

# H6. Global Warming: How To Approach The Science

by Richard S. Lindzen, Program in Atmospheres, Oceans, and Climate  
Massachusetts Institute of Technology, November 17, 2010. [PDF](#)

Testimony: House Subcommittee on Science and Technology

## *A Rational Discussion of Climate Change: the Science, the Evidence, the Response*

I wish to thank the House Committee on Science and Technology for the opportunity to present my views on the issue of climate change—or as it was once referred to: global warming. The written testimony is, of course, far more detailed than my oral summary will be.

**In the summary, I will simply try to clarify what the debate over climate change is really about.**

- It most certainly is not about whether climate is changing: it always is.
- It is not about whether CO<sub>2</sub> is increasing: it clearly is.
- It is not about whether the increase in CO<sub>2</sub>, by itself, will lead to some warming: it should.

The debate is simply over the matter of how much warming the increase in CO<sub>2</sub> can lead to, and the connection of such warming to the innumerable claimed catastrophes.

**The evidence is that the increase in CO<sub>2</sub> will lead to very little warming, and that the connection of this minimal warming (or even significant warming) to the purported catastrophes is also minimal.**

The arguments on which the catastrophic claims are made are extremely weak—and commonly acknowledged as such.

In my long experience with the issue of global warming, I've come to realize that the vast majority of laymen—including policymakers—do not actually know what the scientific debate is about. In this testimony, I will try to clarify this.

Some of you may, for example, be surprised to hear that the debate is not about whether it is warming or not or even about whether man is contributing some portion of whatever is happening. I'll explain this in this testimony. Unfortunately, some part of the confusion is explicitly due to members of the scientific community whose role as partisans has dominated any other role they may be playing.

**Here are two statements that are completely agreed on by the IPCC. It is crucial to be aware of their implications.**

1. A doubling of CO<sub>2</sub>, by itself, contributes only about 1C to greenhouse warming. All models project more warming, because, within models, there are positive feedbacks from water vapor and clouds, and these feedbacks are considered by the IPCC to be uncertain.

2. If one assumes all warming over the past century is due to anthropogenic greenhouse forcing, then the derived sensitivity of the climate to a doubling of CO<sub>2</sub> is less than 1 C. The higher sensitivity of existing models is made consistent with observed warming by invoking unknown additional negative forcings from aerosols and solar variability as arbitrary adjustments.

Given the above, the notion that *alarming* warming is ‘settled science’ should be offensive to any sentient individual, though to be sure, the above is hardly emphasized by the IPCC.

The usual rationale for alarm comes from models. The notion that models are our only tool, even, if it were true, depends on models being objective and not arbitrarily adjusted (unfortunately unwarranted assumptions).

However, models are hardly our only tool, though they are sometimes useful. Models can show why they get the results they get. The reasons involve physical processes that can be independently assessed by both observations and basic theory. This has, in fact, been done, and the results suggest that all models are exaggerating warming.

The details of some such studies will be shown later in this testimony.

**Quite apart from the science itself, there are numerous reasons why an intelligent observer should be suspicious of the presentation of alarm.**

1. The claim of ‘incontrovertibility.’
2. Arguing from ‘authority’ in lieu of scientific reasoning and data or even elementary logic.
3. Use of term ‘global warming’ without either definition or quantification.
4. Identification of complex phenomena with multiple causes with global warming and even as ‘proof’ of global warming.
5. Conflation of existence of climate change with anthropogenic climate change.

**Some Salient Points:**

**1. Virtually by definition, nothing in science is ‘incontrovertible’ –especially in a primitive and complex field as climate.** ‘Incontrovertibility’ belongs to religion where it is referred to as dogma.

**2. As noted, the value of ‘authority’ in a primitive and politicized field like climate is of dubious value –it is essential to deal with the science itself.** This may present less challenge to the layman than is commonly supposed. Consider the following example:

This letter appeared the May 7, 2010, issue of *Science*. It was signed by 250 members of the National Academy of Science. Most signers had no background whatever in climate sciences.

Many were the 'usual suspects.' (ie, Paul Ehrlich, the late Steve Schneider, George Woodwell, Don Kennedy, John Schellnhuber, ...) but a few were indeed active contributors.

