Atmospheric Carbon Dioxide Control Mechanisms

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PART 1: THE PROBLEM
IPCC ASSESSMENT REPORTS

Synopsis

Atmospheric CO_2 levels are at the core of all the issues related to climate change and anthropogenic global warming. Current scientific consensus as elucidated by IPCC assessment reports is that the observed increase in CO_2 levels results directly from anthropogenic activities, principally combustion of fossil fuels. The atmospheric models in use are all based upon the assumption of a basic stable atmosphere with a zero net biome production (NBP) implying that photosynthetic CO_2 absorption by the biosphere is perfectly balanced by respiration and vegetative decay. The introduction of anthropogenic CO_2 emissions is applying a disturbance to this equilibrium. 50% of all CO_2 emissions remain in the atmosphere, resulting in an inevitable and persistent increase in atmospheric CO_2 levels. The evidence cited by the IPCC reports in support of this model is provided by the "anthropogenic fingerprints" of northern hemisphere CO_2 bias, decreasing ^{13}C isotope ratios in atmospheric CO_2 and declining atmospheric O_2 levels. This paper analyses the evidence provided by the anthropogenic fingerprints and other observations, with the conclusion that the IPCC models in use do not conform to the observational evidence. The models and the science described by Working Group 1 (The Physical Science) of the IPCC Assessment Reports are simply wrong!

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1.0 THE IPCC THEORY OF ATMOSPHERIC CO_2

1.1 Current Consensus on Atmospheric CO_2 Levels

The Intergovernmental Panel on Climate change (IPCC) has, to date, published four Assessment Reports on the scientific consensus of climate change. Fundamental to these reports is Working Group 1, which defines the basis of the core science behind the concept of climate change, and fundamental to that science is a thorough understanding of the reasons for the recent increase in atmospheric CO_2 levels.

According to the IPCC Third Assessment Report (TAR), working group 1, Chapter 3, Executive Summary:

Before the Industrial Era, circa 1750, atmospheric carbon dioxide (CO_2) concentration was 280 +/-10 ppm for several thousand years. It has risen continuously since then, reaching 367ppm in 1999.

The present atmospheric CO_2 concentration has not been exceeded during the past 420,000 years, and likely not during the past 20 million years. The rate of increase over the past century is unprecedented, at least during the past 20,000 years.

The present atmospheric CO_2 increase is caused by anthropogenic emissions of CO_2. About three quarters of these emissions are due to fossil fuel burning.

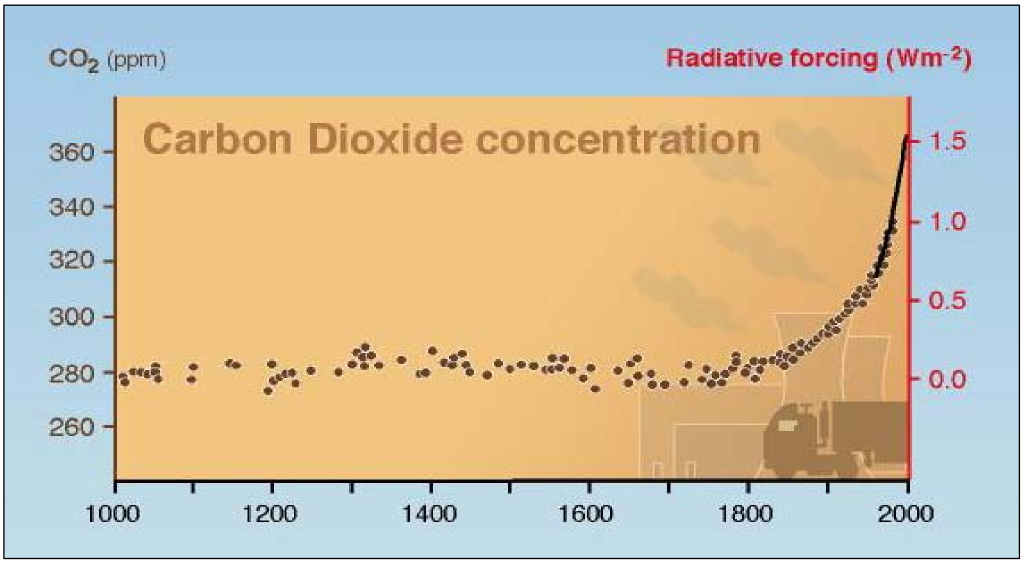


Figure 1.2: CO2 Historical Trends According to TAR (From the IPCC Third Assessment Report showing the trends of atmospheric CO2 emissions from 1000 to 2000AD).

These statements are extraordinarily authoritative leaving absolutely no room for doubt and have remained unchallenged since TAR was published in 2001. The IPCC Fourth Assessment Report (AR4) in 2006 makes almost no further comment on the history and causes of atmospheric CO_2 variations. The science is settled!

The evidence for these conclusions is the systematic array of atmospheric measurements made globally on a continuous basis since 1960; prior to 1960 the evidence for past atmospheric CO_2 levels is based on ice core data, the analysis of the composition of air bubbles trapped in Antarctic ice. According to TAR, Working Group 1, Chapter 3.1:

The concentration of CO_2 in the atmosphere has risen from close to 280ppm in 1800, at first slowly and then progressively faster to a value of 367ppm in 1999, echoing the increasing pace of global agricultural and industrial development. This is known from numerous, well-replicated measurements of the composition of air bubbles trapped in Antarctic ice. Atmospheric CO_2 concentrations have been measured directly with high precision since 1957; these measurements agree with ice-core measurements, and show a continuation of the increasing trend to the present.

