

IPCC AR5 Climate Sensitivity?

Even on business as usual, there will be <1° Celsius warming this century

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By Christopher Monckton of Brenchley

Curiouser and curiouser. As one delves into the leaden, multi-thousand-page text of the IPCC's 2013 *Fifth Assessment Report*, which reads like a conversation between modelers about the merits of their models rather than a serious climate assessment, it is evident that they have lost the thread of the calculation. There are some revealing inconsistencies. Let us expose a few of them.

The IPCC has slashed its central near-term prediction of global warming from 0.28 K/decade in 1990 to 0.17 K/decade in the published draft of IPCC (2013). Therefore, the biggest surprise to honest climate researchers reading the report is why the long-term or equilibrium climate sensitivity has not been slashed as well.

In 1990, the IPCC said equilibrium climate sensitivity would be 3 [1.5, 4.5] K. In 2007, its estimates were 3.3 [2.0, 4.5] K. In 2013 it reverted to the 1990 interval [1.5, 4.5] K per CO₂ doubling. However, in a curt, one-line footnote, it abandoned any attempt to provide a central estimate of climate sensitivity – the key quantity in the entire debate about the climate. The footnote says models cannot agree.

Climate sensitivity is the product of three quantities:

Ø The CO₂ radiative forcing, generally thought to be in the region of 5.35 times the logarithm of the proportionate concentration change – thus, 3.71 Watts per square meter;

Ø The Planck or instantaneous or zero-feedback sensitivity parameter, which is usually taken as 0.31 Kelvin per Watt per square meter; and

Ø The system gain or overall feedback multiplier, which allows for the effect of temperature feedbacks. The system gain is 1 where there are no feedbacks or they sum to zero.

In the 2007 *Fourth Assessment Report*, the implicit system gain was 2.81. The direct warming from a CO₂ doubling is 3.71 times 0.31, or rather less than 1.2 K. Multiply this zero-feedback warming by the system gain and the harmless 1.2 K direct CO₂-driven warming becomes a more thrilling (but still probably harmless) 3.3 K.

That was then. However, on rooting through chapter 9, which is yet another meaningless expatiation on how well the useless models are working, there lies buried an interesting graph that quietly revises the feedback sum sharply downward.

In 2007, the feedback sum implicit in the IPCC’s central estimate of climate sensitivity was 2.06 Watts per square meter per Kelvin, close enough to the implicit sum $f = 1.91 \text{ W m}^{-2} \text{ K}^{-1}$ (water vapor +1.8, lapse rate -0.84, surface albedo +0.26, cloud +0.69) given in Soden & Held (2006), and shown as a blue dot in the “TOTAL” column in the IPCC’s 2013 feedback graph (fig. 1):