Here are two of their assertions:

*(iii) Natural causes always play a role in changing Earth's climate, but are now being overwhelmed by human-induced changes.*

*(iv) Warming the planet will cause many other climatic patterns to change at speeds unprecedented in modern times, including increasing rates of sea-level rise and alterations in the hydrologic cycle.*

Now, one of the signers was Carl Wunsch. Here is what he says in a recent paper in *Journal of Climate* (Wunsch et al, 2007) (and repeated a couple of weeks ago in a departmental lecture):

*It remains possible that the data base is insufficient to compute mean sea level trends with the accuracy necessary to discuss the impact of global warming—as disappointing as this conclusion may be.*

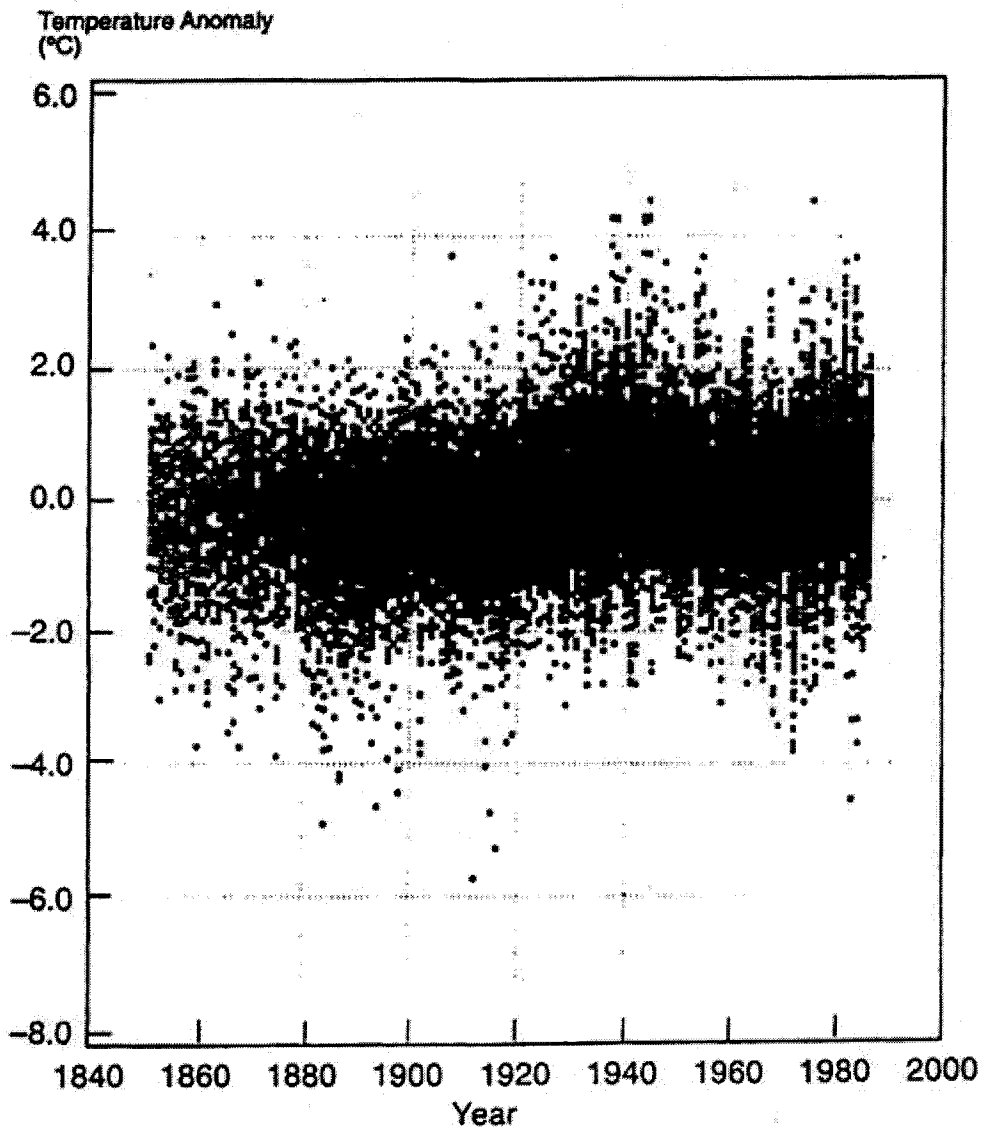
In brief, when we actually go to the scientific literature we see that the 'authoritative' assertions are no more credible than the pathetic picture of the polar bear that accompanied the letter.

