation, which puts more water vapor in the air. Water vapor being a greenhouse gas, this causes extra warming. There being no data to the contrary in 1980, this seemed like a good assumption at the time.

A necessary consequence of the extra water vapor is that it adds water vapor to the top of the lower troposphere (the part of the atmosphere under the water vapor greenhouse blanket), thus pushing the top of the lower troposphere higher, particularly in the tropics. This means that a volume of atmosphere that was previously *above* the lower troposphere (above the blanket) is now *inside* the lower troposphere (beneath the blanket)—so this volume warms up. In graphs of the atmospheric warming pattern expected by the IPCC, this volume shows up as a very prominent hotspot. Thus, if water vapor feedback is positive, warming due to increased CO<sub>2</sub> (or indeed any other cause) should cause a hotspot about 10 km up over the tropics.

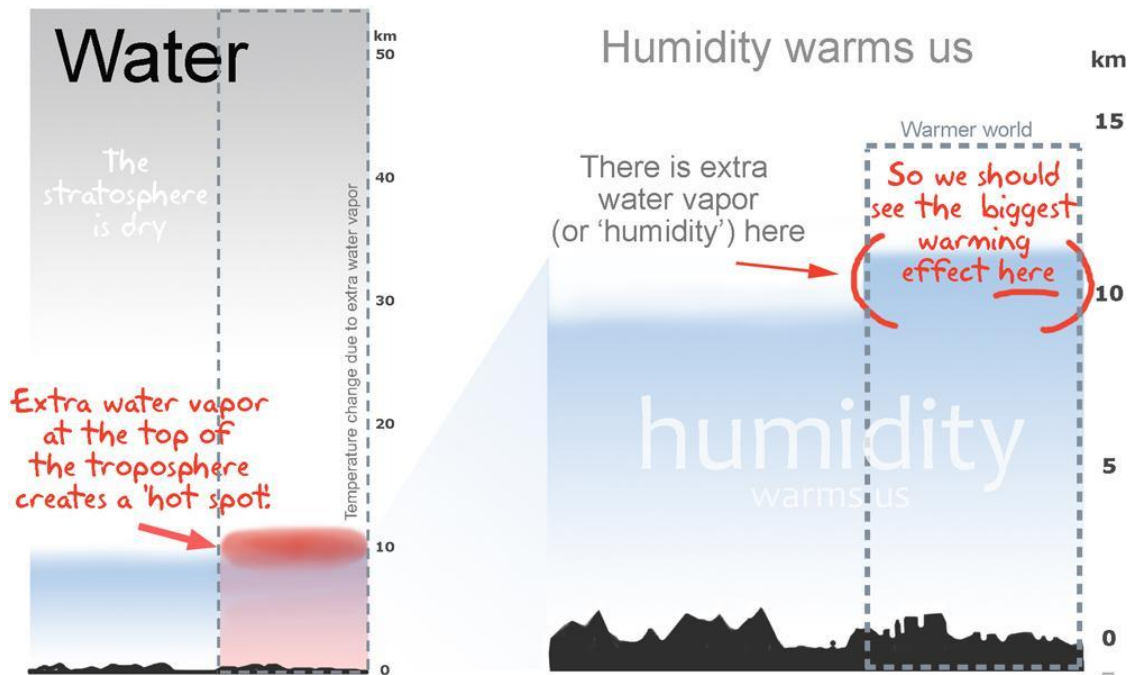


Figure 1: Climate models assume that a warming world will lead to extra water vapor (due to more evaporation from the oceans), and that this extra water vapor will warm the world further (water vapor is the main greenhouse gas). That extra vapor would extend the lower troposphere upward and create a hotspot. Observations show there is no hotspot. Therefore there is no extra water vapor and no amplification of the warming due to extra CO<sub>2</sub>. Diagram from joannenova.com.au.