Several additional lines of evidence confirm that the recent and continuing increase of atmospheric CO_2 content is caused by anthropogenic CO_2 emissions – most importantly fossil fuel burning. First, atmospheric O_2 is declining at a rate comparable with fossil fuel emissions of CO_2 (combustion consumes O_2). Second, the characteristic isotope signatures of fossil fuel (its lack of ^{14}C, and depleted content of ^{13}C) leave their mark in the atmosphere. Third, the increase in observed CO_2 concentration has been faster in the northern hemisphere, where most fossil fuel burning occurs.

Atmospheric CO_2 is, however, increasing only at about half the rate of fossil fuel emissions; the rest of the CO_2 emitted either dissolves in seawater and mixes into the deep ocean, or is taken up by terrestrial ecosystems.

The part of fossil fuel CO_2 that is taken up by the ocean and the part that is taken up by the land can be calculated from the changes in atmospheric CO_2 and O_2 content because terrestrial processes of CO_2 exchange involve exchange of oxygen whereas dissolution in the ocean does not.

1.2 Unanswered Questions

These statements made in TAR raise the following questions: -

- Why have historical CO_2 levels been so stable for the past several thousand years?
- Why have CO_2 levels been stable at the precise value of 280 +/-10ppm as claimed in TAR? (Later IPCC references to historical levels more than 1000 years ago do place a higher level of deviation than the +/-10ppm as quoted in TAR as a result of data

obtained from the Vostok Antarctic ice cores, which show CO_2 levels varying between 220 and 290ppm).

- Why should the oceans and ecosystems take up half the anthropogenic CO_2 emissions? Why not a quarter, or three quarters?

- How is the partitioning of CO_2 emissions between the ocean and land controlled?

The basis for the TAR statements is that the biosphere and hence atmosphere are in a state of stable equilibrium where various CO_2 fluxes are in a natural balance.

According to TAR:

By definition, for an ecosystem in steady state, Rh (heterotrophic respiration – by decomposers, bacteria and fungi feeding on dead tissue and exudates) and other carbon losses would just balance NPP (Net Primary Production – net CO_2 absorption by photosynthesis) and NBP (Net Biome Production – the carbon accumulated by the terrestrial biosphere) would be zero.

The introduction of a CO_2 flux from anthropogenic fossil fuel combustion has apparently disturbed this balance resulting in an inexorable increase in atmospheric CO_2 levels. This postulate however does not explain why such equilibrium should exist in the first place, nor does it explain why CO_2 levels should be stable at around 280ppm. Stability can exist at any absolute level.

Furthermore there appears to be no physical or chemical reason why two totally different processes, photosynthesis, and organic respiration and decomposition should balance, not only balance, but also balance perfectly over thousands and millions of years. How, for example is this claim reconciled with the fact that fossil fuels themselves are a result of biospheric photosynthesis being greater than organic respiration, a positive Net Biome Production?

In seeking answers, perhaps we should examine the evidence for the IPCC TAR theory, namely the so-called anthropogenic fingerprints, which are declining atmospheric O_2 content, the changes in carbon isotopic ratio and the northern hemisphere CO_2 bias. Before that, however, let us take a look at an atmospheric CO_2 effect not mentioned, for some unknown reason, in any of the IPCC assessment reports, but which is detailed very explicitly in much of the cited literature, the seasonal variation of atmospheric CO_2.

1.3 Seasonal Variability of Atmospheric CO_2 Levels

Although it received no mention in TAR, it is well documented that global CO_2 levels show a distinct seasonal variation (figure 1.2), which is more pronounced in the northern latitudes. The northern hemisphere contains the bulk of the world's plant producing land. At Mauna Loa (Hawaii), where data records are the most extensive, this seasonal CO_2 variation has an amplitude of around 6ppm peak-to-peak.

During the summer months, when plant growth is active, CO_2 absorption by photosynthesis is high and atmospheric CO_2 levels fall. During the winter months, plant growth is low, CO_2 photosynthetic absorption diminishes, and CO_2 levels rise again. This is particularly noticeable in the far northern latitudes with two measuring stations, at Point Barrow in Alaska (71°N) and Alert in Northern Canada (82°N) showing exceptionally strong seasonal CO_2 variations.

Here is the problem. **Where does the CO_2 come from, to restore the atmospheric levels during the winter months?**

According to TAR the main balancing flux Rh is due to "heterotrophic respiration, by decomposers, bacteria and fungi feeding on dead tissue and exudates". We thus have two mechanisms, one for Net Primary Production (NPP - photosynthesis) and one for Heterotrophic Respiration (Rh). These are entirely different biological mechanisms with no obvious connections. NPP increases during the summer months in the northern hemisphere. The TAR theory requires that this increase in CO2 absorption be exactly balanced by CO2 release to atmosphere by Rh during the winter months, so that over the twelve-month cycle there is no net change to atmospheric CO2 levels. Why should this be so?