**3. 'Global Warming' refers to an obscure statistical quantity, globally averaged temperature anomaly, the small residue of far larger and mostly uncorrelated local anomalies.**

This quantity is highly uncertain, but may be on the order of 0.7 C over the past 150 years. This quantity is always varying at this level and there have been periods of both warming and cooling on virtually all time scales. On the time scale of from 1 year to 100 years, there is no need for any externally specified forcing. The climate system is never in equilibrium because, among other things, the ocean transports heat between the surface and the depths. To be sure, however, there are other sources of internal variability as well.

Because the quantity we are speaking of is so small, and the error bars are so large, the quantity is easy to abuse in a variety of ways.

## Deviations of Annual Mean Temperature from Long-term Average

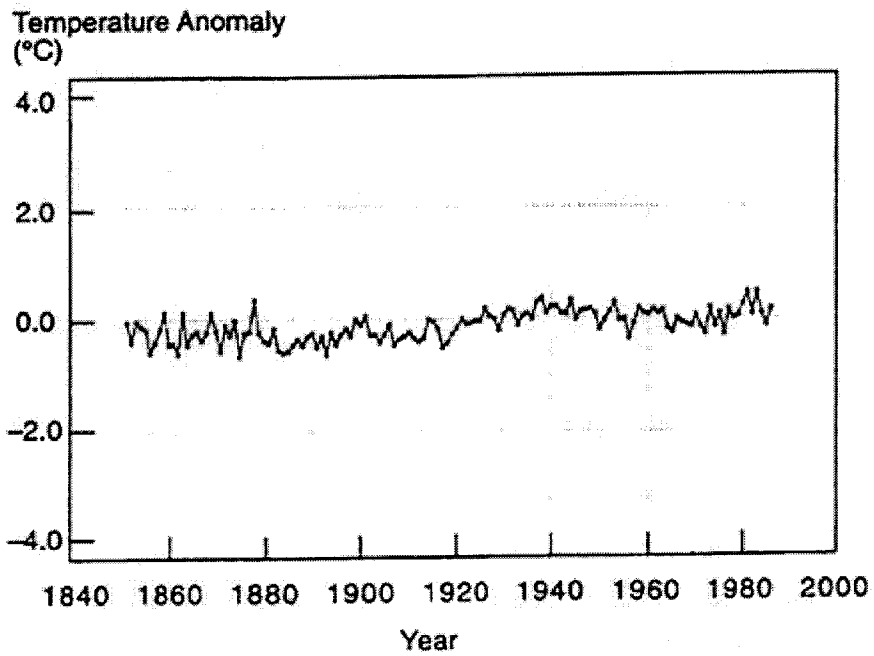


**1. Data points averaged to obtain time record of global mean temperature. Note points range from less than -2C to more than +2C.**

