To the senate Committee on climate

Dear Senators

I have used basic physics from the kinetic theory of gases, the Max Planck radiation formula and his relationship giving the energy intensity of a quantum of radiation to the frequency to calculate the behaviour of carbon dioxide in the atmosphere.

The results from these calculations are beyond dispute for using the proven formula derived by the brilliant men, Max Planck, Boltzmann, Avogadro etc, any year 12 student using a spreadsheet could easily duplicate them.

Suggestions have been made on the internet that radiation absorbed by carbon dioxide giving the molecules vibrational energy is instantly converted into heat (translational energy) a form from which a gas does not radiate.

The figures obtained from the calculations combined with the proven principle equipartition of energy prove that this in fact must occur and therefore carbon dioxide will not re-radiate the energy it absorbs either incoming from the sun or outgoing from earth.

Using the Planck radiation formula the Howard graph of radiation absorbed by CO2 and taking into account the overlap of some of the CO2 absorption bands of CO2 it appears that CO2 actually blocks more incoming radiation from the sun than outgoing from earth.

This was shown by a numerical integration of the energy for each absorption band.

I also point out the very great effect that particulate matter both in the atmosphere and oceans greatly affect temperature of both.

Mild turbidity in the ocean will decrease the depth of penetration of sunlight and so increase the surface temperature.

Particulate matter in the atmosphere can mean a difference in temperature such as 47°C in Melbourne at 37 degrees south while at Yungaburra 17 degrees south we had a constant temperature of 20°C for 48 hours.

I herewith submit my as yet unpolished paper as text and am willing to answer any questions.

I must mention that over two weeks ago I sent it to the PM but he has chosen to ignore it.

I suggest that you look at a recent important Press release from CSIRO at URL/
http://www.csiro.au/news/Aerosols.html

Robert Stringer

Carbon dioxide and climate change

By Robert & Graeme Stringer

Introduction

In recent years, much has been written and said about the causes of global warming.[1]
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While the fact of global warming is not under dispute, it is far less clear as to what is the cause of it..[2]

The claimed consensus internationally, as presented in the IPCC reports .[3] is that anthropogenic increase in CO2 emissions into the atmosphere are the main cause of this warming. There are a range of opinions as to the validity of this concept .[4], including many well respected scientists .[5]

The aim of this article is to review some of the basic physics behind the role of CO2 in the atmosphere in relation to earth's temperature, specifically the absorption by CO2 of all radiation in its absorption bands and the sharing of energy between vibrational modes and that of translational kinetic energy. The physical laws that govern the resultant heat of the CO2 molecules and the atmosphere.

Background

We know that the average temperature of the earth taken over the whole surface is estimated to be somewhere about 14 C which is 287.13 K, that is 287.13 degrees above the absolute

zero of temperature at which all atoms are completely still. Without an atmosphere it is reckoned that the average temperature would be minus 18 C or 255.13 K.

Thus the atmosphere has an insulating role for the surface of the earth..[6&7] Much of this insulating quality comes from the ability of the atmosphere to carry in suspension condensed matter which is capable of reflection and scattering over an extended bandwidth as well as absorption and re-radiation at longer wavelengths than the received radiation.

A change in the amount of this condensed matter can result in variation of overnight cooling between zero and 30 or more degrees C and also for extremes of temperature frost of minus 10 C at latitude 16 south and to day temperatures of 43°C at latitude 38 degrees south .[8] It can also reflect onto solar panels to produce at least 6.5 watts/sqm of power before there is direct sunlight on the panels [8a]

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At this time there are many who believe that the observed small increase in global temperature over the past 50, 100 or 200 years has been caused by an increase in the atmospheric concentration of carbon dioxide from around 280 parts per million 200 years ago to 380 parts per million today.