Would we not expect these biological mechanisms contributing to Rh, to be temperature dependent and thus also to be seasonally variable? If we wish to arrest vegetative decay, do we not simply freeze it? In the case of Point Barrow and Alert, both well within the Arctic Circle we would expect biological activity to peak sharply in the short but intense summer months and reduce to virtually zero during the long winters when temperatures rarely rise above freezing. If that is so, then we have a problem in that during the winter months, when CO_2 levels are being re-established, the emission flux source Rh that, according to TAR, would be expected to achieve that rebalance, has also shut down because of sub-zero temperatures.

The inescapable conclusion is that heterotrophic respiration cannot be the balancing CO_2 flux at these northerly latitudes. If it is not the balancing flux at these latitudes it is unlikely to be the balancing flux at any other latitude either.

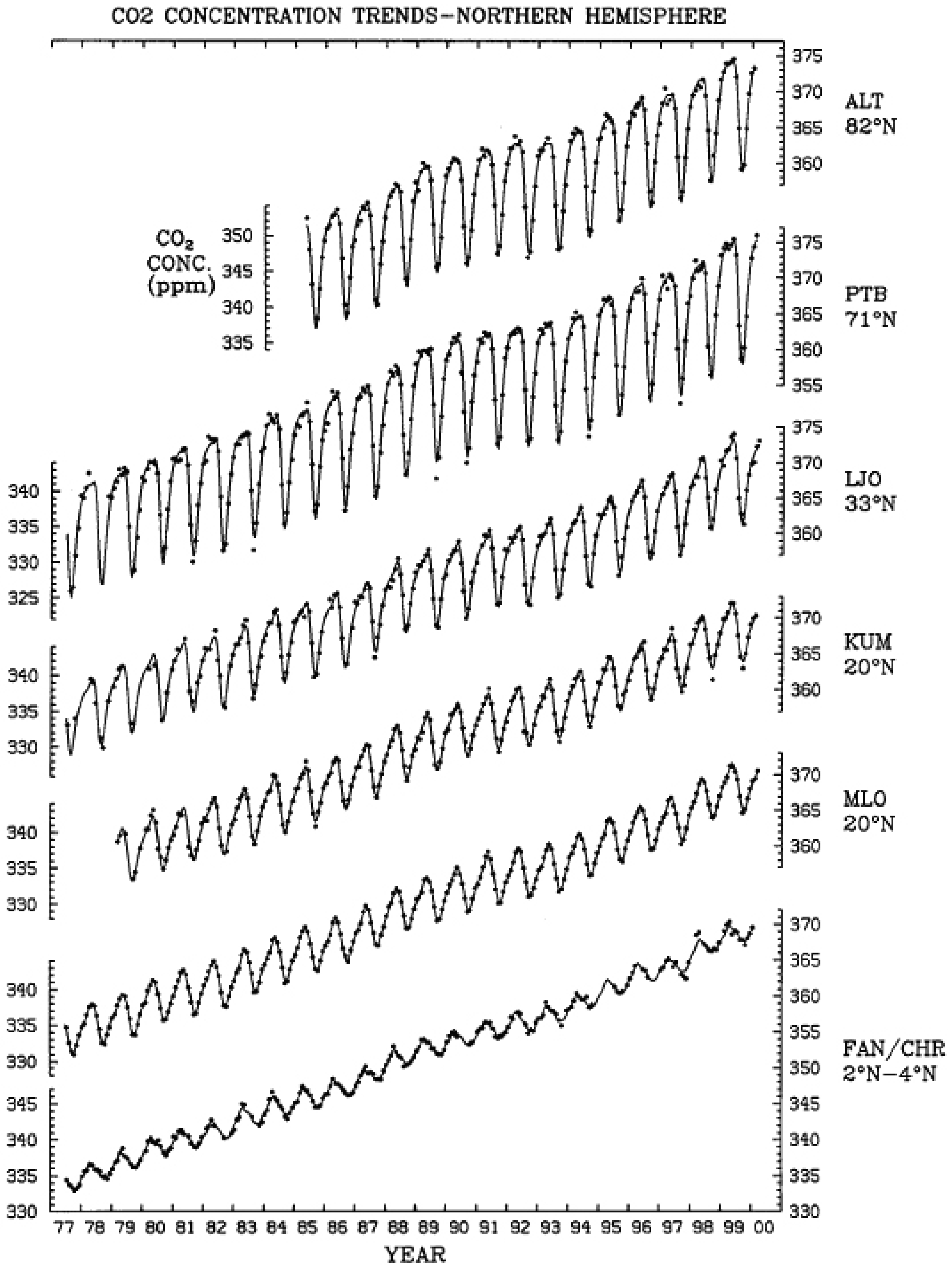


Figure 1.2: Seasonal Variability of Atmospheric CO_2 Levels (From Keeling C, et al (reference 2) Exchange of atmospheric CO_2 and $^{13}CO_2$ within the terrestrial biosphere and oceans from 1978 to 2000: SIO 2001 showing increasing amplitude of variability generally attributed to plant photosynthesis, as latitude increases. The greatest variability is found at the Alert (ALT) and Point Barrow (PTB) stations in the Arctic Circle.

The only way around this problem is to accept that there is another, more consistent, balancing flux present that is maintaining the atmospheric CO_2 levels. Biologically sourced fluxes will not be constant throughout the seasons. It appears, therefore, that the ecosphere is not in a delicate balance and is reliant upon another, as yet unidentified, source to maintain equilibrium. The theories and explanations expounded in TAR collapse. The science is apparently not settled after all. There is no ecosystem steady state. The Net Biome Production (NBP) cannot be zero.