---

Source: S. L. Grotch, Lawrence Livermore Laboratory, Livermore California

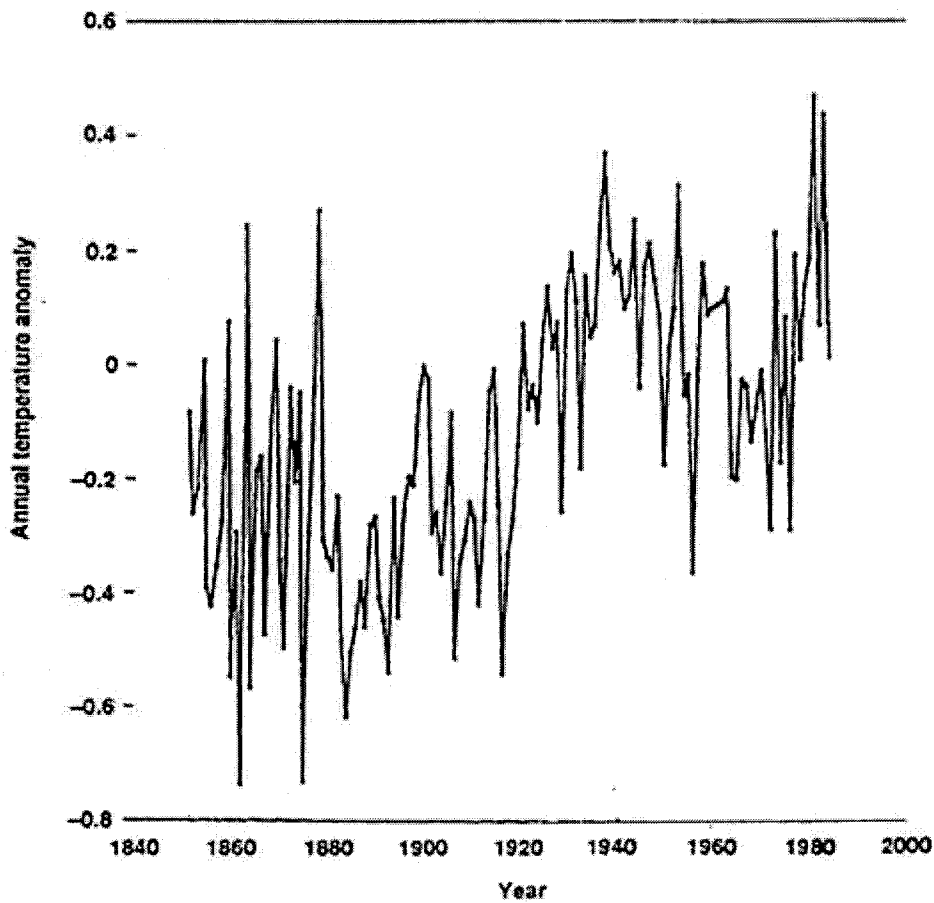
**Globally Averaged Deviations from Average Temperature Plotted on a Scale Relevant to the Individual Station Deviations.**



**2. Average of points in previous figure.**

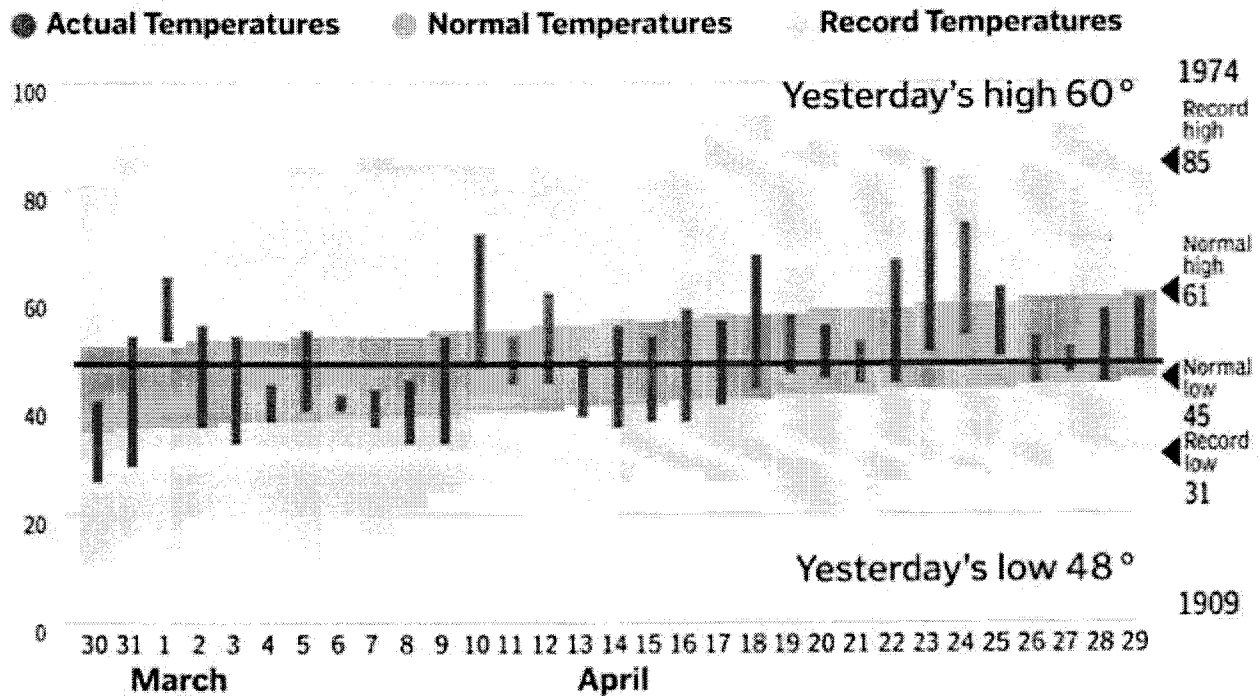
Notice the vertical scale in the above diagrams. Relative to the variability in the data, the changes in the globally averaged temperature anomaly look negligible.

