



Carbon Dioxide: no big deal

Pure physics climate statistics explained in plain terms

by Ian Phillips, based on research by David Coe, Walter Fabinski and Gerhard Wiegleb © 2021

Introduction

Important new research on climate change has just been published by David Coe, MA (Physics), a retired researcher with a career in industry, specialising for a large part in the measurement of atmospheric gases using infrared absorption spectroscopy.

His paper, co-authored with Walter Fabinski and Gerhard Wiegleb, challenges the prevailing view on climate change. This view is, firstly, that the carbon dioxide resulting from fossil fuel use is the prime cause of the warming of the Earth's atmosphere and, secondly, that we must abandon our use of fossil fuels by 2050, in a policy of Net Zero, or risk an accelerating and eventually uncontrollable overheating of the planet. We

are bombarded on a daily basis from almost every section of the media with stories of impending doom, unless we take immediate and decisive action.

The full version of Coe's paper is titled "The Impact of CO₂, H₂O and Other 'Greenhouse Gases' on Equilibrium Earth Temperatures". It is available to read on Paul Homewood's climate blog, "Not A Lot of People Know That", dated 31 August, 2021.

His findings show that the popular claims of carbon dioxide's ability to influence the planet's mean temperature have been grossly exaggerated, and are based on unsound science. Net Zero is therefore an overreaction, and a misconceived policy.

What follows is a simplified version. – Ian Phillips

The Equilibrium Climate Sensitivity and HITRAN Database

The scientific yardstick devised to measure the scale of this apparent threat is the "equilibrium climate sensitivity", or ECS, meaning the increase in average global temperature caused by a doubling of the atmospheric CO₂ concentration. However, no general agreement on this figure exists among the scientific community. Estimates of the ECS throughout the years have varied widely between one and six degrees Celsius, (°C), settling down at this moment to a band between 1.5 and 4.5°C, still a factor of three variation. This is summed up on the UK Met Office website thus, "As there is no 'perfect' way of estimating climate sensitivity, it remains a hotly debated area of science and there remains a wide range of estimates of what the ECS could be."

Coe's research takes a pure physics approach to calculating the greenhouse/heat-absorbing capability of the atmosphere's component gases, from their long-established thermal properties. These have been very precisely measured by laboratory spectral analysis at the Harvard-Smithsonian Center for Astrophysics, whose HITRAN database is the repository for this information.

CO₂'s Role in Atmospheric Warming Has Been Exaggerated

Coe applies this HITRAN data to a simplified model of the atmosphere and its interaction with solar radiation, but one where all the major influences are nevertheless taken into consideration. The end result is his finding that the ECS of CO₂ is only 0.5°C, just one third of even the lowest figure within the currently accepted range, of 1.5 to 4.5°C per doubling. What does this imply?

The graph below (figure 1) is to illustrate the effect of carbon dioxide on its own, without the influence of any other gases. The orange line portrays the amount of warming which would occur if CO₂ were the only greenhouse gas present. The blue line is there simply to

highlight the Earth's current mean temperature, of 15°C.

The vertical axis represents the Earth's mean temperature in degrees Celsius. The horizontal axis is a scale of atmospheric CO₂ concentration in parts per million, ppm.

Starting from the left, where there is zero CO₂, the Earth temperature is minus 18°C. In other words, without any "greenhouse warming" the planet would be locked into a permanent ice age. As the CO₂ level begins to rise, along the horizontal axis towards today's figure of 400ppm, the line curves upwards steeply, to produce about a 6°C rise in temperature for 400ppm of CO₂. Note, it's still ice age cold, at minus 12°C. Further increases of CO₂ produce steadily diminishing changes in temperature, shown by the gradual flattening of the curve. Even for a huge concentration of 3,000ppm, at the right-hand side of the graph, CO₂ acting on its own increases the Earth's temperature from minus 18°C to only about minus 10°C. The reason we are not locked into such long-term icy conditions is the influence of water vapour.

Water Vapour and Its Overriding Influence

The effect of water vapour is now included to the original graph, as show here below. The orange, CO₂ only, line is left in place.