The claim is that this increase has been brought about by the burning of fossil fuels of various kinds .[9 & 10]

Some people who make this claim tell us that the atmosphere is transparent to short wave radiation from the sun, but that longer wavelengths such as are radiated from the earth are absorbed by carbon dioxide, and so remain trapped in the atmosphere. [11]

They also claim that some of the trapped radiation is then transmitted by re-radiation back to the earth and that this process causes earth warming. [12]

However, incoming radiation from the sun of these same longer wavelengths is also trapped in the atmosphere on the way in .[13]

According to spectroscopic analysis, none of these longer wavelengths from the sun reach the earth surface as radiation. They are certainly partly converted into heat of the translational form but they do not reach the earth [14]

The carbon dioxide molecule has been depicted on the internet as receiving radiation and set into vibration but immediately re-emitting and coming back to rest .[15]

If this happened the radiation might be slowed down in reaching the earth but it would be passed from molecule to molecule and the atmosphere would not be opaque to these radiations.

Instead they are converted partly into heat of the translational form. Further explanation of this point appears later in the article

Gases with more than one atom in the molecule radiate at the same frequencies at which they absorb but only if their vibrational energies are high enough to raise the minimum quantum.

Carbon dioxide with three atoms (one of carbon and two of oxygen) is known to absorb electro magnetic radiation in three main bands of wavelength, namely at 2.7, 4.3 and 14.99 microns, (i.e). millionths of a metre). The CO2 molecule has a large number of harmonics to these frequencies up to equivalent wavelength of 18 microns. These are termed sidebands they absorb with a large number of lines but at a much lower intensity. There is also an absorption band at 2.1 microns but absorption for it for sun radiation reaching earth is only about 36% [13&14]

Research using the Planck formula for black body radiation [16] has found that the intensity per unit area of the CO2 absorption wavelength of 14.99 microns, coming from the sun at 5800 K is 2.746E-13 watt/sqm while that emitted by earth surface taken at 293°K is 1.942E-15 watt/sqm.

These figures are for a single frequency and neglect line broadening due to the doppler effect or collisions and the low intensity side bands but are sufficient to show the ratio between intensities emitted by both bodies of which both are considered to

have emissivities of about 0.9 instead of 1 which was used to calculate the above figures. The absorption bandwidths will be the same for both incoming and outgoing radiation.

The emissivity for the sun will be fairly uniform over the whole surface except where there are sunspots but that of earth will be variable and overall lower than 0.9, some estimates being as low as 0.74 which if correct would lower the calculated emission from earth.

These figures then give the at sun intensity 141 times that of earth for the wavelength 14.99 micron

Similarly for the 4.3 micron band the relative intensities are sun 3.2609E-11Watt/sqm and earth 2.801E-16Watt/sqm. A ratio of 116,416 to 1 sun to earth

For the 2.7 micron band sun the relative intensities are 1.731E-10 W/sqm and earth 3.308E-19W/sqm.

The ratio of sun intensity to that of earth is 5.23E+07 to 1 sun to earth.

For the 2 micron band the ratio of intensity emitted at the sun and earth is 9.6E+08

Because of the distance of the earth from the sun is 1.49476E+11 km and the radiation intensity falls off as the square of the distance the intensity received above the atmosphere will be less by a factor of 46123.

This is the ratio of the surface area of the sun to the average surface area of the sphere of the earth orbit.

From this and the known radiation received at the top of earth atmosphere 1367 watt/Sqm we get the output of the sun to be 63,051,143 watt/sqm. The diameter of the sun is 1,392,000 km

Now dividing the intensity at the sun for the 4 bands by the fall in sun intensity due to distance the above factor 46123 results are taking the earth temperature as 293°K.

For the14.99 micron band energy received from sun is 0.00309 of that radiated by earth and for the 4.3 micron band energy received from the sun is 2.52 times that radiated by earth , for the 2.7 micron band energy received from the sun is 1134 times that radiated by earth. And for the 2 micron band the ratio is 4.03E+5.

Using the Howard graph [14] to estimate the bandwidths for the four absorption bands and integrating using a numerical method the energy received at earth above the atmosphere and radiated from earth below the atmosphere the sum for all four bands gives a ratio of incoming radiation blocked to outgoing radiation blocked of near 0.5.