## CRU NH Average Annual Anomalies (1851-1984)



**3. Curve in previous figure stretched to fill graph.  
Note that range is now from about -0.6C to +0.3C.**

April 30, 2008



The thickness of the red line represents the range of global mean temperature anomaly over the past century.

One month's record of high and low temperatures for Boston.

**4. The claims that the earth has been warming, that there is a greenhouse effect, and that man's activities have contributed to warming, are trivially true and essentially meaningless in terms of alarm.**

Nonetheless, they are frequently trotted out as evidence for alarm. For example, here is the response of the American Physical Society to Hal Lewis' resignation letter:

- *On the matter of global climate change, APS notes that virtually all reputable scientists agree with the following observations:*
- *Carbon dioxide is increasing in the atmosphere due to human activity;*
- *Carbon dioxide is an excellent infrared absorber, and therefore, its increasing presence in the atmosphere contributes to global warming; and*
- *The dwell time of carbon dioxide in the atmosphere is hundreds of years.*

*On these matters, APS judges the science to be quite clear.*

*The last item is actually quite misleading on its own terms. The APS also denies financial involvement despite the fact that POPA's chair is Bob Socolow who is chair of the Carbon Mitigation Initiative, and on the advisory board of Deutsche Bank.*

**Two separate but frequently conflated issues are essential for alarm:**

- 1) The magnitude of warming, and
- 2) The relation of warming of any magnitude to the projected catastrophe.

When it comes to unusual climate (which always occurs some place), most claims of evidence for global warming are guilty of the 'prosecutor's fallacy.' For example this confuses the near certainty of the fact that if A shoots B, there will be evidence of gunpowder on A's hand with the assertion that if C has evidence of gunpowder on his hands then C shot B.

However, with global warming the line of argument is even sillier. It generally amounts to something like if A kicked up some dirt, leaving an indentation in the ground into which a rock fell and B tripped on this rock and bumped into C who was carrying a carton of eggs which fell and broke, then if some broken eggs were found it showed that A had kicked up some dirt. These days we go even further, and decide that the best way to prevent broken eggs is to ban dirt kicking.

**Some current problems with science**

1. **Questionable data.** (Climategate and involvement of all three centers tracking global average temperature anomaly.) This is a complicated ethical issue for several reasons. Small temperature changes are not abnormal and even claimed changes are consistent with low climate sensitivity. However, the public has been misled to believe that whether it is warming or cooling –no matter how little –is of vital importance. Tilting the record slightly is thus of little consequence to the science but of great importance to the public perception.

2. More sophisticated data is being analyzed with the aim of supporting rather than testing models (validation rather than testing). That certainly has been my experience during service with both the IPCC and the National Climate Assessment Program. It is also evident in the recent scandal concerning Himalayan glaciers.

(Note that in both cases, we are not dealing with simple measurements, but rather with huge collections of sometimes dubious measurements that are subject to often subjective analysis – sometimes referred to as 'massaging'.')

