23.4.14

More questions and Answers

I've continued to be flooded with questions. Here are a few more responses (in italics).

Q. ("Friends of Science"): You make simplistic correlations between carbon dioxide levels and warming, without accounting for the increased solar activity in that time period. The sun is the sole energy source of earth; its effect cannot be discounted.

A. I do not discount the effects of solar variability – on the contrary, they are taken into account, they are part of the natural variability!

Q. ("Friends of Science"): Likewise you only refer to proxies from the 1500 year time frame, when there are complete temperature records from Central England available between January 1663 and December 1762 that show a warming of 0.90°C. This was long before industrial activity. Only natural factors caused this warming; you do not address this flaw in your thesis.

*A. This is a typical misunderstanding: all my conclusions concern **global** temperatures, in the question we are given changes in a **local** temperatures. Using the three multiproxies discussed in my paper, we find that for the same period of time, that the global scale temperature change was 0.21±0.12 °C, i.e. 4 to 5 times smaller than the cited value and – as claimed - far less than the 0.78°C of anthropogenic global warming that occurred between 1904-2004 (fig. 3b of my paper).*

The reason that the global fluctuations are much smaller than the regional and local temperatures is easy to understand. In this case the question cites a change of +0.9 °C for the famous central England series, but this only concerns a very small region (only a fraction of England which itself is only 0.026% of the global surface area). One can imagine that the earth is composed of 4000 regions the size of England, some of which will warm a lot, some of which will cool, some will warm but only a little bit etc. When one takes the average, there will be a lot of cancelation and the overall change will be quite small, as the multiproxies indicate.

A. (continued) I received variants of the previous question, for example someone displayed a Greenland ice core (GISP2) proxy temperature plot going back ten thousand years that displayed several variations in temperature apparently more extreme than the core indicates for the industrial period.

In this case, there are several flaws.

a) First, I'm only considering changes over 125 years, so that just "eyeballing" the 10000 year series isn't enough.

b) *The temperature is local, so that the argument from the previous question applies: it's normal that the fluctuations are much larger than for the entire globe.*

c) *Finally there is a specific problem with the Greenland cores in the last 10000 years: it is known that they are very special: they may not even be representative of regional variations, see ch. 11 in my book for a comparison with a reconstructions over the same period but from a nearby ocean core paleo series. The ocean ocean core temperatures are totally different even though only 1500 km distant.*

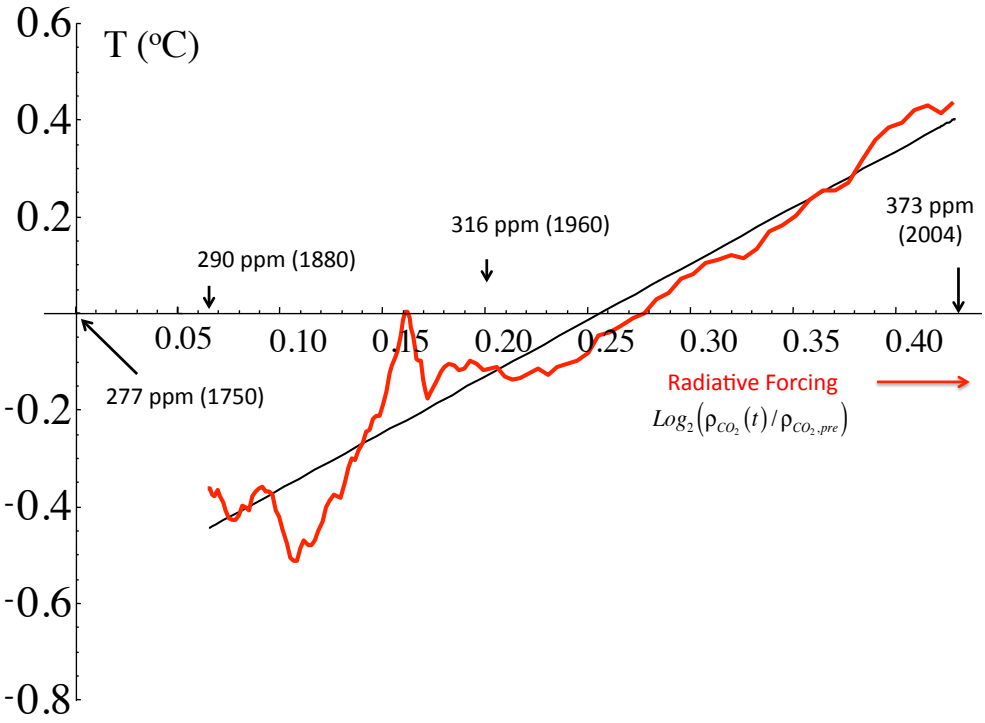
Q. Why do you suggest that the alleged CO_2 signal emerged in 1880 when Schneider/Trenberth said more like ~1980?

A. I didn't say that it emerged in 1880, but the available data of highest quality for both global temperature estimates and global CO_2 concentrations were from 1880 – 2004.

Q. OK, how can you tell when man made warming could clearly be seen?

A. This is a somewhat subjective question, a simple way to answer it is to judge from the graph below. One can see that the largest deviations from the line are about 0.25 ^oC (the spike near the numeral "1" in the number 0.15 on the horizontal axis. This is the largest deviation (it is associated with the post-war cooling, the spike is 1944). If we agree that anthropogenic warming is evident when the anthropogenic part (the straight line) has changed by about double that - say 0.5 ^oC, then this occurs around 1978 (this date corresponds to value ≈0.28 on the forcing axis). According to this reasoning Trenbeth's estimate is pretty good.