On the next graph (figure 2), the data for water vapour is combined with that for CO₂, taking account of the fact that their properties of heat absorption overlap somewhat. Various realistic assumptions are made, e.g. that nearly all the greenhouse warming occurs up to a height of 5,000 metres. The cluster of lines, from yellow to green, represent different concentrations of water vapour (see the key below the graph).

For approximately one per cent of water vapour, which is about the average concentration in the atmosphere, the effect on increasing levels of CO₂ is represented by the light brown line.

For the current level of CO₂ at around 400ppm, the Earth's mean temperature has increased from minus 10°C to plus 15°C, which we now experience. This line shows how the Earth's temperature then varies according to the amount of CO₂, from zero to 3,000ppm. The other coloured lines in the cluster show what happens for other percentages of water vapour.

It is the water vapour which lifts the mean temperature by 25°C, plus or minus. But after this H₂O surge, variations in CO₂ levels produce only a very limited influence on the mean Earth temperature. The overriding

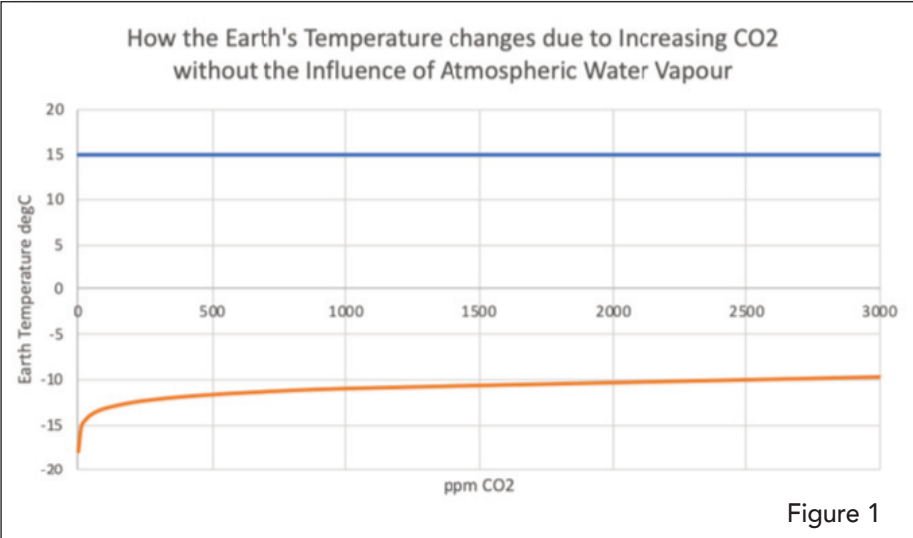


Figure 1

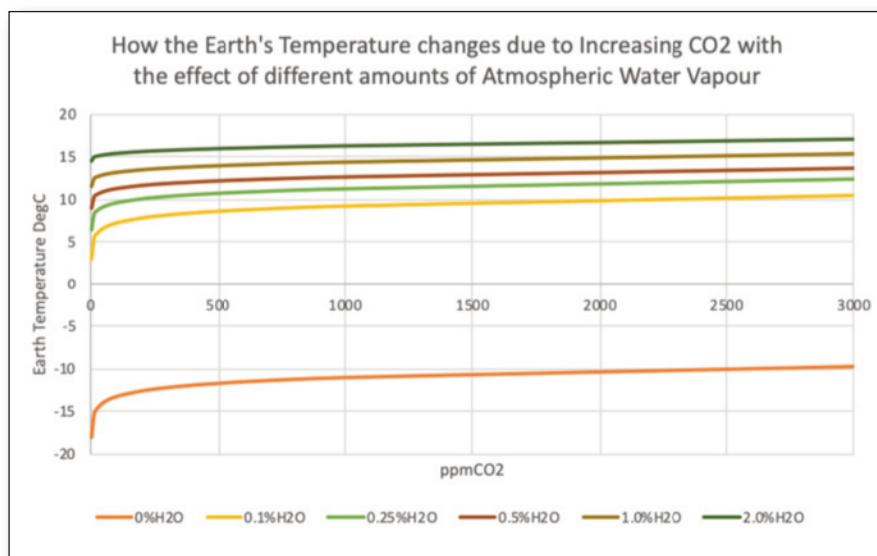


Figure 2

influence here is the water vapour, not the CO₂.