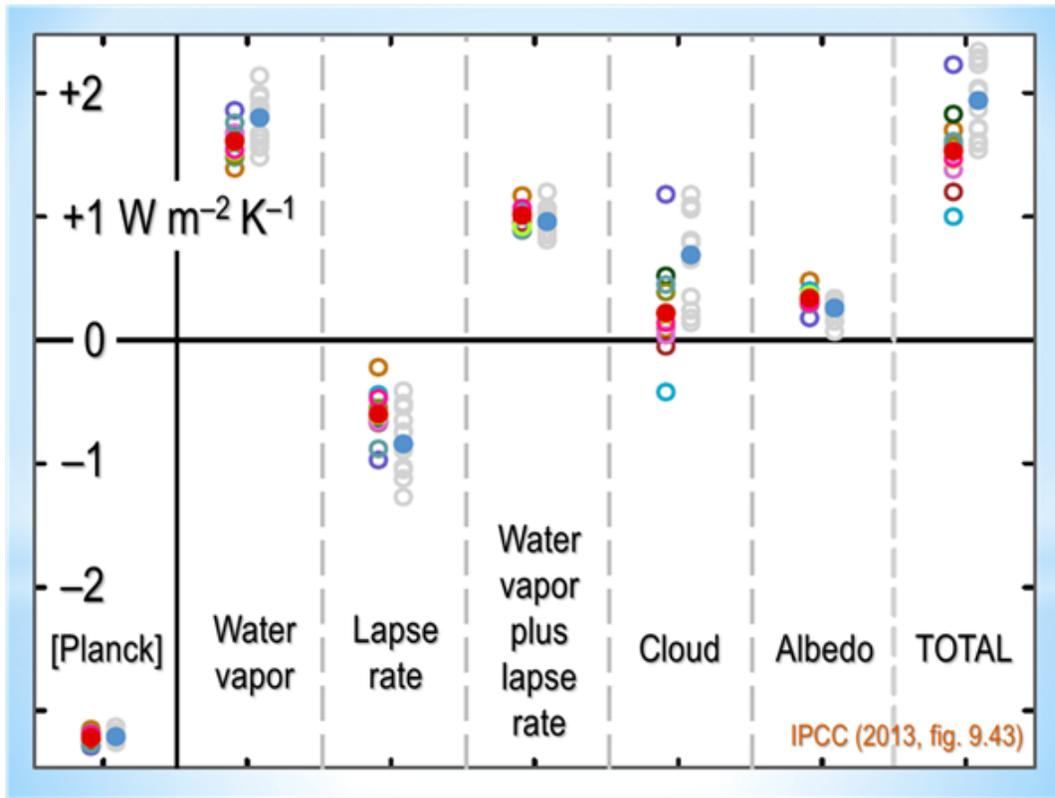


Figure 1. Estimates of the principal positive (above the line) and negative (below it) temperature feedbacks. The total feedback sum, which excludes the Planck “feedback”, has been cut from 2 to 1.5 Watts per square meter per Kelvin since 2007.

The 2013 central estimate of each feedback is shown in red flanked by multi-colored outliers and, alongside it, the 2007 central estimate shown in blue.

Look at the TOTAL column on the right. The IPCC’s old feedback sum was 1.91 Watts per square meter per Kelvin (in practice, the value used in the CMIP3 model ensemble was 2.06). In 2013, however, the value of the feedback sum fell to 1.5 Watts per square meter per Kelvin.

That fall in value has a disproportionately large effect on final climate sensitivity. For the equation by which individual feedbacks are mutually amplified to give the system gain G is as follows:

$$G = (1 - g)^{-1} = (1 - \lambda_0 f)^{-1}, \quad | f = \sum_{i=0}^n f_i(1)$$

where g , the closed-loop gain, is the product of the Planck sensitivity parameter $\lambda_0 = 0.31$ Kelvin per Watt per square meter and the feedback sum $f = 1.5$ Watts per square meter per Kelvin. The unitless overall system gain G was thus 2.81 in 2007 but is just 1.88 now.

And just look what effect that reduction in the temperature feedbacks has on final climate sensitivity. With $f = 2.06$ and consequently $G = 2.81$, as in 2007, equilibrium sensitivity after all feedbacks have acted was then thought to be 3.26 K. Now, however, it is just 2.2 K. As reality begins to dawn even in the halls of Marxist academe, the reduction of one-quarter in the feedback sum has dropped equilibrium climate sensitivity by fully one-third.

Now we can discern why that curious footnote dismissed the notion of determining a central estimate of climate sensitivity. For the new central estimate, if they had dared to admit it, would have been just 2.2 K per CO₂ doubling. No ifs, no buts. All the other values that are used to determine climate sensitivity remain unaltered, so there is no wriggle-room for the usual suspects.

The cut the IPCC has now made in the feedback sum is attributable chiefly to Roy Spencer's dazzling paper of 2011 showing the cloud feedback to be negative, not strongly positive as the IPCC had previously imagined.

But, as they say on the shopping channels, "There's More!!!" The IPCC, to try to keep the funds flowing, has invented what it calls "Representative Concentration Pathway 8.5" as its business-as-usual case.

On that pathway, the prediction is that CO₂ concentration will rise from 400 to 936 ppmv; that including projected increases in CH₄ and N₂O concentration one can make that 1313 ppmv CO₂ equivalent; and that the resultant anthropogenic forcing of 7.3 Watts per square meter, combined with an implicit transient climate-sensitivity parameter of 0.5 Kelvin per Watt per square meter, will warm the world 3.7 K by 2100 (at a mean rate equivalent to 0.44 K per decade, or more than twice as fast *on average* as the *maximum* supra-decadal rate of 0.2 K/decade in the instrumental record to date) and a swingeing 8 K by 2300 (fig. 2). Can They not see the howling implausibility of these absurdly fanciful predictions?