**In point of fact, we know that some of the recent temperature data must be wrong!**



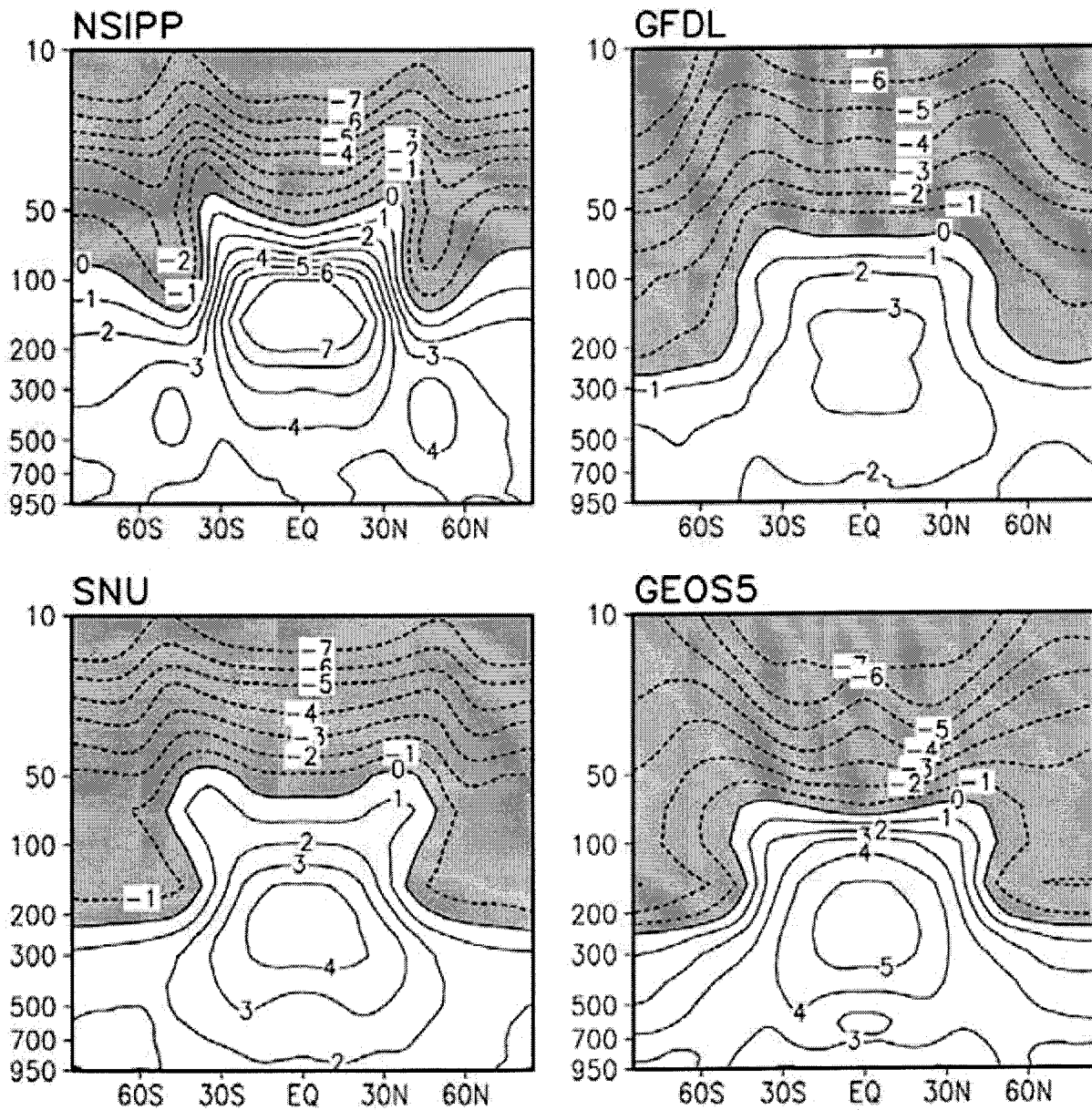


FIG. 14. Zonal-mean distributions of temperature change ( $2 \times \text{CO}_2 - \text{Control}$ ). Units are kelvin.

Here we see the meridional distribution of the temperature response to a doubling of  $\text{CO}_2$  from four typical models. The response is characterized by the so-called hot spot (ie, the response in the tropical upper troposphere is from 2-3 times larger than the surface response).

We know that the models are correct in this respect since the hot spot is simply a consequence of the fact that tropical temperatures approximately follow what is known as the moist adiabat. This is simply a consequence of the dominant role of moist convection in the tropics.

However, the temperature trends obtained from observations fail to show the hot spot.