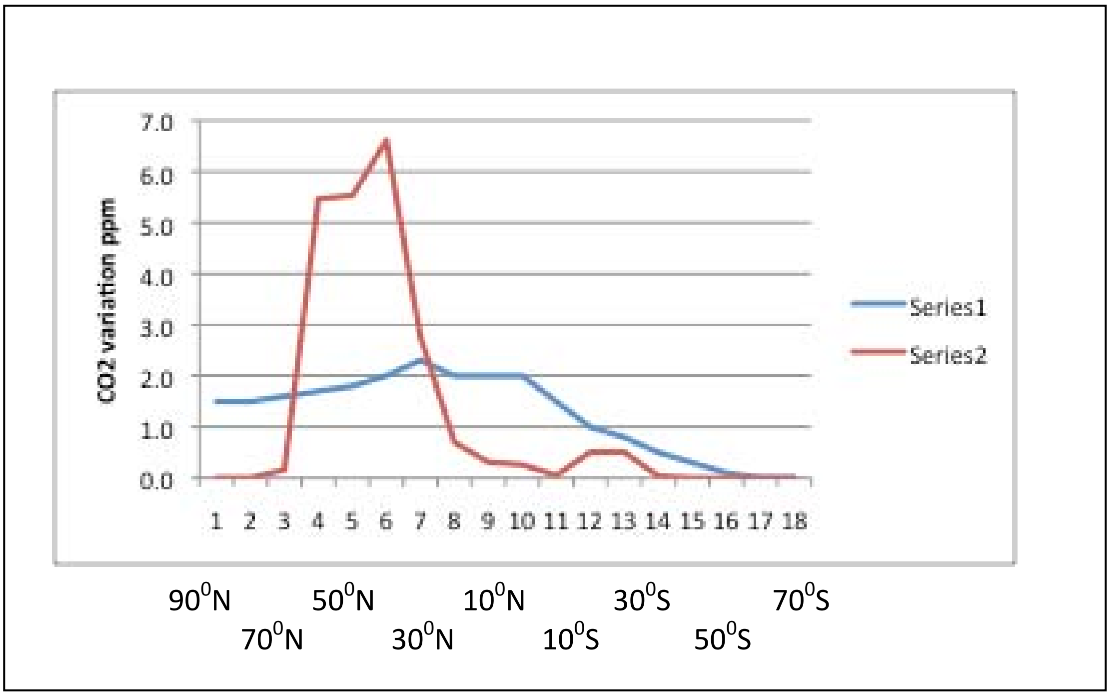
But, of course, there is much further evidence cited by TAR to support its theory. The TAR model should not be dismissed without examination of this evidence.

1.4 Northern Hemisphere CO_2 Loading

The increase in observed CO_2 concentration has been faster in the northern hemisphere, where most fossil fuel burning occurs.

This statement in TAR is used as one of three examples of evidence that fossil fuel burning is the source of increased atmospheric CO_2 levels. It is absolutely true that the majority of fossil fuel burning occurs in the northern hemisphere and that CO_2 levels are typically around 2ppm higher in the northern as opposed to southern hemisphere.

Figure 1.3 Global CO_2 emissions retention and Stratified Atmospheric Concentrations



Series 1 - Stratified atmospheric CO_2 concentrations
Series 2 - Global Anthropogenic CO_2 retained emissions

While global CO_2 levels are remarkably consistent over the globe, implying efficient long-term atmospheric mixing, atmospheric CO_2 levels are heavily stratified, latitudinally, for short time period events as can be noted from the seasonal CO_2 variation due to photosynthesis. In support of the TAR theory, we would perhaps expect to see some correlation between the latitudinal CO_2 emissions and the observed latitudinal CO_2 levels.

Anthropogenic CO_2 emissions are heavily stratified, with over 50% of global emissions occurring between 30° and 50°N (data from Fuel Combustion 2009 issued by the International Energy Agency). There is, however, absolutely no correlation between this stratified CO_2 emission and global CO_2 levels which show not only a northern hemisphere bias of around 2ppm but a distinct peak at the equator. (Data derived from Keeling et al, reference 2).

The important question is why we do not see such correlation? The CO_2 emissions between latitudes 30° and 40° N are equivalent to around 14ppm CO2, assuming that they remain stratified during the year, in the same way that seasonal photosynthetic variations are stratified. If, as expounded in TAR, 50% of the CO_2 emitted each year was retained in the atmosphere we would expect to see peak CO_2 levels some 7ppm higher than the atmospheric average in latitudes 30° to 50°N as shown in Figure 1.3. However no such effect is observed.

Of course it could be claimed that latitudinal mixing within the atmosphere smears the emissions peak out. If that is so, why do we see such large latitudinal variations in seasonal CO2 concentrations due to photosynthetic activity?

1.5 Carbon Isotope Signatures

According to the IPCC Assessment Report 4 (AR4), Working Group 1, Chapter 2.3.1 Atmospheric Carbon Dioxide

The carbon content contained in CO_2 has two naturally occurring isotopes denoted ^{12}C and ^{13}C. The first of these, ^{12}C, is the most abundant isotope at about 99%, followed by ^{13}C at about 1%. Emissions of CO_2 from coal, gas and oil combustion and land clearing have $^{13}C/^{12}C$ isotopic ratios that are less than those in atmospheric CO_2, and each carries a signature related to its source. Thus, as shown in Prentice et al. (2001), when CO_2 from fossil fuel combustion enters the atmosphere, the $^{13}C/^{12}C$ isotope ratio in atmospheric CO_2 decreases at a predictable rate consistent with emissions of CO_2 from fossil fuel origin.

