THE PROBLEM WITH CLIMATE MODELS

Excerpt from New Zealand Letter - by **Dr Vincent Gray**

Models incorporate a large number of "parameters" for climate properties and mathematical equations and use them to calculate an average climate and its changes. Both the parameters and the equations contain uncertainties whose quantitative values are mostly unknown. The choice of which parameter or equation to use is purely arbitrary. left to the judgement of the modellist. It is therefore hardly surprising, then, that the results from different models are very different.

The models are classified according to the figure they obtain for the equilibrium global temperature change caused by a doubling the concentration of the carbon dioxide in the atmosphere. This quantity is called the "Climate Sensitivity". In order to predict future climate there needs to be in addition, an estimate of how long it is going to take for the carbon dioxide concentration to double.

The early modellists tried to come up with a "range" for the climate sensitivity from different models, and eventually, by a "show of hands" decided on a low figure of 1.5°C and a higher figure of 4.5°C. These figures were confirmed through all the subsequent IPCC reports and were the basis of "projection" of future temperature change, when incorporated with "scenarios" of the future increases in carbon dioxide. "Climate Change" 2001" was able to use highly unlikely scenarios, such as a belief that Rwanda and Mali would equal the GNP per head of the USA, or that coal consumption would rise eleven times, to "project" a global temperature rise by 2100 of between 1.4°C and 5.8°C.

The "range" of "climate sensitivity" accepted by the IPCC was always just guesswork, with no scientific basis, since none of the model parameters and equations had a scientifically established uncertainty level. This applied particularly to the "feedbacks" of water vapour and clouds. On page 555 of IPCC's "Climate Change 2001" is the following passage:

"The range is 1.4 to 5.8°C. Note that this is not the extreme range of possibilities, for two reasons. First, forcing uncertainties have not been considered, second, some models have effective climate sensitivities outside the range"

So you can get almost any upper range you want. Not mentioned is that you can also go down. Page 334 of "Climate Change 2001" has the passage "The largest estimates of negative forcing due to the warm-cloud indirect effect may approach or exceed the positive forcing due to long-lived greenhouse gases"

Thus a model could be devised where the temperature falls with increasing carbon dioxide, but nobody seems to want to do this. In this situation we have the latest letter in "Nature" by sixteen authors (Vol453, pages 403-406, 2005),

headed by D A Stainforth, which attempts to give a wider range of "Climate Sensitivity" from a "multi-thousand-member grand ensemble of climate simulations using 90,000 participants from 140 countries using personal computers. They chose three possible values for six parameters, and ran the Hadley (UK Met Office) model for different perturbation mixes.

They ended up with a bigger range for "Climate Sensitivity" than the previous guess. They got six results that were negative, but they found an excuse for rejecting these because of "known limitations with the use of a simplified ocean". After these had been thrown out, they were left with a range of "climate sensitivity" from 1.9°C to 11.5°C. Of course, the press emphasised the possibility of 11.5°C rise.

The authors threaten us with an extension of the exercise to even more "perturbed" parameters, but so far, they don't seem to want to use different basic models or different model equations. These should give us even higher values, and maybe some low ones they can't explain away. The authors, frankly, state ""experts are known to underestimate uncertainty even in straightforward elicitation exercises where the import of the question is clear" and "we cannot provide an objective probability density function for simulated climate sensitivity"

The study thus proves what some of us have known all along; that computer models cannot at present predict the future climate at all.

The current rate of increase of carbon dioxide in the atmosphere is about 0.43% a year, so at the present rate it will double over the 2000 value by 2230, so we have a long time to wait to check up on Stainforth et al. We ought to be running on nuclear energy by then.
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