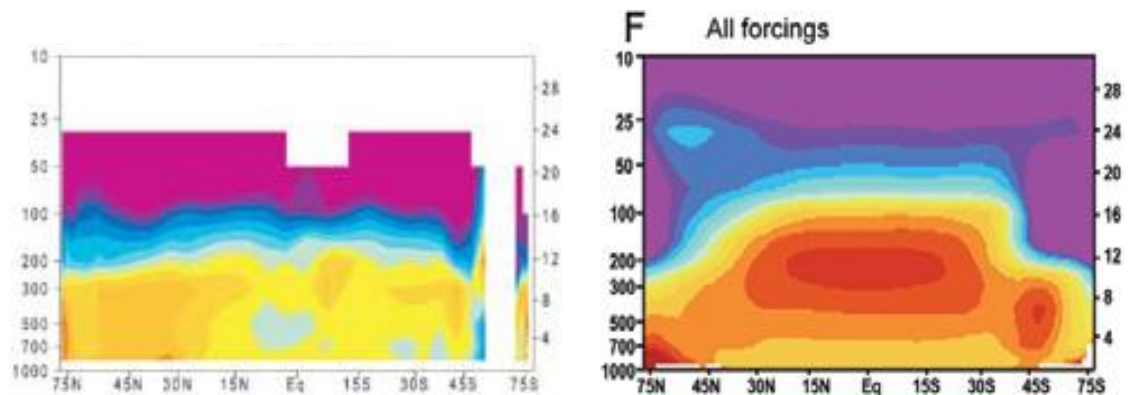


Figure 2: Observed atmospheric warming pattern (left) versus IPCC theory (right). Note the dominant hotspot at 11 km over the tropics predicted by the models on the right, but its complete absence in the observed data on the left. The left diagram shows radiosonde observations for 1979 – 1999, as per the US CCSP of 2006, part E of Figure 5.7 in section 5.5 on page 116. The right diagram shows what the IPCC climate models say happened for 1958 – 1999, as per the US CCSP of 2006, Figure 1.3 in section 1.5 on page 25. The period 1958 – 1999 is comparable to 1979 – 1999 because there was little net temperature change in 1958 – 1978, and this is the public data of model outputs that best matches the observed data on the left (which is only available for 1979 – 1999).

However radiosonde observations for 1979 – 1999, which covers the bulk of the last period of global warming, show no hotspot whatsoever. Not even a small one. This shows pretty conclusively that the water vapor feedback assumed in the IPCC climate

models does not exist. Turning the water vapor feedback in the IPC models down to zero reduces the temperature increases predicted by those various models due to increased CO<sub>2</sub> by a factor of 2 to 3: the assumed water vapor feedback was responsible for most of the warming in the models. This is discussed in more detail in

[sciencespeak.com/MissingSignature.pdf](http://sciencespeak.com/MissingSignature.pdf)

(The alarmists were expecting the radiosonde data to reveal the hotspot. If it had, this would have been excellent confirmation of a strong positive feedback and thus support of the climate model predictions—that is, evidence! But by 1995 it was becoming obvious that the hotspot wasn't present. The alarmists went awfully quiet on the issue, and as far as I know the first public outing of the radiosonde data that showed the hotspot was missing was buried among a set of theoretical warming patterns deep in a US CCSP report in 2006. The alarmists never raise the topic of the missing hotspot, except when they have a new method for claiming that we cannot entirely rule out its presence.)

### ***Satellites show increased absorption of upwelling infrared radiation in the CO<sub>2</sub> bands***

Of course. CO<sub>2</sub> is a greenhouse gas and its levels have been increasing, so it absorbs and reflects more infrared radiation coming from the earth. These satellite observations tells us no more than what we already knew, except that the satellite is working correctly.

This is not evidence because it does not tell us how much warming the extra CO<sub>2</sub> causes, as per the section [CO<sub>2</sub> is a Greenhouse Gas](#) above.

### ***The atmospheric warming pattern over the last warming period shows stratospheric cooling and tropospheric warming***

A pattern of broad stratospheric cooling and broad tropospheric warming is caused by either:

- More greenhouse gases (because more outgoing infrared radiation is absorbed and reflected in the troposphere).
- Less ozone (because less incoming UV-radiation is absorbed by the ozone in the stratosphere).

We already know that ozone depletion and rising levels of CO<sub>2</sub> both occurred during the last warming period (1977 – 2001), so both are responsible, in some unknown proportions, for the observed pattern. So these satellite observations tells us no more than what we already knew, except that the satellite is working correctly.

This is not evidence because it does not tell us how much warming the extra CO<sub>2</sub> causes, as per the section [CO<sub>2</sub> is a Greenhouse Gas](#) above.

### ***CO<sub>2</sub> is Correlated with Temperature***

This “evidence” is often stated something like this: “There is no smoking gun that proves CO<sub>2</sub> is the culprit, but, as with germ theory, evolution, and the ill-effects of smoking, it is correlations that is the evidence.”



Alarmists assert that there is a generally linear relationship between CO<sub>2</sub> levels and temperature: as Al Gore said in his movie, the higher the CO<sub>2</sub> level the hotter the temperature. Obviously they don't say the correlation is perfect, because there are also other factors that influence temperature. But the central alarmist assertion is that CO<sub>2</sub> levels are highly correlated with temperatures. In Gore's movie it is the only reason offered for blaming global warming on carbon emissions.