Let us examine the IPCC's "funding-as-usual" case in a little more detail.

First, the CO₂ forcing. From 400 ppmv today to 936 ppmv in 2100 is frankly implausible even if the world, as it should, abandons all CO₂ targets altogether. There has been very little growth in the annual rate of CO₂ increase: it is little more than 2 ppmv a year at present. Even if we supposed this would rise linearly to 4 ppmv a year by 2100, there would be only 655 ppmv CO₂ in the air by then. So let us generously call it 700 ppmv. That gives us our CO₂ radiative forcing by the IPCC's own method: it is $5.35 \ln(700/400) = 3$ Watts per square meter.

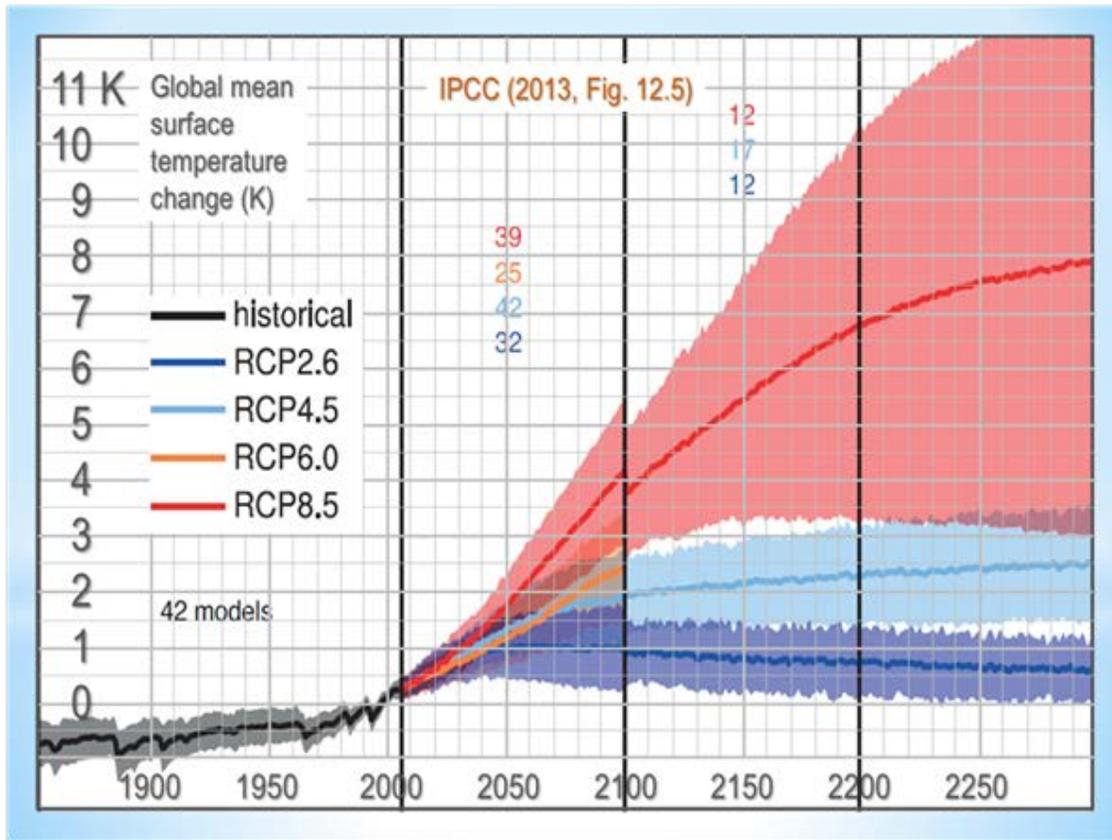


Figure 2. Projected global warming to 2300 on four “pathways”. The business-as-usual “pathway” is shown in red. Source: IPCC (2013), fig. 12.5.

We also need to allow for the non-CO₂ greenhouse gases. For a decade, the IPCC has been trying to pretend that CO₂ accounts for as small a fraction of total anthropogenic warming as 70%. However, it admits in its 2013 report that the true current fraction is 83%. One reason for this large discrepancy is that once Gazputin had repaired the methane pipeline from Siberia to Europe the rate of increase in methane concentration slowed dramatically in around the year 2000 (fig. 3). So we shall use 83%, rather than 70%, as the CO₂ fraction.

