

**Review of “Environmental Effects of Increased Carbon Dioxide” by Robinson, Robinson and Soon (RRS), *Journal of American Physicians and Surgeons* (2007) 12 79-90.**

**Critique by Dave Lowe, Peter Barrett and Lionel Carter for Gareth Morgan  
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We've read the paper with care and found many statements that in our view are inconsistent with current knowledge of the way the Earth's climate system works as reported in the scientific literature and in the IPCC AR4 WG1 (2007) report.

Though we've spent a lot of time on this, the critique is still not exhaustive because the paper covers so much ground and there are so many points we consider deficient. We will therefore deal in some detail with just 3 of those we see as more important, and comment on a further 6.

**Three key points**

- (1) A 3000 year proxy temperature record from the Sargasso Sea is presented as RSS Fig 1. This shows temperature was a degree higher in the Medieval Climatic Optimum than in 2006, and implies that present average temperature is not unusual. This is not so as explained in the next paragraph. RRS also state “The average temperature of the earth [our underline] has varied within the range of about 3° C during the last 3000 years.” This is also not so. They are plainly referring to Fig 1 and the Sargasso Sea, which is <1% of the earth This is in no way typical in its average (23 °C in contrast to 14°C for the earth as a whole) or its range (3°C for the Sargasso Sea and <1°C for average global temperature in the last 2000 years).

Michael Mann's average of records from many different regions weighted by area is a logical and rational approach for obtaining a best estimate of the history of global average temperature over the last thousand years, and it has been confirmed by others, as the 2005 US National Academy of Sciences review concluded. They found “that scientists' reconstructions of Northern Hemisphere surface temperatures for the past thousand years [most focus on the Northern Hemisphere because there are many more and longer sites] are generally consistent. The reconstructions show relatively warm conditions centered around the year 1000, and a relatively cold period, or "Little Ice Age," from roughly 1500 to 1850. The exact timing of warm episodes in the medieval period may have varied by region, and the magnitude and geographical extent of the warmth is uncertain, the committee said. None of the reconstructions indicates that temperatures were warmer during medieval times than during the past few decades...” [from the press statement]. Mann also found that the Medieval Warm Period was significant in the Northern Hemisphere but not in the Southern Hemisphere, and this is borne out by the IPCC review on this topic (IPCC AR4 Ch 6 Box 6.10).

- (2) A key issue in RSS is the assertion that surface air temperature changes are closely linked to changes in total solar irradiance as shown in Figure 3. We have three points of concern.

- i) Temperatures shown in RSS Fig 3 are Arctic, not globally-averaged surface air temperatures.
- ii) The RSS Fig 3 solar irradiance curve (derived from Soon, *Geophysical Research Letters*, 2005) is quite different in variability ( $2 \text{ W/m}^2$  vs  $\sim 0.1 \text{ W/m}^2$ ) from the curve presented in Chapter 2 WG1 in the IPCC 4<sup>th</sup> Assessment Report. Solar irradiance is now one of the most precise measurements made of the Earth system. As shown from the work of the solar research groups assessed in the AR4, changes in this parameter over the last 20 to 30 years have been only a fraction of a  $\text{W/m}^2$ . This is more than an order of magnitude smaller than the changes reported by RRS.
- iii) The RSS Fig 3 solar irradiance curve also differs from the IPCC assessment in its absolute value ( $1371 \text{ W/m}^2$  vs  $1366 \text{ W/m}^2$ ).