The reference to Prentice et al. (2001) is actually a reference to the IPCC TAR of 2001, which provides the following insight for the decrease in $^{13}C/^{12}C$ ratio, to be consistent with fossil fuel CO_2 emissions:

$\delta^{13}C$, a measure of the relative abundance of the two stable carbon isotopes, ^{13}C and ^{12}C, in atmospheric CO_2 gives in principle similar possibilities to O_2 for the partitioning of

atmospheric CO_2 uptake (Keeling et al.,1979 1980; Mook et al., 1983; Keeling et al., 1989; Francey et al., 1995; Keeling et al., 1995). The principle of using $\delta^{13}C$ to separate land and ocean components of the carbon budget relies on the fractionation during photosynthesis by C3 plants, which discriminates against ^{13}C. This fractionisation leads to biospheric carbon being depleted in ^{13}C by about 18‰ relative to the atmosphere. In contrast, exchanges with the ocean involve relatively small fractionation effects. Changes in the $^{13}C/^{12}C$ ratio of atmosphere CO_2 thus indicate the extent to which concurrent CO_2 variations can be ascribed to variations in biospheric uptake. The calculation also requires specification of the turnover times of carbon in the ocean and on land, because fossil fuel burning implies a continuous release of isotopically light carbon to the atmosphere. This leads to a lowering of the atmosphere $^{13}C/^{12}C$ isotope ratio, which takes years to centuries to work its way through the carbon cycle.

This requires some explanation, perhaps!

$\delta^{13}C$ represents the relative change of the $^{13}C/^{12}C$ isotope ratio from an international standard reference value: It is simply a convenient measure of small relative changes in the carbon isotopic ratio and is usually expressed in units of per mil or ‰ (1/1000).

Photosynthesis by the category of plants denoted by C3, encompassing most biospheric plants, is more efficient for ^{12}C than for ^{13}C carbon resulting in a deficiency of ^{13}C in those plants of around 18‰ (1.8%) compared to the atmospheric $\delta^{13}C$. Fossil fuels, which are of course derived from biospheric carbon are also deplete in ^{13}C. The continuous injection of CO_2 from fossil fuel combustion into the atmosphere thus results in a steady decline in the $^{13}C/^{12}C$ ratio in the atmosphere. This steady reduction is considered to be a 'fingerprint' of anthropogenic CO_2 emissions, and a vindication of the TAR theory that the increase in atmospheric CO_2 is a direct result of CO_2 production by anthropogenic factors.

It should of course be possible to calculate the expected annual $\delta^{13}C$ reduction assuming that the observed annual CO_2 increase is due to anthropogenic emissions. $\delta^{13}C$ values for fossil fuels are actually lower than those for current photosynthesis values. A plant category identified as C4, evolved around 5 million years ago and is more efficient at processing ^{13}C than the more common C3 category plants, thus elevating slightly the biospheric $\delta^{13}C$ value. Fossil fuels, which are all considerably older than 5 million years do not have this C4 content and thus have a more negative $\delta^{13}C$ value than the current biosphere.

Using data from Battle et al. (ref 5), for fossil fuel $\delta^{13}C_{fuel} = -29.4$ +/−1.8 ‰ and for the atmosphere $\delta^{13}C_{atmos} = -7.86$‰. This results in a $\delta^{13}C$ deficiency compared to atmosphere for fossil fuels of −21.6‰ compared with −18‰ for the current biosphere.

By the year 2000, atmospheric CO_2 levels were rising at a rate of around 1.4ppm/yr or expressed as a percentage of atmospheric CO_2 at 0.35%/yr. Assuming this CO_2 resulted from the emissions due to the burning of fossil fuels it would be depleted in $\delta^{13}C$ by −21.6‰. It follows therefore, from a simple dilution calculation, that the $\delta^{13}C$ value of the atmosphere must be reducing by an amount equal to the product of the fossil fuel CO_2 retained in the atmosphere, expressed as a fraction of total atmospheric CO_2, and the $\delta^{13}C$ deficiency of that CO_2.

The result is that $\delta^{13}C$ is calculated to reduce at 0.0035/yr x 21.6‰ = 0.076‰/yr.

The actual change in $\delta^{13}C$ is, according to Battle in 2000, 0.013‰/yr, a figure some six times lower than would be expected from the assumption that the source of increased atmospheric CO_2 is retained anthropogenic CO_2 emissions! Far from being a fingerprint for anthropogenic sources of CO_2, the isotopic ratio variation suggests conversely that **the main source of CO_2 is NOT in fact retained anthropogenic emissions.**

1.5.1 Carbon Isotope Distribution

For a system consisting of liquid and gas in equilibrium, diffusion theories suggest that there is a steady transfer of molecules between the liquid and gaseous phases, the net transfer between the two being zero. According to TAR

The annual two-way gross exchange of CO_2 between the atmosphere and surface ocean is about 90 PgC/yr, mediated by molecular diffusion across the air-sea interface.