From this at first look it would seem that CO2 will cause an increase in temperature but since both incoming and outgoing radiation are converted into heat in the atmosphere an increase in CO2 concentration will not alter the ratio of the absorbed radiations but merely shorten the distance needed for complete absorption in accordance with the Lambert- Beer law.

When the fact that both the 15 micron and the 2.7 micron absorption bands are overlapped by water as gas and if they are therefore deleted from the sum the blocked incoming radiation to outgoing radiation rises to just over 12.

These figures are in contrast to the figure 2.1 on page 9 of Haughton's book [13] which is false and repeated in a number of places on the internet. The origin of this diagram is unknown but it is certainly not arrived at by application of the Planck radiation formula the validity of which has been proven.

At night of course there is no incoming radiation and any reduction in cooling rate by CO2 will depend on whether or not it re-radiates some of the absorbed radiation from earth.

By the argument which follows this can not happen because the absorbed radiation which causes inter atomic vibration will immediately be converted partly into kinetic energy in the translational rather than the vibrational form.

The reason for the conversion to heat is set out in following argument.

Based on these three established facts.

(1)We know from the kinetic theory of gasses that the average kinetic energy of a single molecule in translational movement is given by the formula E=3/2kT where E equals the statistical average kinetic energy of motion of one molecule, k equals a very small constant named the Boltzman constant, and T is the absolute temperature in degrees Kelvin. The value of the Boltzman constant is 1.38E-23 Joule/molecule-degree. The E-23 means divided by 10, 23 times, so it is very small.

(2) We also know from the work of Max Planck that radiation energy occurs in packets or quanta the value of each packet being given by the formula E=nhf where E is the energy of a single quanta n a number varying by a unit number added to 1.5, h is Planck's constant 6.62517E-27 erg/sec or 6.62517E-34 Joule/sec and f is the frequency in cycles /second.

From these two relationships the kinetic energy of straight line motion of a single molecule and the energy of a single photon which sets it in vibrational motion between the atoms can be calculated.

(3) We also know that kinetic energy of molecules is statistically evenly distributed between modes (vibrational and translational) the reference any good physics text book.

The atmosphere is in four distinctive layers. The first from ground to between 15 and 20 kilometres is the troposphere, where the temperature decreases with altitude, and then there is the stratosphere, at about 20 to 45 kilometres above ground level, where the temperature increases with altitude [17]

It is known that the stratosphere is heated from above by the fact that ozone, which is three atoms of oxygen joined together, absorbs radiation in the energetic short ultra violet wavelengths causing the atoms to vibrate within the molecules. [18] This absorbed radiation which produces kinetic energy of vibration is known to be converted partly from kinetic energy as vibrational energy to translational energy and not re-radiated. The reason for this is that the energy of the received photons which cause vibration of the atoms within the molecule greatly exceeds the kinetic energy of motion in straight lines.

At any moment the translational speed of molecules in a gas varies from zero to about three times the statistical average speed, and if we plot the speed of a molecule against the number with that speed we get a bell-shaped curve called a Gaussian curve (after the German physicist Carl Gauss who first described it).

Now it is known that in any gas composed of molecules the intensity of one form of kinetic energy, vibration between atoms in a molecule can not be greater than the intensity of energy of motion in straight lines, hence, if energy is received by radiation is greater than the average translational form it will be immediately shared with the translational form.

This is understood as equipartition of energy between modes. It is known that a multi atom gas has a higher specific heat than monatomic gases the reason being that some of the heat energy is in the form of vibrations within the molecules [19] This is the reverse of the process just stated.

This physical law explains the observations that in the stratosphere, the short wave ultra violet wavelength from the sun is absorbed by ozone and instantly converted partially into kinetic energy of the translational form.[20]
The ozone is then ready to receive more radiation. Because some of the vibrationl energy has been converted into translational kinetic energy, it is not then available to be re-radiated from molecule to molecule, and so it does not reach the earth.