Papers assessed by the lead authors of the AR4 are judged on their relevance to a particular feature of the climate system. They must be peer reviewed and preferably, for the AR4, should have been published since the close-off date for the previous IPCC report which was 1999. Soon and Lindzen have published widely in top scientific peer-reviewed literature and both are global warming sceptics. Lindzen's work is widely cited in the AR4 WG1 but Soon's is not cited at all in AR4 WG1's Chapter 2, which discusses solar forcing of climate. At this stage therefore we can only conclude that Soon's work was not considered as significant as the other cited work in Chapter 2. At our last meeting we gave you the latest peer reviewed publication we could find on solar irradiance (Lockwood and Froehlich, Proceedings of the Royal Society, 2007), which reports that not only are the recent (last 20 years) changes in solar irradiance small, but that they actually trend in the opposite direction to that required to explain increasing global temperatures. We have asked two solar radiation experts to comment on why there is such a difference between the two papers and will get back to you with their report.

(3) In the bottom left hand column of P2 there is a statement comparing solar activity change over the past century (0.19%) and United States temperature change (0.21%). This comparison offers two similar numbers. However, it's like comparing apples with apple trees, and inappropriate for three reasons:

- i) a global influence is being compared with a regional response. How US temperature relates to global temperature depends on a number of factors – albedo, interaction with adjacent oceans and passing weather systems etc.
- ii) it is not clear how the solar activity is translated into solar warming on the earth's surface (see concern over the difference between Soons' derived estimate and the IPCC in point 2).
- iii) it ignores the crucial point that the energy shift represented in the change in solar warming is less than a small fraction of that required to provide the observed increase in global temperature.

The comparison a couple of lines down between an average temperature shift based on thousands of weather stations across the United States and a personal perception in a room is also meaningless. Its only purpose seems to be to trivialise small but still statistically significant changes based on carefully collected and analysed data.

### **Further points that concern us**

(4) We talked about Figure 3 of RRS at our Friday meeting. It is not clear to us why world hydrocarbon usage was used as the parameter of choice in this graph. If you check the same web site (7) cited by RRS you can find estimates of CO<sub>2</sub> released by land use changes e.g. forest clearance etc. These changes released far more CO<sub>2</sub> into the atmosphere than fossil fuel combustion right through into the early 1900s. This is called the "pioneer effect" and CO<sub>2</sub> concentration would obviously not correlate with hydrocarbon usage during this period. Even today land use changes account for about 20-30% of "excess" CO<sub>2</sub> released into the atmosphere by humans.

In addition because the Earth System's active carbon reservoirs react to excess CO<sub>2</sub> in a variable way, there are huge annual swings in the amount of CO<sub>2</sub> which remains in the atmosphere from fossil fuel combustion. This is known as the airborne fraction and if you look at the histogram in figure 7.4 (b) p516 of the AR4 you can see that there are large annual variations of up to +/- 50%. This is like many of the features in the Earth system where decadal averages have to be taken to make sense of the data.

World hydrocarbon use must also be viewed critically with respect to the type of usage and atmospheric response. There was a change from the burning of high sulphurous coal as exemplified by the London smogs of the early 1950s, to cleaner burning types. Such inputs of

particulates and aerosols into the atmosphere may have contributed to marked cooling in the 1940s and 1950s. World War II was also a likely contributor to atmospheric particulates.

Hence we don't think plotting fossil fuel consumption directly against other parameters like solar radiation or temperature from one region of the Earth makes any scientific sense. A better parameter to use would be the combined radiative forcing of the long-lived greenhouse gases (currently about  $2.7 \text{ W/m}^2$ ) and offset this with what is known about aerosols, volcanic eruptions and solar forcing. When you include all these drivers as well as the radiative forcing from the gases, current AOGCMs do a good job of simulating global average surface temperatures over the last 100 years. If you don't include the gases and use the natural drivers only (solar and volcanoes) then, after about 1970, the modelled temperature remains level or drops a little while measured global average surface temperature increases. Dave gave you a plot of this at our last meeting (Figure 9.5 bottom panel on p684 of the AR4).

(5) There is a remarkable statement in the paper about the combined breath exhalation of humans being about  $0.6 \text{ GtC/year}$ . This is irrelevant, and suggests they do not know how the carbon cycle works. (Please see the carbon cycle slides in the power point presentation Dave gave you plus the article he wrote on this) We simply use oxygen to burn carbon in food that has been recently fixed by plants. We are therefore "carbon neutral". Our breath does not increase the carbon loading of the atmosphere. That occurs only when we add additional carbon to the atmosphere by burning fossil fuels in decades that have been trapped over millions of years.

