CO2 Coalition's not so Golden Science

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Abstract

A *CO2 Coalition* (2024) special document (hereinafter CO2C) argues that human CO2 emissions cause all or most of the CO2 increase, hereinafter Hypothesis (1) or H(1).

CO2C argues that its "evidence" proves H(1) is true. But CO2C makes a simple physics error in its carbon mass balance formulation, ignores published proofs that H(1) is false, and violates the scientific method. We use correct physics to prove H(1) is false.

Trump's defense of the *Our Children's Trust Lighthiser v. Trump* climate lawsuit – that seeks to overturn President Trump's executive orders on climate – must include the proof that H(1) is false to assure he defeats this lawsuit.

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1. INTRODUCTION

1.1 Overview

The United Nations (UN) *Intergovernmental Panel on Climate Change* (IPCC, 2013) claims human CO2 emission causes dangerous climate change is based on three hypotheses, hereinafter called H(1), H(2), and H(3):

1. Human CO2 causes most of the increase in atmospheric CO2 above 280 ppm.
2. The CO2 increase above 280 ppm causes most global warming.
3. This global warming causes dangerous climate change.

Here, we define human CO2 to be the amount of human CO2 produced by burning carbon fuels. We do not consider other causes of human CO2 emissions, like land use.

H(1) is the subject of this paper because it has the most disagreement among those who otherwise disagree with the IPCC.

The CO2 Coalition published a special report (Engelbeen et al., 2024) entitled "*The Human Contribution to Atmospheric Carbon Dioxide – How Human Emissions Are Restoring Vital Atmospheric CO2*", hereinafter called CO2C. (We re-posted this special report here.)

CO2C tries to prove H(1) is true. This paper proves CO2C's attempts fail and H(1) is false.

The CO2 Coalition published a second special report (Lindzen and Happer, 2025) entitled "*Greenhouse Gases and Fossil Fuels Climate Science*," hereinafter called RLWH. RLWH is in a link inside the special report entitled, "*Gold Standard Science*," by the same authors.

RLWH is excellent, of course, given the professional excellence of its authors. However, it makes one error. It assumes H(1) is true.

RLWH also references Koonin (2021). Koonin wrote – before H(1) was widely questioned in science literature – in his excellent book, *Unsettled* (page 68):

> *Carbon dioxide is the single human-caused greenhouse gas with the largest influence on the climate. But it is of greatest concern also because it persists in the atmosphere/surface cycle for a very long time. About 60 percent of any CO2 emitted today will remain in the atmosphere twenty years from now, between 30 and 55 percent will still be there after a century, and between 15 and 30 percent will remain after one thousand years.*
>
> *The simple fact that carbon dioxide lasts a long time in the atmosphere is a fundamental impediment to reducing human influences on the climate. Any emission adds to the concentration, which keeps increasing as long as emissions continue. In other words, CO2 is not like smog, which disappears a few days after you stop emissions; it takes centuries for the excess carbon dioxide to vanish from the atmosphere. So modest reductions in CO2 emissions would only slow the increase in concentration but not prevent it. Just to stabilize the CO2 concentration, and hence its warming influence, global emissions would have to vanish.*

Neither Lindzen, Happer, nor Koonin (2021) have made any public arguments to support or deny their belief in H(1). Therefore, we conclude CO2C presents their best arguments in support of H(1).

1.2 The importance of H(1) truth

President Trump has issued three Executive Order's related to climate:

1. EO 14154 – Unleashing American Energy
2. EO 14156 – Declaring a National Energy
3. EO 14261 – Reinvigorating America's Beautiful Coal Industry

President Trump's first Executive Order on Climate intends to stop the effects of climate alarmism:

> *"My Administration is committed to unleashing American energy, especially through the removal of all illegitimate impediments to the identification, development, siting, production, investment in, or use of domestic energy resources — particularly oil, natural gas, coal, hydropower, geothermal, biofuel, critical mineral, and nuclear energy resources."*

To cure the climate alarmism disease, however, Trump must defeat the dominating groupthink belief in climate alarmism. Achieving this goal can be President Trump's major achievement.

On May 29, 2025, *Our Children's Trust* (OCT) filed Lighthiser v. Trump (LvT) that intends to overturn Trump's Executive Orders on climate.

OCT filed in the US District Court in Butte, Montana, because OCT won its Held v Montana (HvM) climate lawsuit in 2023 in Montana. OCT is using the same well-prepared legal and expert team they used to win HvM. LvT is the same lawsuit as HvM but applied to federal law.

To assure defeat of LvT, Trump must prove in court that IPCC's three key hypotheses H(1), H(2), and H(3) are false. Logically, proving only one of these hypotheses false would win. But, given the power of emotions in a trial, allowing the plaintiffs to win H(1) may allow them to win their lawsuit.