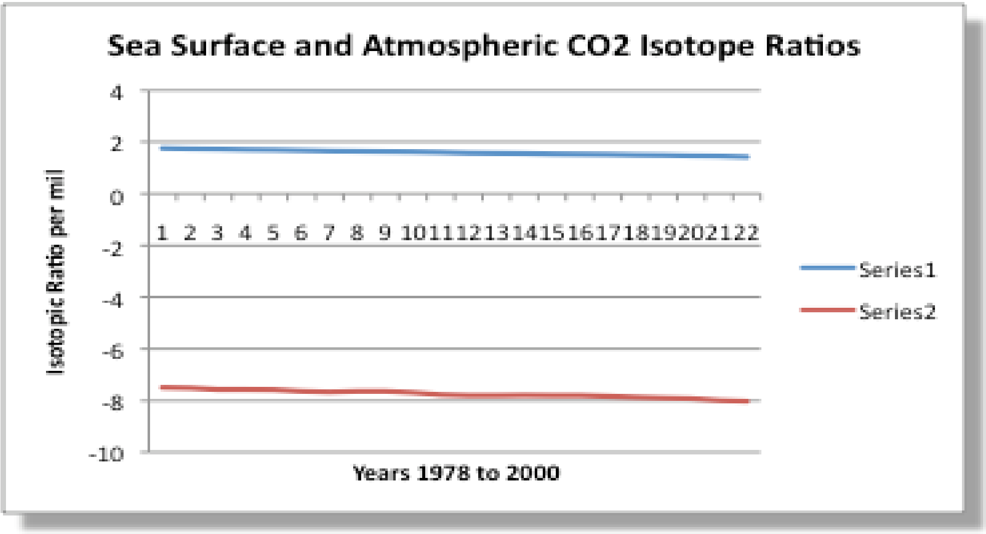
This is equivalent to 10% of the entire atmospheric CO_2 being exchanged with the ocean each year. Because of the extremely large surface area of the ocean/atmosphere interface compared with the atmospheric thickness such a rate of exchange is not at all surprising. Since the mass of CO_2 dissolved in the sea surface layer is widely believed to be similar to the mass in the atmosphere, one would expect that, from this high level of molecular exchange, the composition of CO_2 in the atmosphere would closely match that of CO_2 within the sea surface layers.

How then can the TAR description account for the disparity between the carbon isotope ratio of CO_2 in the atmosphere (−8 per mil) and that of the sea surface (+1.5 per mil) identified in the paper by C D Keeling et al (SIO Reference 01-06) 2001 shown in Figure 1.4?

Nowhere within the climate science literature has anyone attempted an explanation for these measurements. There is not even a single reference to this uncomfortable anomaly in any IPCC Assessment Report to date.

In addition, the rates of reduction of CO_2 isotope ratio in the atmosphere and sea surface are virtually the same, despite the claim that half the anthropogenic emissions of retained by the atmosphere while only one quarter is taken up by the oceans. The IPCC claims are thus inconsistent.

Figure 1.4



Series 1	Sea surface isotopic ratio
Series 2	Atmospheric isotopic ratio

Data from Keeling et al in 2001

1.6 The Relevance of Atmospheric O_2 Levels

According to TAR - *Several additional lines of evidence confirm that the recent and continuing increase of atmospheric CO_2 content is caused by anthropogenic CO_2 emissions – most importantly fossil fuel burning. First, atmospheric O_2 is declining at a rate comparable with fossil fuel emissions of CO_2 (combustion consumes O_2).*

The combustion of hydrocarbon fuels consumes oxygen from the atmosphere. The amount of oxygen consumed depends upon the hydrogen/carbon ratio of the fuel:

$$C_nH_m + (n+m/4)O_2 \rightarrow nCO_2 + (m/2)H_2O$$

The ratio of oxygen consumed to CO_2 emitted, $O_2/CO_2 = 1 + m/4n$.

For natural gas, methane (CH_4) the ratio is 2 and for anthracite coal it reduces to around 1.2 with fuel oils in-between, varying from 1.4 to 1.7.

Thus for the known level of CO_2 emissions from fossil fuel burning there should be a corresponding reduction in atmospheric O_2. TAR uses an O_2/CO_2 ratio of 1.33 for average global fossil fuel burning. Using data over the period 1990 to 2000 it is estimated that fossil fuel burning emitted the equivalent of 30ppm of CO_2 into the atmosphere, but according to the TAR theory, only 14ppm remained there, leaving 16ppm to be absorbed by either the oceans or the biosphere. On the other hand the emission of 30ppm of CO_2 requires the consumption of 40ppm O_2 (assuming an O_2/CO_2 ratio of 1.33). However, atmospheric O_2 levels only decreased by 33ppm during that period.

How is this 7ppm discrepancy explained? TAR makes the point that dissolution of CO_2 in the oceans involves no transfer of oxygen. Photosynthesis, however, involves the synthesis of complex hydrocarbons from CO_2 and results in emission of O_2 to the atmosphere. TAR assumes that the O_2/CO_2 ratio for photosynthesis is 1 and the 7ppm oxygen discrepancy is explained by the fact that 7ppm of anthropogenic CO_2 must be consumed in photosynthesis thus releasing the oxygen required to make-up the difference. Thus, of the 50% (16ppm) or so of the CO_2 not remaining in the atmosphere, approximately half must be taken up by the oceans and half by the biosphere.