Correlation is not causation. If two things are correlated we don't know which thing caused the other, or even that neither caused the other but both are due to a third factor. However a lack of correlation between CO<sub>2</sub> and temperature would demonstrate that there is no linear relationship between CO<sub>2</sub> and temperature. A greater clue to a causal connection is that both change trend direction at the same time or after a fixed delay.

Let's consider three relevant time scales.

Firstly, on a time scale of tens of years, the correlation between CO<sub>2</sub> and temperature is middling. Temperatures and CO<sub>2</sub> levels have been rising since before 1880; but human emissions were not significant before 1940. The yearly rises in CO<sub>2</sub> have been steady, with no drops. During that time temperature trended up but moved in cycles of about 30 years:

1882 – 1910	Cooling
1910 – 1944	Warming
1944 – 1975	Cooling (despite significant human emissions of CO <sub>2</sub> )
1975 – 2001	Warming
2001 –	Cooling (despite increased human emissions of CO <sub>2</sub> )

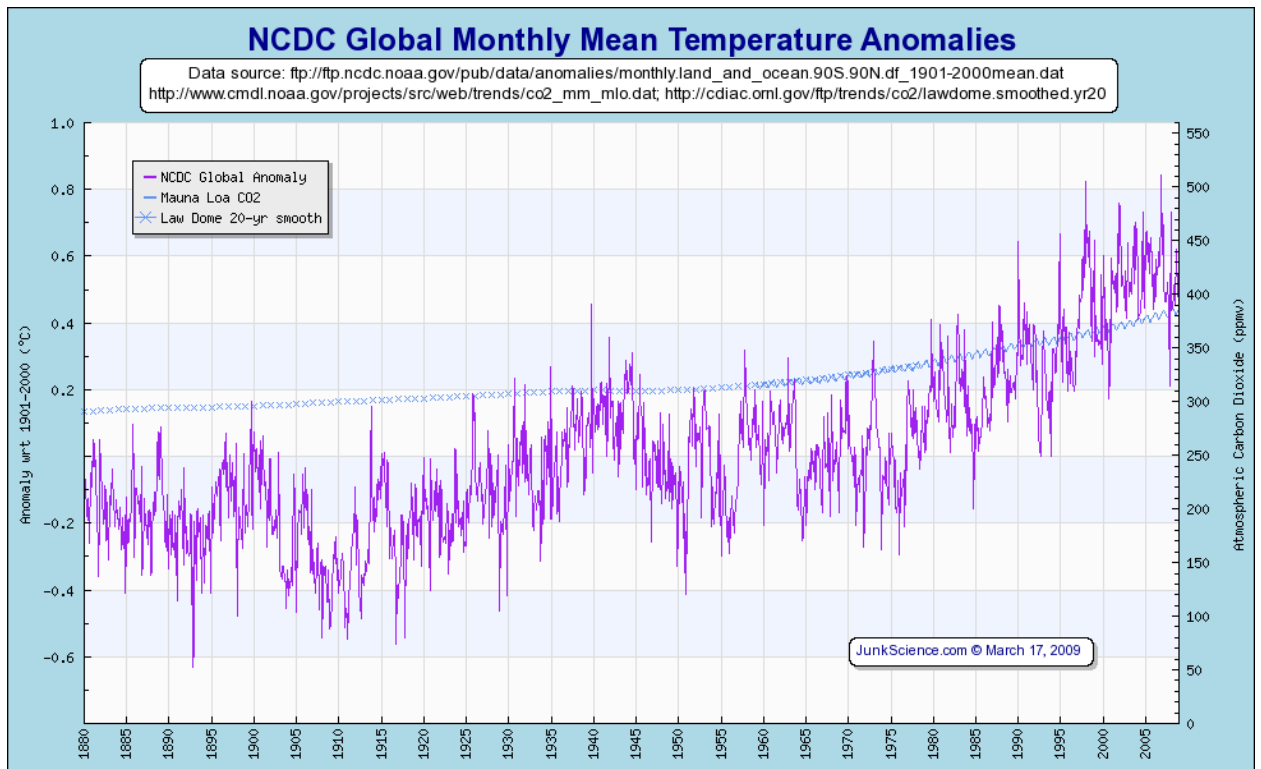


Figure 3: Timescale: Tens of years. CO<sub>2</sub> in blue and temperature in purple.  
[www.junkscience.com/MSU\\_Temps/NCDCanom1880.html](http://www.junkscience.com/MSU_Temps/NCDCanom1880.html)

The temperature trends *down* and CO<sub>2</sub> moves steadily up; the temperature trends *up* and CO<sub>2</sub> moves steadily up. No strong causal relationship here.