(6) Throughout the paper, RRS refer to Earth's temperatures as "recovering" or rebounding from the little ice age. There is nothing in the peer reviewed literature to substantiate that warmer temperatures today are a "recovery" from lower temperatures during the little ice age. Also once again RRS are referring to the Sargasso Sea temperature, not global average temperature nor other regions of the globe. The IPCC jury is still out on as to whether the little ice age had much of an impact on the southern hemisphere, but there is no obvious little ice age signal in past climate records from New Zealand. While acutely aware that we are talking about one small region the reasons for the lack of a distinct signal in NZ probably reflects the ameliorating influence of the ocean (e.g. Carter et al., *Palaeo*<sup>3</sup>, 2008). Hence the observation may also apply to other regions of the ocean-dominant Southern Hemisphere, but a literature survey would be needed to confirm.

(7) Figure 20, page 8. This graph shows atmospheric methane levelling off. However, the most recent data from Baring Head, and other sites world wide, show that the concentration of methane is increasing again. The concentration of a relatively short lived (about 10 years) gas like methane in the atmosphere is determined by a balance between its sources and removal processes. We know that the major removal process (via the hydroxyl free radical) for methane has not changed over the last 25 years which implies that its sources have increased. The reasons for this are not clear but the point we would make here is that our knowledge of the climate system is constantly improving and it is premature to make statements about whether the concentration of a gas is levelling off or not.

(8) Figures 9-10 on hurricanes are at odds with the findings of the IPCC using peer reviewed literature. Their findings indicate an increase in intense tropical cyclone activity in the North Atlantic since 1970, which is correlated with increases of tropical sea surface temperatures This is also what is expected from physics- warmer temperature, more energy, more evaporation, higher winds.

### **A couple of general points to end up with.**

i) We have found so many basic scientific flaws in this paper that we have to question the quality of the scientific review process. We note that the paper, which is based on physics and chemistry of the atmosphere, was published in a medical journal, the *Journal of American Physicians and Surgeons*. This is not one of the 8700 leading peer-reviewed journals in medicine, science, technology, social sciences, arts, and humanities listed by the ISI Web of Knowledge ([www.isiwebofknowledge.com](http://www.isiwebofknowledge.com)), the mainstream standard for scholarly research. We have no view on the quality of the review process for medical papers, but on the basis of this experience we find it hard to accept that this paper was subject to review by climate science peers.

ii) We have in the last few months studied enough material from the sceptics to see a theme in the flawed arguments being made against AGW. These are largely being made on the basis of comparisons between time series data sets – eg. variations in fuel use, CO2 level, sea level, solar activity, temperature etc. Where we examine them we can show the comparisons are inappropriate (eg. local records being compared without qualification with global records, short term trends being highlighted over long term). In addition, they fail to offer quantifiable explanations for the cause and effect relationships they show (which amounts to ignoring basic physics and chemistry). In contrast, the body of science reviewed by the IPCC offers quantitative explanations based on physics and chemistry. The projections are assigned a probability, and the history of the last 20 years is showing that key parameters eg sea level rise, are in fact running a little higher than earlier IPCC projections.

The basic science of climate change has been extensively studied and reviewed, and there is now a pressing need to gain a deeper understanding of the interactions between earth, atmosphere, cryosphere and oceans. There is still a huge task in gauging the full consequences of this unfortunate experiment on the Earth's climate system so that they can be understood by everyone while there is still time to remedy the situation. Your talent could be crucial in helping with this.

See this recent comment from the world's greatest oceanographer

<http://www.guardian.co.uk/environment/2008/may/24/carbonemissions.climatechange1?gusrc=rss&feed=environment>