The crux of the argument in this article and its unique perspective on the issue of global warming is as follows:
As previously stated
The average kinetic energy of a single molecule as heat is given by the formula E=3/2kT where k = Boltzman's constant and T the absolute temperature °K.
The Planck formula for the energy of photons is E= nhf where E is the energy n, a number varying by unity with a minimum of 1.5, h is Planck's constant and f the frequency in cycles / second. f being the speed of light 2.997925E+08 metres per second divided by the wavelength in metres

Research, using the formula above with the minimum value for n applied to the frequencies for which CO2 absorbs, has found that, for the wavelength 14.99 microns, the ratio of a single photon energy ranges from 3 times the average translational kinetic energy per molecule at 323 K to 4.5 times at 203 K.

At the shorter wavelength of 4.3 microns, the ratio ranges between 10.3 at 323 K to 16.5 times at 203 K. For the highest energy wavelength of 2.3 microns, the ratio ranges from 16.5 times at 323 K to 26.25 times at 203 K.

This means that all the energy absorbed by CO2 as radiation to give kinetic energy of vibration (various modes) will be partly converted into kinetic energy of translation, such that the two forms of energy are statistically equal. This by the principle of statistical equipartition of energy.

The heat energy of vibration having been partially converted into heat of the translational form is then not available at high enough level in the vibrational form to allow the molecule to re-radiate. Thus radiation from earth and absorbed by CO2 will not be re-radiated at least not near the ground. Instead it will be carried aloft by convection.

Also it should be noted here that warming of the atmosphere by actual contact with earth surface, land or water will vastly exceed that caused by absorbed radiation. The transfer of heat from ocean to air is greatly accelerated by air movement and is the cause of cyclones.

It is known from spectroscopy that none of the radiation from the sun in the CO2 absorption bands reaches the earth, because most of it is converted from vibrational kinetic energy to translationalon energy on the way in. It follows therefore that all the radiation in those wavelengths from earth will also be absorbed in the atmosphere and converted largely into translational kinetic energy.

This being the case, what does an increase in the concentration of CO2 imply for the earth's temperature?

An increase in CO2 concentration should simply mean that the photon energy initially causing resonant vibration in the molecule is partially converted into kinetic energy (translational form) of all components of the atmosphere in a shorter distance in the atmosphere both for the incoming and outgoing radiation. The absorption distance will decrease in accordance with the Lambert-Beer Law. In the stratosphere this heat will not move by convection, but in the troposphere it will be carried aloft by convection in the same way as air heated to a far greater extent by contact with the ground is carried upwards by convection and cooling as it goes because of pressure decreasing exponentially with increase in altitude.

So, logically, a change of CO2 concentration in the atmosphere should cause no increase in earth's surface temperature.

Discussion

Tim Flannery, in his much acclaimed book entitled "The Weather Makers", suggests that gases in the atmosphere absorb long wavelength radiation but these gases eventually become unstable and re-radiate it back to earth as heat. He says: (Flannery 2005, 23)

"We are familiar with the long wavelength under the name 'heat energy' and heat is what these gases trap. By doing so, however, they become unstable and eventually release the heat, some of which radiates back to earth."[21]

The statement should receive the crowning prize for the most erroneous off the top of the head statement for the year. That is if not topped by the sentence which follows it, "Greenhouse gases may be rare, but their impact is massive, for by trapping heat near the planet's surface they both warm our world and account for the 'upside down' troposphere."

This Flannery statement demonstrates an ignorance of the kinetic theory of gases and apparently also the distinction between radiation and heat as forms of energy. It is akin to saying that, in a solution of say saltpetre in water, the saltpetre (KNO3) molecule can be hotter than the water.

Absorbed radiation does not account for the upside down temperature profile of the troposphere. To say this is pure conjecture and to state conjecture as fact is scientific corruption.

The troposphere is heated from below in contrast to the stratosphere which is heated form above.

The troposphere is heated vastly more by contact with the ground than by absorbed radiation and the warmed air is carried aloft by convection.