The correlation coefficient is middling, but that is simply because both CO<sub>2</sub> and temperature are generally increasing. Temperature correlates well with almost anything that generally goes up in the twentieth century—for example, global temperature correlates better with US postal charges than with atmospheric CO<sub>2</sub> levels:  
[joannenova.com.au/2009/05/03/shock-global-temperatures-driven-by-us-postal-charges/](http://joannenova.com.au/2009/05/03/shock-global-temperatures-driven-by-us-postal-charges/)

Secondly, on a time scale of thousands of years the correlation between temperature and CO<sub>2</sub> is excellent, as illustrated by Gore in his movie with the old ice core data:



Figure 4: Timescale: Thousands of years. CO<sub>2</sub> in red and temperature in blue. From the old ice core data presented in Gore's movie, *An Inconvenient Truth*.

On this time scale, temperature and CO<sub>2</sub> move in lockstep; clearly there is a strong causal relationship. Either temperature causes CO<sub>2</sub> or the other way around (or both are caused by a third factor).

The first ice core data appeared in around 1985, and in the old ice core data collected to about 2000 the time resolution of the data is low—thousands of years between data points. The old ice core data did not show which changed direction first, the temperature or the CO<sub>2</sub>. Most alarmists expected that it was the CO<sub>2</sub> that changed direction first, or at least at about the same time as the temperature changed direction, because they believed that CO<sub>2</sub> changes caused or amplified temperature changes.

The new ice core data that was collected from about 1998 had a better time resolution, only hundreds of years between data points. By 2003 it had been firmly established that changes in CO<sub>2</sub>, both up and down, *lagged* the corresponding temperature changes by an average of *800 years*.

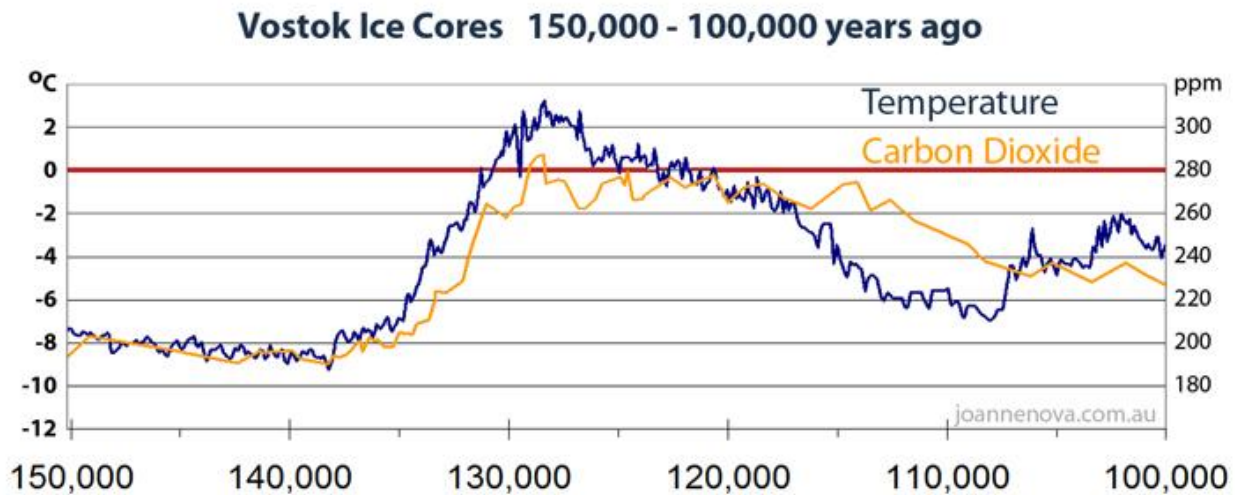


Figure 5. A close up of some new ice core data. Turns out that the changes in CO<sub>2</sub> lag the temperature changes by an average of 800 years, so the CO<sub>2</sub> changes could not have caused the corresponding temperature changes.

This was not what the alarmists expected (for example, *New Scientist* magazine in 1989 entitled a graph of ice core data “Where carbon dioxide leads temperature follows”). They have basically kept quiet about the ice core data ever since. If the new ice core had showed that CO<sub>2</sub> changes preceded the corresponding temperature changes then that would have been compelling evidence for the idea that rising CO<sub>2</sub> levels were the main cause of global warming.

Because they follow the corresponding temperature changes by an average of 800 years, the CO<sub>2</sub> changes cannot have caused the temperature changes. The correlation is very strong, but the direction of causality is the wrong way around for the theory that CO<sub>2</sub> changes causes temperature changes. Obviously it is the other way around.