Now we can put together a business-as-usual warming case that is a realistic reflection of the IPCC’s own methods and data but without the naughty bits. The business-as-usual warming to be expected by 2100 is as follows:

3.0 Watts per square meter CO₂ forcing

x **6/5** (the reciprocal of 83%) to allow for non-CO₂ anthropogenic forcings

x **0.31** Kelvin per Watt per square meter for the Planck parameter

x **1.88** for the system gain on the basis of the new, lower feedback sum.

The answer is not [3.7 K by 2100]. It is just **2.1 K**. That is all.

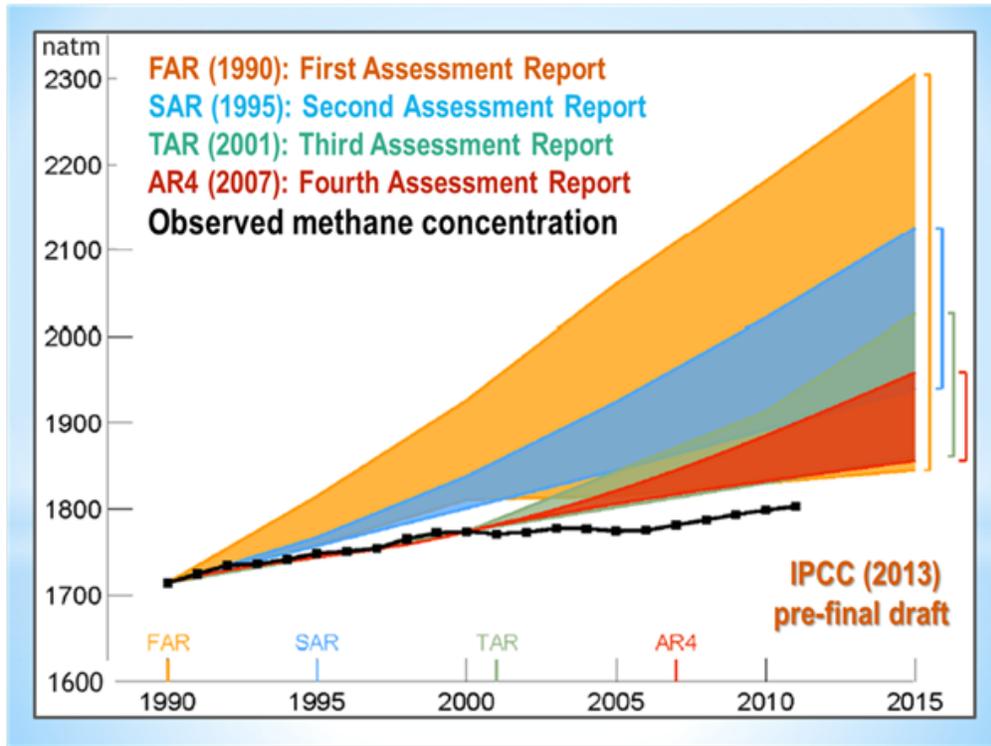


Figure 3. Observed methane concentration (**black**) compared with projections from the first four IPCC *Assessment Reports*. This graph, which appeared in the pre-final draft, was removed from the final draft lest it give ammunition to skeptics (as Germany and Hungary put it). Its removal, of course, gave ammunition to skeptics.

Even this is too high to be realistic. Here is my best estimate. There will be 600 ppmv CO₂ in the air by 2100, giving a CO₂ forcing of 2.2 Watts per square meter. CO₂ will represent 90% of all anthropogenic influences. The feedback sum will be zero. So:

2.2 Watts per square meter CO₂ forcing from now to 2100

x **10/9** to allow for non-CO₂ anthropogenic forcings

x **0.31** for the Planck sensitivity parameter

x **1** for the system gain.

= **0.76 °C**.

That gives my best estimate of expected anthropogenic global warming from now to 2100: three-quarters of a Celsius degree. The end of the world may be at hand, but if it is it won't have anything much to do with our paltry influence on the climate.