At today's concentration of around 400ppm of CO₂, Coe's calculations show that, ignoring for a moment the effect of minority gases, water vapour accounts for 92.3 per cent of the greenhouse heating effect, while the figure for carbon dioxide is just 7.7 per cent. It is water vapour which is doing the "heavy lifting" in our atmosphere and giving us our habitable climate. CO₂ is a relatively minor player in influencing the mean planetary temperature.

The "elephant in the room" of the climate debate is the scientific fact that atmospheric water vapour holds around 12 times as much heat as carbon dioxide.

The Minority Gases

And what of the warming contributions of those minority gases?

Methane (CH₄) and nitrous oxide (N₂O) are popularly cited. Using similar calculations, again based on the HITRAN data, their ECS, concentration-doubling effects, amount to only 0.06°C and 0.08°C, respectively. These are very small compared to that figure of 0.5°C for carbon dioxide, and taken together represent only 0.4 per cent of the overall greenhouse effect at current concentrations. The minority gases may therefore be considered insignificant contributors to atmospheric warming, Coe concludes.

There Can Be No "Tipping Point"

Fears of a "tipping point" due to the increasing evaporation of water as the temperature increases, generating a progressive and uncontrollable positive feedback, are unfounded. There is, indeed, positive feedback due to water vapour, and this is linked to the vapour pressure/humidity. Bearing in mind that there is almost no water vapour above a height of 10,000 metres

and that temperature diminishes with altitude, the mathematics involves the summation of an algebraic series, which is detailed in the full paper. These calculations are not for the faint-hearted! Happily, the outcome of this calculation is to introduce only a simple multiplying factor, of 1.183. Water vapour feedback results in just a small additional increase of a fraction of a degree, depending on the vapour pressure/humidity level.

Looked at in terms of the ECS value, atmospheric water vapour increases the CO₂ climate sensitivity slightly from 0.45°C to 0.5°C, and any "runaway overheating" is shown to be impossible.

Despite the advanced mathematics, most of the paragraphs of text in Coe's paper remain highly readable for non-scientific background readers.

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Net Zero Target of Global Warming Pointless

Climate campaigners, and all those currently pushing for the Net Zero target, have identified one particular goal, to keep further temperature rises below 1.5°C. According to Coe's research, if this increase were to be caused by the increase of CO₂ in the atmosphere, three concentration doublings would be required, each one increasing the temperature by 0.5°C. To achieve this, the current level of CO₂ of 400ppm would need to double to 800ppm, and then again to 1600ppm, and then again once more to 3200ppm. So, how long would this temperature rise take?

A quick look at the Scripps Institute's Mauna Loa graph (figure 3), shows that CO₂ is currently increasing at an approximate rate of 240ppm per 100 years. The increase from the current 400ppm to 3,200ppm is a figure of 2,800ppm. Assuming a continuation of the same rate of increase, the time needed to reach a further 2,800ppm and a 1.5°C warming would be just over 1,300 years.

Looking back at the past 1,300 years, the planet has experienced both the Medieval Warm Period and The Little Ice Age. Who is to say similar massive climate changes, due entirely to natural causes, will not be repeated while the very gentle warming influence of CO₂ is continuing? Our current condition is hardly a crisis, and