Temperature changes cause changes in CO<sub>2</sub> levels, on a time scale of hundreds of years or more. This is high school chemistry: the ocean contains huge amounts of dissolved CO<sub>2</sub>, so the ocean supports a certain vapor pressure of CO<sub>2</sub> in the air above it. The higher the temperature of the liquid, the higher the vapor pressure (or “partial pressure”) of the gas in the enclosed air above the liquid. So the higher the temperature, and thus the warmer the ocean, the higher the level of atmospheric CO<sub>2</sub>.

The alarmists claim “amplification”, that rising temperatures caused rising CO<sub>2</sub>, but then that rising CO<sub>2</sub> in turn caused even higher temperatures. Since higher CO<sub>2</sub> levels cause some extra warming this is obviously true to some extent, but is the effect significant or too small to matter? Obviously some force other than CO<sub>2</sub> levels started each warming episode in the past, and some force stronger than any amplified CO<sub>2</sub> ended each warming episode. The alarmists claim evidence of amplification in some cross correlations of CO<sub>2</sub> to temperature, but closer examination shows they have just found an aliasing artefact in the particular way they processed their data. Process the data in any of many other ways and the artefact, and their “evidence” for amplification, disappears:

[www.palisad.com/co2/slides/siframes.html](http://www.palisad.com/co2/slides/siframes.html)

So any amplification is indeed too small to matter.

By the way, Gore's movie was made in 2005, two years *after* it had been definitely established that the CO<sub>2</sub> changes occurred 800 years on average after the corresponding temperature changes. Gore had scientific advisors and must have known of that fact, but he did not mention it in his movie. Instead, his movie presented the old ice core data as the only reason for believing that rising CO<sub>2</sub> caused global warming: "the higher the CO<sub>2</sub> level the hotter the temperature". Imagine if he had told the whole truth: that the temperature changes occurred 800 years before the cause he was alleging. His movie would have been laughed at, and the public would not now be so convinced of his explanation.

Thirdly, on a time scale of millions of years, the correlation is hardly compelling and the turning points do not match up. Clearly larger forces are at play here.