This argument is summarised in TAR:

The amount of CO_2 that remains in the atmosphere each year has been consistently less than the amount emitted by fossil fuel burning. This is because some CO_2 dissolves and mixes in the ocean, and some is taken up by the land. These two modes of uptake have different effects on the concentration of O_2 in the atmosphere. Fossil fuel burning consumes O_2 and causes a decline in atmospheric O_2 concentration. Dissolution of CO_2 in the ocean has no effect on atmospheric O_2. Terrestrial uptake of CO_2, by contrast, implies that photosynthesis (which releases O_2) is exceeding respiration and other oxidation processes, including fire (which consumes O_2). Thus, net terrestrial uptake of CO_2 implies a net release of O_2, in a known stoichiometric ratio. This difference can be used to partition the total CO_2 uptake into land and ocean components.

Since, prior to release of the anthropogenic CO_2 the biosphere was, according to TAR, in perfect equilibrium, the act of burning fossil fuel must somehow promote additional and immediate photosynthesis over and above the normal balance that occurs without the fossil fuel burning in order to absorb a fixed percentage (25%) of the CO_2 emitted. An even stranger concept is that the 50% of the CO_2 that is retained in the atmosphere induces no further photosynthesis but simply resides there, inert for centuries, neither partaking in photosynthesis nor ocean dissolution. Fossil fuel burning, therefore, is producing three types of CO_2, that which is destined for immediate dissolution in the oceans, that which induces photosynthesis, and the rest, which will take-up long-term residence in the atmosphere.

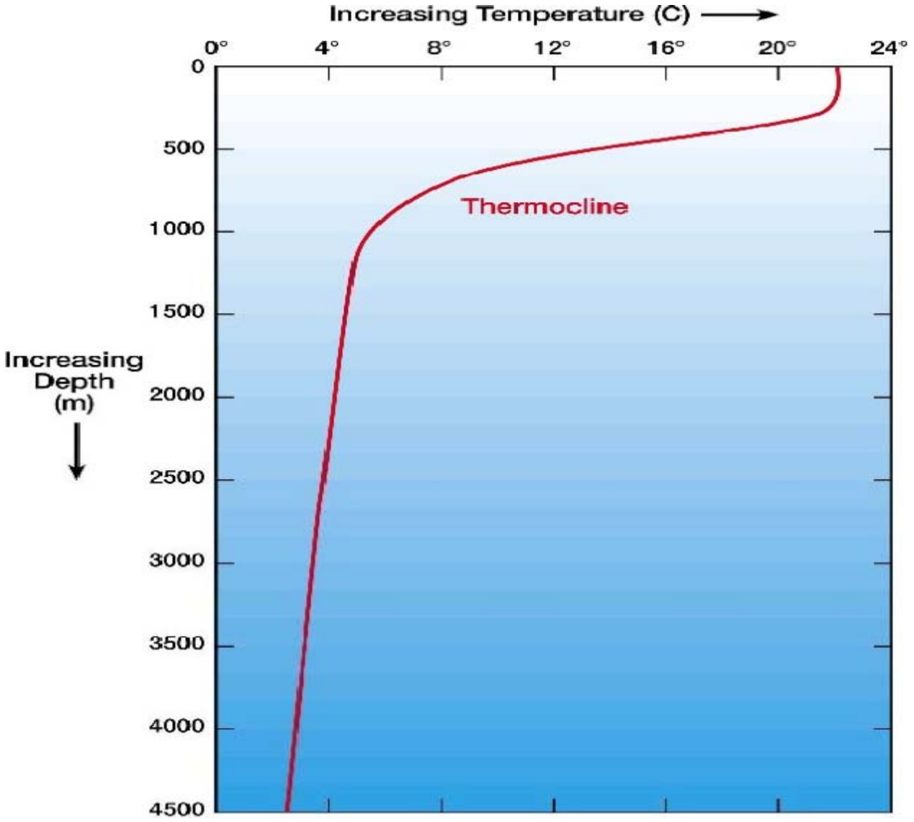
Nature has thus created a degree of organisation or order among the CO_2 molecules emitted by anthropogenic activity, thus lowering their entropy. Unless the forces that produce this organisation can be identified, along with the energy expended and the associated entropy increase, in doing so can be quantified, this explanation falls foul of the second law of thermodynamics, which insists that entropy of a system can only increase.

1.7 Understanding the Oceans

It is generally accepted that there is a strong link between the oceans and the atmosphere in respect of climate and indeed atmospheric effects in general. TAR claims that the oceans act as a sink for some 25% of emitted anthropogenic CO_2. It is vital therefore that we have a thorough understanding of the oceans and how they interact with the atmosphere. To this end billions of dollars of research funding are expended annually on ocean and climate research. Current knowledge suggests that the oceans consist of a surface layer of water a few hundred metres in depth, often referred to as "the mixed layer". This sea surface zone is heated by the sun's radiation, is well mixed due to wind and wave action, and contains at least 50% of the global biological activity.

Below this level is the deep ocean, which is cold, dark and inhospitable. The two are separated by a relatively thin boundary layer of water known as the thermocline. Relatively little is known about the deep ocean because of the difficulty of operation under the immense hydrostatic pressures encountered there.

Figure 1.5



Now, imagine the scene of a father keen to impress and impart his wisdom and knowledge to his young son as he explains the wonders of the oceans. "And then there is the mysterious deep ocean, where it is totally dark and immensely cold, a world that is entirely alien to us. It is dark because it is so deep that sunlight simply cannot penetrate the murky depths."