More rigourous methods involve the use of return time that I describe in a forthcoming paper.



This figure visually shows the strong linear relation between the radiative forcing and the global temperature response since 1880, it is a simplified version of fig. 3a of [*Lovejoy*, 2014a] showing the 5 year running average of global temperature (red) as a function of the CO_2 forcing surrogate from 1880 to 2004. The linearity is impressive; the deviations from linearity are due to natural variability. The slope of the regression line is 2.33±0.22 °C per CO_2 doubling (it is for the unlagged forcing/response relation).

Q. You can't disprove natural warming. We haven't a total understanding and audit of the complex coupled ocean-atmosphere processes.

A. This is an interesting misunderstanding of the scientific method.

Think of the most complex system of all, the human body. Scientists are constantly testing new medications to cure various conditions, and fortunately – without needing any understanding of the human body – double blind tests and statistics allow them to decide which work and which don't. It's exactly the same with global warming, we can reject theories that don't work using the same statistical methodology.

Q. For a professor you sure like to use nonsensical terminology.

A. Unfortunately, science does involve some specialist jargon. My paper was written for other scientists. I'm trying to explain things as simply as possible, but it isn't always easy.

Q. "The global temperature (as measured operationally) has certainly changed since the 1800s. *Something*, or some things, *caused* it to change. It is impossible—as in *impossible*—that the cause was "natural random variation", "chance" or anything like that. Chance and randomness are not causes; they are not real, not physical entities, and therefore cannot be causes. They are instead measures of our ignorance. All physical and probability models (or their combinations) are encapsulations of our knowledge; they quantify the certainty and uncertainty that temperature takes the values it does. Models are uncertainty engines.

A. The notions of chance and randomness exposed in this question are pre 20th century. They express the idea that "chance is nothing" (Voltaire) meaning that it is a subjective expression of ignorance. Since the development of axiomatic probability theory and of physical theories based on objective randomness (statistical mechanics and especially quantum mechanics), this view has been abandoned by modern science. In my paper, the natural variability is precisely treated as an objective causal but random process with well defined statistical properties. Indeed, the basic eq. 1 should be understood in this light: the $T_{nat}(t)$ term is a stochastic (random) process that is of the same type (technically from the same ensemble) when $T_{ant}(t)$ is zero (pre-industrial) or nonzero (post-industrial).

Q. "Chance" and "random variation" are not actual forces (marvel that this even needs to be said). There's a bit of a problem with something known as cause and effect. Our expressions of ignorance are getting mistaken for forcings.

A. Obviously chance and random variation are not forces. However, in a stochastic model, cause and effect are stochastic, but this has nothing to do with ignorance. You need a course in modern physics. Take a look at: http://www.physics.mcgill.ca/~gang/eprints/eprintLovejoy/neweprint/stochall.pdf.

Q. Is there any proof that his model is a useful representation of the actual atmosphere? None at all. But, hey, I may be wrong. I therefore challenge you to use your model to predict future temperatures. If it's any good, it will be able to skilfully do so. I'm willing to bet good money it can't.

A. How much are you willing to bet?

Actually, it's very easy to make such stochastic climate models and make stochastic forecasts using conditional expectations. The basic technique can be found in ch. 9 in my book but the specific application to global temperatures is work in progress that hopefully will be published soon. (By the way seasonal stochastic forecasts have been routinely made for some time, using the Stochastic Linear Forcing approach).

Q. So with >95% certainty you state that without humans Earth would still be in the Little Ice Age? This is bad?

A. I never said anything like that. The Little Ice Age was due to some low frequency natural variability. It turns out that in the industrial epoch for periods of 125 or more, the human induced variability is quite a bit larger than the corresponding natural variability.

What is likely to be bad is the continuation of our current warming trend over the next few decades.

Q. Using the word denier shows you are NOT doing science.

A. The science of global warming has been sufficiently settled that it is no longer accurate to qualify people who deny the evidence, the models and the theories as simply "sceptics". At some point it is important to underline the distinction between scepticism and denial. Someone haranguing me by claiming that the earth is flat would fall in the same category: the term "sceptic" would not be scientific, the term "denier" would be.

Q. If want to be taken seriously as a scientist, stop only talking to leftists who already agree with you. Your credibility shot.

*A. In my scientific publications, I'm communicating with other scientists, not all of whom are leftists. Their politics are irrelevant (so are mine!). Your witch hunting claim shoots **your** credibility.*

Q. The problem with people like you is you live in echo chamber. Go outside and learn what people outside the ivory towers of academia think.

A. Science is not a beauty contest, a theory is correct or incorrect independently of what scientists – or non-scientists – think.

Q. You said: "one of the three (Huang) used boreholes (it needed no paleo calibrations)." No paleo calibration? We can only *guess* how fast heat waves sink into the crust by calibrating those curves with other proxies. The only message we get from boreholes is that there have been large global swings in temperature and at the moment, no one can explain what drives them.

A. Honestly, boreholes don't need paleo calibration! The past temperatures are determined by using the measured temperature along with thermal diffusion constants that are measured in the borehole; the laws of thermal diffusion are then used to invert the system and determine the past temperatures. It is indeed an independent method, you are simply misinformed.