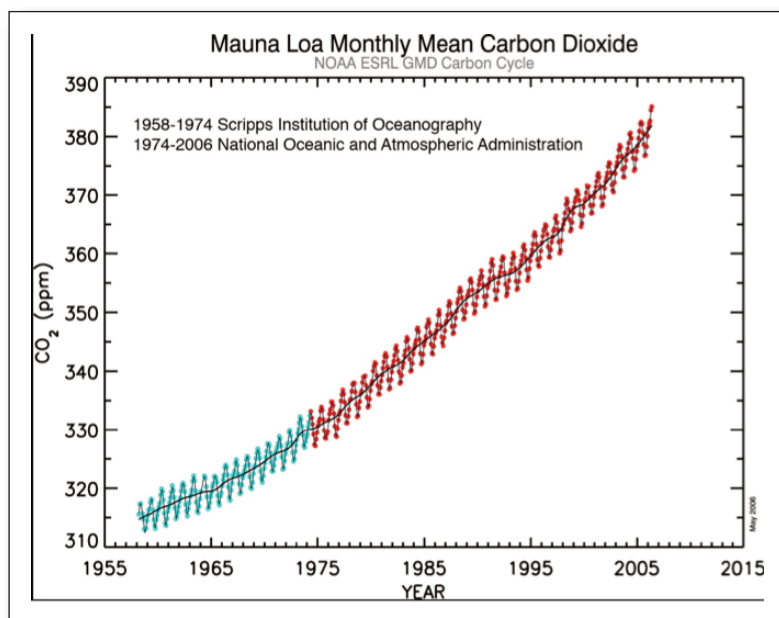


Figure 3

the current frantic attempts to eliminate fossil fuel use are of highly dubious significance.

Warming Before the Industrial Revolution

The same ECS-based approach may be applied to the increase of CO₂ since before the Industrial Revolution, from 280ppm to 420ppm currently. This increase, of 140ppm, amounts to only a "half-doubling", which would cause just a 0.25°C rise in temperature. The accepted rise in temperature during this period, however, is taken as having been 1°C. It is therefore wrong to attribute this totally to warming by carbon dioxide. The remaining gain of 0.75°C must be due to other causes, primarily the Sun!

Conclusion

In the author's own words, from his paper's abstract:

"The result strongly suggests that increasing levels of CO₂ will not lead to significant changes in Earth temperature and that increases in CH₄ and N₂O will have very little discernible impact."

And in an earlier version of the paper, Coe ends with:

"Variations of Earth temperature of many degrees Celsius, over millennia, are known to have occurred caused by entirely natural phenomena, particularly solar radiation intensity variations. The Medieval Warm Period and the Little Ice Age are two recent examples. Scientific concern could perhaps be better focused on the possibility that we are approaching the end of an interglacial period at which point the Earth will enter a new ice age. Our impotence to influence the climate will then be immediately and painfully realised."

A final word from David Coe:

"The overarching principle of scientific method from the time of Isaac Newton is to always question any findings in order to ascertain the truth. This principle has been totally destroyed by climate science. Any voices dissenting from the approved narrative are quickly shut down. You, dear reader, can begin to restore the integrity of science by questioning what you are told to believe."

About the Authors:

Ian Phillips holds a degree in physics from Oxford University and is a retired teacher, living in South Devon. Phillips is a campaigner for climate realism and acknowledges that David Coe's assistance in the preparation of this article was much appreciated—the supplying of graphs and providing assistance with editing and wordings within the text.

David Coe is a physicist, having read physics at Oxford back in the 1960s. His day job for the past 20+ years has been developing a range of sensors for the monitoring of gaseous emissions to atmosphere, using infrared absorption spectroscopy. He thus has not only some knowledge in this area but has access to a database of molecular absorption spectra for most common gases, particularly CO₂ and H₂O. He is the founding director of the company Codel International Ltd, based in Bakewell, Derbyshire. Coe may be contacted via email at coecharlesdavid@gmail.com.

The paper described in this article was published earlier this year and was research undertaken by: David Coe, Walter Fabinski, Gerhard Wiegler, "The Impact of CO₂, H₂O and other Greenhouse Gases on Equilibrium Earth Temperatures", International Journal of Atmospheric and Oceanic Sciences. Vol.5, No.2, 2021, pp. 29-40. doi:10.11648/j.ijaos.20210502.12.

David Coe is now retired from Codel International Ltd, England; Walter Fabinski has retired from ABB Automation, Frankfurt, Germany; and Gerhard Wiegler is attached to the Department of Electrical Engineering (Research Group for Environmental Monitoring), at the University of Applied Sciences Dortmund, Dortmund, Germany.

Postscript from David Coe

Based on complaints from the climate alarmists, my paper was retracted by the journal, shortly after publication, while a further "vigorous peer review" was conducted, after which it was formally reinstated. No faults could be found.

By early November, the paper had received 5600 views and 1525 downloads.