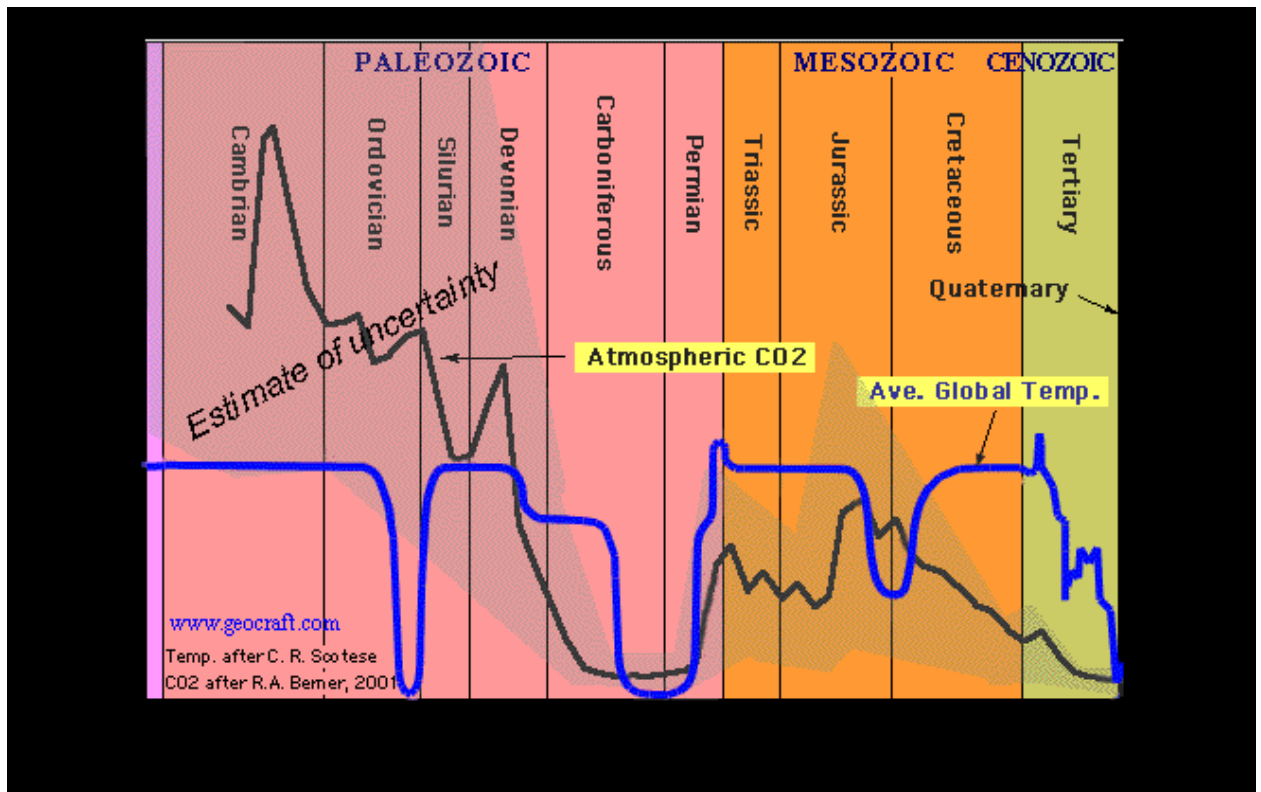


Figure 6. Timescale: Millions of years. CO<sub>2</sub> in black and temperature in blue.  
[www.geocraft.com/WVFossils/PageMill/Images/image277.gif](http://www.geocraft.com/WVFossils/PageMill/Images/image277.gif)

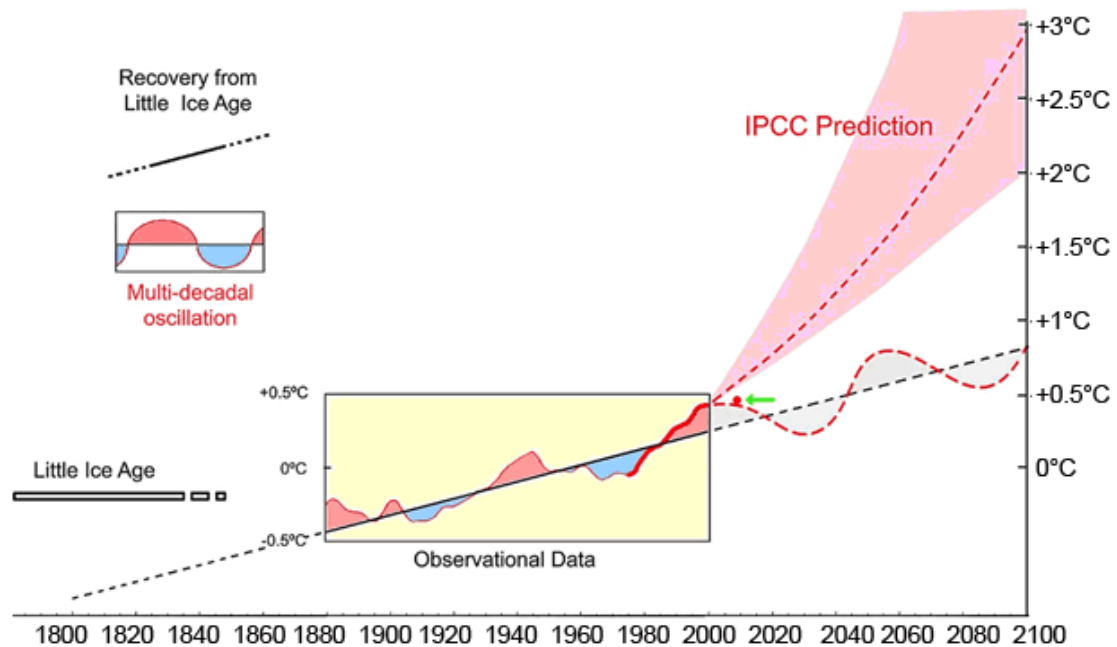
If the alarmists were correct in their assertion that CO<sub>2</sub> levels governs temperature, then there should be good correlations on all time scales between CO<sub>2</sub> and temperature and the turning points should match up. But the correlations are not strong, the turning points don't match, and the strong correlation in the ice cores is due to temperature causing CO<sub>2</sub>, not the other way around.

So, correlations between temperature and CO<sub>2</sub> are not evidence, even of a circumstantial or indirect kind such as in the case of establishing the link between smoking and lung cancer.

Finally, the correlations with temperature are much stronger for ocean oscillations and cosmic rays than they are for CO<sub>2</sub>. Not that correlations demonstrate causation...

### **CO<sub>2</sub> and Temperature Both Increased Over the Last Century**

This “evidence” is just a poor man’s correlation (see [CO<sub>2</sub> is Correlated with Temperature](#), above). Here’s another explanation of why it is not evidence.