To which his son responds. “Yes, that must be a truly frightening place to be. But Daddy, why is the deep ocean so cold?”

The father thinks for a while, shuffles in his chair, and finally replies. “Because it is! Why don’t we go and do a spot of fishing?”

The son in his innocence has just asked the awkward question. His inquisitiveness has not yet been dulled by indoctrination. **JUST WHY IS THE DEEP OCEAN, NOT ONLY COLD, BUT UNIFORMLY COLD?** The temperature of the deep ocean appears to vary in the range 3 to 5 dig no matter where on the globe you are or at what depth you make the measurement. I have yet to hear or read of this question ever being asked. The temperature of the deep ocean is taken as a given, but there has to be an answer to the question WHY.

Papers in scientific journals and in IPCC assessment reports suggest that ocean currents transfer warm waters to the polar regions, where they are chilled and descend into the ocean depths to be slowly transported to the equatorial regions where they unwell as warm water back to the surface again. If you like fairy stories this one is just for you!

Firstly the mass of frozen water in the polar ice caps represents less than 1% of the mass of water in the oceans. To suggest that the poles can chill the oceans to 3 degC is pure fantasy. In the case of interaction between two bodies, mass conquers all!

Secondly there is a constant heat release from the earth’s core of around 0.06 Watts/m^2 over the entire global seabed. This integrates to a total annual heat input from the earth’s core to the oceans of 6.8 x 10^{17} kJ of energy, sufficient to raise the temperature of the world’s oceans by 10degC in 100,000 years, a mere blink of the eye in geological timescales or alternatively sufficient to melt the polar ice-caps in 20,000 years. Since neither of these effects is observed, we should perhaps ask the question, **“where does this heat go”?** It cannot be released upwards since the sea surface zone above the thermocline is already at a higher temperature and any heat transfer that does take place, can only be into the deep ocean from the sea surface.

The deep ocean is bombarded from top and bottom by incoming heat fluxes and yet it is uniformly cold. WHY, WHY, WHY?

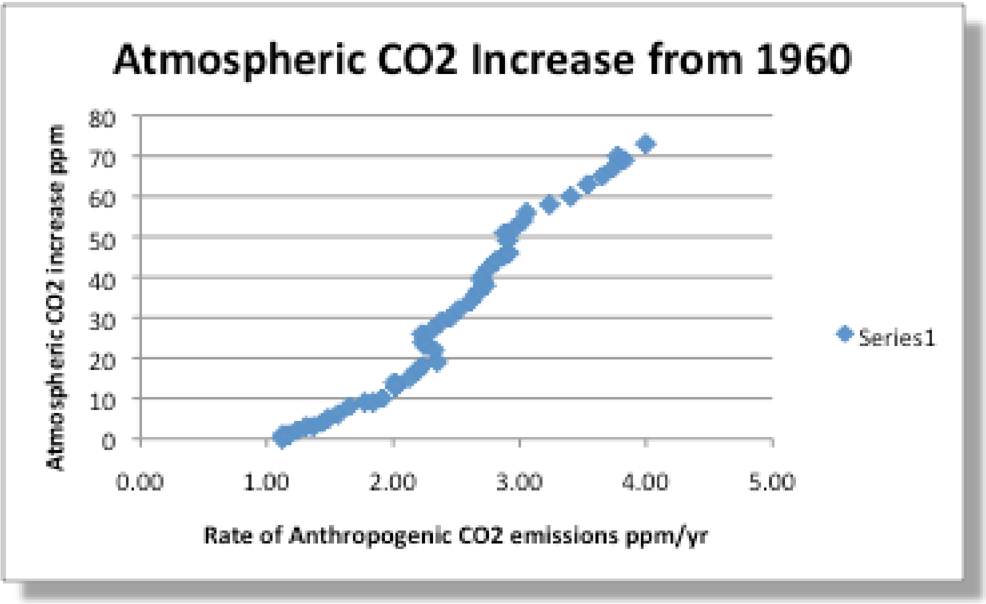
After decades of research and the expenditure of tens of billions of dollars in research funding, is our knowledge such that we cannot even ask, let alone answer the most basic of questions involving our world?

1.8 Conclusions

The claim that the three anthropogenic fingerprints, northern hemisphere CO_2 bias, decreasing carbon isotope ratio of atmospheric CO_2, and reducing atmospheric O_2 levels support the consensus claimed in the IPCC 3rd and 4th assessment reports does not withstand close scrutiny. In fact each one of them suggests strongly that the model of atmospheric CO_2 stability described in TAR, and continued through AR4 and to the present date, is simply incorrect.

That this model forms a key part (Chapter 3 The Carbon Cycle and Atmospheric Carbon Dioxide) of Working Group 1, the Physical Science Basis of the IPCC assessment reports, and is the basis for all climate models upon which future predictions of climate change are made, becomes a major concern.

Figure 1.5



There is cold comfort, however, for those who believe that current observations and trends of CO_2 result from natural sources that far outweigh any impact made by human behaviour. Figure 1.5 shows clearly that there is **a linear relationship between the rate of anthropogenic emissions and the levels of CO_2 observed in the atmosphere**. Is this relationship simply an accident, a coincidence, or does it have deeper significance?

There are so many unanswered questions that claims that the science is settled and that consensus among scientists is the decisive factor seem utterly absurd. Indeed the science is far from settled and the debate far from over, consensus or no consensus.

1.9 References

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