The rising air reduces in pressure exponentially with altitude and so expands and cools as it goes. The air continues to rise because the density decreases exponentionally with altitude.

We know that heat moves only from a hot to a colder body so if radiation from earth heats the air this air will rise by convection and by reducing pressure become cooler than the ground or water below so how can it radiate some of the absorbed heat back to earth.

Carbon dioxide is considered to be contributing to cooling in the upper atmosphere where the pressures is low and the molecules receive energy from fast collisions or by collisions with charged particles from the solar atmosphere and so are stimulated to radiate.
This may be just conjecture as in the thin upper atmosphere there is less of the heavier gasses such as CO2 mole weight 44 against air average 29.

Recently plans have been advanced to sequester CO2 underground, at great expense.(ref)

Thus, one so-called solution to global warming, namely the sequestration (burying) of CO2, which will be done at a tremendous cost, will achieve no result in changing earth's climate.

Conclusion
After reviewing the basic physics as it applies to CO2 in the atmosphere it is contrasted with the current theories that attribute global warming to an increase in concentration of CO2 in the atmosphere, with consequent absorption of radiation and re-radiation back to earth. This idea is not in accord with current understanding of the laws of physics. Furthermore, these laws indicate that any future change in CO2 concentration in the atmosphere will have no effect whatever on earth's surface temperature.

This article does not for a moment imply that the abundance of fossil fuel which has been exploited by mankind for the past two centuries should continue to be exploited so lavishly. The fossil fuels on which we have become so dependent, will not be replenished in the future by natural processes at anywhere near the rate at which we have been depleting them. The planet is ageing like everything else.
In recognition of this, humanity should refrain from squandering its remaining fuel resources especially in the grossly wasteful indulgence of warfare. However, it is imperative that the world's statesmen and economists should realise that a decrease in carbon dioxide emission by the burning of fossil fuels will not solve the problems of global warming. Mankind should look elsewhere for a solution.
ADDENDUM

There are two further points in support of the argument presented in this paper. They are included within this addendum rather than in the main body of the article so as not to complicate the general thrust of the argument.

1.0
Independent scientist, Gary Novak also argues that there is no valid mechanism for CO2 creating global warming:
"Heinz Hug (1998) showed that carbon dioxide in the air absorbs to extinction at its 15 micron band peak in about ten meters. This means that CO2 does whatever it's going to do in that amount of space.
Twice as much CO2 would do the same thing in about 5m. There's no significant difference between 5m and 10m for global warming, because convectional currents mix the air in such short distances. This means that CO2 does whatever it's going to do in that amount of space. Twice as much CO2 would do the same thing in about 5m. [22]

If the 15 micron band is absorbed to extinction in 9.7 metres then the shorter wavelength bands by my argument should also be absorbed to extinction because the ratio of photon energy to translational KE (kinetic energy) of single molecules is even higher. This supports the notion that all of the wavelengths which CO2 absorbs both from the sun and from the earth have been , are now, and will continue to be fully absorbed regardless of probable atmospheric CO2 concentrations.
The only difference is the path length taken for this absorption to occur. This should have no effect on air temperature because heating of air by contact with ground or water vastly exceeds that caused by radiation.

2.0
It is also worth pointing out that an oxygen acetylene flame at about 3500 K and containing 66% by weight of CO_2 and the other 33% water radiates very little; similarly a propane air flame at about 1300 K containing about 11%CO_2 by weight radiates very little and so to get infra red radiation it has to be applied to a solid.

This supports the notion that the distribution of kinetic energy between the vibrational modes and translational modes of kinetic energy of CO_2 is such that the vibrational modes are of intensity too low to produce a photon, so there will be no back radiation to earth from CO_2. This is further supported by the observation that on calm nights with little haze in the atmosphere the temperature of a surface exposed to the sky is frequently two degrees C lower than the air at the same level, more rarely, with an even clearer sky, a difference of five degrees has been noted.

This difference occurs only if the air is very still and the sky has very low content of condensed matter

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