*Figure 7: The big temperature picture, using the entire measured world temperature record (which goes back to 1880). In 2009 we are at the red dot, where the green arrow is pointing. Graph and insight from Dr Syun Akasofu (2009).*

The global temperature has been rising at a steady trend rate of 0.5°C per century since the end of the little ice age in the 1700s (when the Thames River would freeze over every winter; the last time it froze over was 1804). On top of the trend are oscillations that last about thirty years in each direction:

- 1882 – 1910 Cooling
- 1910 – 1944 Warming
- 1944 – 1975 Cooling
- 1975 – 2001 Warming

In 2009 the temperatures have leveled off for eight years. The pattern suggests that the world has entered a period of slight cooling until about 2030.

There was a cooling scare in the early 1970s at the end of the last cooling phase. The current global warming alarm is based on the last warming oscillation, from 1975 to 2001. The IPCC predictions simply extrapolate the last warming as if it would last forever, a textbook case of alarmism. However the last warming period ended after the usual thirty years or so, and the global temperature is now definitely tracking below the IPCC predictions.

The alarmists blame human emissions of carbon dioxide for the last warming. But by general consensus human emissions of carbon dioxide have only been large enough to be significant since 1940—yet the warming trend was in place for well over a century before that. And there was a cooling period from 1940 to 1975, despite human emissions of carbon dioxide. And there has been no warming since 2001, despite record human emissions of carbon dioxide.

No one knows for sure what caused the little ice age or for how many more centuries the slow warming trend will continue. It has been warmer than the present for much of the ten thousand years since the last big ice age: it was a little warmer for a few centuries in the medieval warm period around 1100 (when Greenland was settled for grazing) and also during the Roman-Climate Optimum at the time of the Roman Empire (when grapes grew almost as far north as Scotland), and at least 1°C warmer for much of the Holocene Climate Optimum (four to eight thousand years ago).

### ***It Cannot Be Anything Else***

Implicitly, and sometimes explicitly, the notion that CO<sub>2</sub> caused global warming often rested partly on the “evidence” that “it couldn’t be anything else”.

This is illogical, because there could be forces at work that we aren’t aware of yet. Obviously people have been unaware of phenomena before—for example, before 1800 there was little awareness of electricity, magnetism, nuclear forces, or germs.

But ridiculous as it may seem, this reason is actually a very important part of the IPCC’s case. IPCC theory *assumes* that rising CO<sub>2</sub> levels caused:

- Nearly all the warming from the beginning of the industrial age (around 1750) to the present.
- Much of the warming in the warming episodes in the ice cores.

They justify this assumption on the grounds that they cannot think of any other causes!

This assumption has huge ramifications for the IPCC theory: their climate models are calibrated so that the rise in CO<sub>2</sub> from 1750 to the present causes all the warming from 1750 to the present *in their models*. (They also calibrated them on other episodes, such as the ice core warmings, but this is the main one.) Thus if there were any other warming forces between 1750 and the present, then the *climate models are too sensitive to CO<sub>2</sub> rises*.

This is why the alarmists so savagely dismiss any other possible causes for global warming: if they admit there are other warming forces then they admit that their models are invalid and too sensitive to CO<sub>2</sub>, and they admit that their predictions of future temperature rises due to rising CO<sub>2</sub> are too high.

But as shown in Figure 7 above, the temperature has been rising since the mid 1700s as the earth came out of the little ice age of the 1600s and 1700s.

- It wasn’t any human activity that plunged the earth from the medieval warm period into the little ice age, so the move out of the little ice age probably isn’t due to humans either.

- Human emissions of CO<sub>2</sub> were virtually non-existent before 1850, and not significant compared to current levels until after 1945 (see for example Figures 2 and 3 in [www.oism.org/pproject/s33p36.htm](http://www.oism.org/pproject/s33p36.htm)). This begs the question: was the rise in CO<sub>2</sub> prior to 1945 mainly due to rising temperatures or to the tiny human emissions? The level of CO<sub>2</sub> in the atmosphere depends on ocean temperature, because the atmospheric CO<sub>2</sub> is in equilibrium with the dissolved CO<sub>2</sub> in the water: the vapor pressure of a gas in the air above a liquid with dissolved gas increases with the temperature of the liquid. So the rises in CO<sub>2</sub> level prior to 1945 might be mainly due to rising temperatures, just as they were in the ice-core warming episodes.
- As it happens, the little ice age coincides with a dearth of sunspots, and solar activity rose from 1720 to a maximum in the late 1900s (see for example [en.wikipedia.org/wiki/File:Sunspot\\_Numbers.png](http://en.wikipedia.org/wiki/File:Sunspot_Numbers.png)). While the amount of light from the sun (irradiance) has not changed enough to cause much of the warming, perhaps some other feature associated with sunspots (such as the sun's magnetic field) affects the earth's temperature. After all, the correlation of sunspots with wheat prices was noticed centuries ago (sunspots affect wheat growth and thus crop yield).

So the assumption that nearly all the warming from 1750 to the present is due to rising CO<sub>2</sub> levels is a brave one, and attributing it to human emissions of CO<sub>2</sub> is especially foolish.

So if the assumption that only CO<sub>2</sub> could have caused the warming from 1750 has led to climate models that are too sensitive to CO<sub>2</sub> rises, how does that exhibit itself in the IPCC climate theory? Why, our old friend water vapor feedback again.

The forcings and no-feedbacks parts of the CO<sub>2</sub> warming calculations are based on empirical physics and are reasonably accurate (see [CO2 is a Greenhouse Gas](#) above). So that only leaves the feedbacks part of the calculations. In order for their models to show that the warming from 1750 is mainly due to the CO<sub>2</sub> rises from 1750, the IPCC climate theorists were *required* to assume that the climate system had a high positive feedback. Some feedbacks were known, but they are all modest and could not account for a high overall feedback. But the water vapor feedback was unknown, and it is hard to even measure where water is in the atmosphere—it can be a gas (water vapor) or liquid (clouds, rain), it moves around and between forms quickly.

So the water vapor feedback became the fudge factor that embodies the assumption that the nearly all the temperature rise since 1750 is due to rising CO<sub>2</sub> levels. From the viewpoint of the alarmists, the water vapor feedback *has* to be a large positive feedback, because it is the only possible mechanism to make the assumption possible. ***Without a large positive water vapor feedback, the models cannot be made to produce the observed temperature rises since 1750 mainly from the CO<sub>2</sub> rises since 1750.***

This is why the missing hotspot ([sciencespeak.com/MissingSignature.pdf](http://sciencespeak.com/MissingSignature.pdf)) is so devastating to the alarmist case. Over the period 1995 – 2000 it became apparent from observations that the predicted hotspot due to extra water vapor in the atmosphere did not exist. So there was no water vapor feedback—the alarmist theory, the climate



models, and the assumption that rising CO<sub>2</sub> caused nearly all the warming since 1750 are all invalid.

There are now several credible alternatives as possible causes of global warming. As examples we mention just two here (they are not mutually exclusive, because they may both be influenced by a third factor).

The Pacific Decadal Oscillation (PDO) is an ocean oscillation that seems to govern much of the world's climate, and seems to change direction every thirty years or so, broadly in synch with the cycles of global warming and cooling. The correlation of the PDO with global temperature is much higher than the correlation between CO<sub>2</sub> and temperature.

Cosmic rays probably assist in the formation of low clouds: if more cosmic rays hit the earth then there are more low clouds. Low clouds cool the planet, because they reflect more incoming energy as light than they trap as outgoing infrared. The sun shields us from cosmic rays with its magnetic field, and sunspots are associated with a stronger magnetic field from the sun (the earth's magnetic field is too weak to have much effect on cosmic rays). Cosmic ray theory says that the following are associated:

- More sunspots
- Stronger sun's magnetic field
- Fewer cosmic rays hitting the earth
- Less formation of low clouds
- Fewer low clouds
- Higher global temperatures.

The correlation of the sun's magnetic activity with our global temperature is encouraging, and the trend turning points match well.

## **What Would Constitute Evidence?**

There is good evidence to support the calculations of the warming caused by an increase in atmospheric CO<sub>2</sub>, without the effect of the climate feedbacks. We are much less certain about the total warming due to increasing CO<sub>2</sub>, which include the climate feedbacks that amplify or dampen this no-feedbacks warming due to CO<sub>2</sub>. IPCC climate theory assumes a strong positive, amplifying climate feedback, principally due to water vapor. Therefore what would constitute evidence (that CO<sub>2</sub> is the main cause of the recent global warming) is either:

- Evidence of overall strong positive feedback in the climate
- Evidence of a strongly positive water vapor feedback.

For example, if the radiosondes had detected the strong hotspot predicted by the IPCC climate models then that would have been strong evidence—but instead the observed lack of hotspot demonstrates that the water vapor feedback is weak or negative.

Strong correlations and synchronized changes in trend directions between CO<sub>2</sub> and temperature on all time scales would constitute evidence, but we know that it is not the case.

Otherwise we are looking for some new evidence from somewhere else.

Especially difficult for the CO<sub>2</sub> theory is how to explain the counter evidence that is accumulating, which shows that the feedbacks are dampening not amplifying and that the climate sensitivity is a fraction of that assumed by the IPCC. It appears at this point that the CO<sub>2</sub> theory is doomed, and it is only a matter of time before its bubble bursts.