Defeating a lawsuit like LvT is a team effort and has no place for Lone Rangers. Every member of the team must work together like the Blue Angels. An expert on the team who believes H(1) is true would cripple the best defense team. No coach puts a guy with one leg on his track relay team.

Therefore, it's past time to settle this issue of H(1).

1.3 The rules of science

John Kemeny taught the *Philosophy of Science* at Dartmouth College (Kemeny, 1959). After Caltech gave me a BS in engineering, Dartmouth College gave me a teaching fellowship in physics. This gave me the opportunity to study under Kemeny, who opened my mind to a whole new world on how to think.

Born in Budapest in 1926, Kemeny came to America in 1940. As a mathematician, he worked in the theoretical division of the Manhattan Project at Los Alamos from 1945 to 1948, with fellow Hungarians, John von Neumann and Leo Szilard. While working on his PhD degree, Kemeny was a special assistant in mathematics to Albert Einstein from 1948 to 1949. Kemeny learned the scientific method from Albert.

Kemeny was such a remarkable teacher that I can still see him lecturing to his class. In the evenings, I and other students watched Kemeny invent the Basic computer language.

"Robert" left the following comment about Kemeny in a post on edberry.com:

> *I just discovered your webpage. Professor **Kemeny** would have been delighted. I took his philosophy of science course in 1964 with 6 other students. He sat on the corner of a desk and mesmerized me. I have treasured my copy of his book, "A Philosopher Looks at Science".*

Kemeny's other excellent class, *Probability and Markov Chains,* (Kemeny, 1960) was equally important. Kemeny talks about Markov Chains in his philosophy book. Both

courses opened doors to thinking that I did not know existed and turned out to be critical to my PhD thesis and to my professional life.

The philosophy of science and the scientific method are the core studies relevant to theoretical physics of climate change.

The scientific method began at least 2400 years ago when Aristotle added the induction process to the scientific method. Since Aristotle, other scientists and philosophers have improved the scientific method, right up to Einstein.

Figure 1 shows Kemeny's diagram of the scientific method.

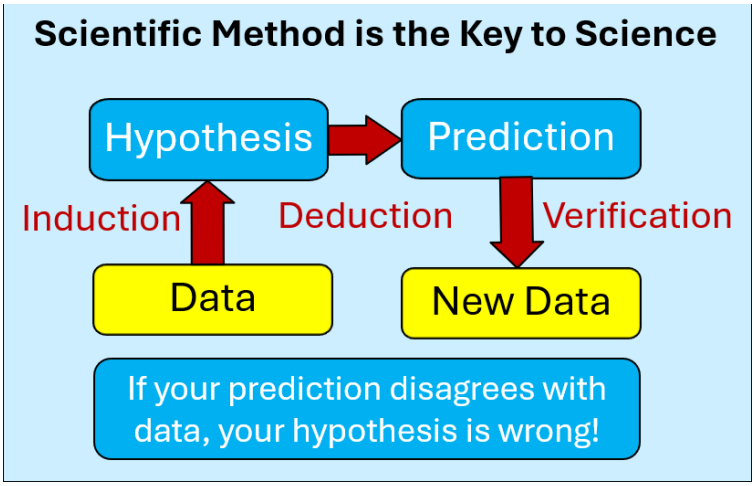

Figure 1. The scientific method uses data to create a hypothesis by induction. Then it uses deduction to make a prediction and uses new data to verify the prediction. If the prediction disagrees with data, the hypothesis is wrong.

The scientific method says we must evaluate a scientific hypothesis by using it to make predictions.

Good predictions do not and cannot prove a hypothesis is true. There is no such thing in science as using evidence to prove a hypothesis is true, but CO2C claims its evidence proves H(1) is true.

It is impossible to prove a hypothesis is true because the next test may prove it is false. However, one bad prediction proves the hypothesis is false.

John Kemeny at Dartmouth and Richard Feynman at Cornell and later Caltech led the teaching of the scientific method in America. Unfortunately, far too many PhD scientists never learn the scientific method. They think they can make up their own rules for science.

Data alone prove nothing in science.

There are only two uses of data in science. First, we use data to formulate a hypothesis that uses data to predict a future event. Second, we use new data to evaluate the hypothesis predictions.

If any prediction is false, the hypothesis (or theory) is false. Feynman taught that this rule is the key to science.

Feynman emphasized that it does not matter how beautiful your hypothesis is or how smart you are or how distinguished you are or how many papers you have published or how many people agree with you.

Feynman and Kemeny said, “If your prediction is wrong, your hypothesis is wrong.”

If we do not follow these rules, we are not doing science.

CO2C does not follow these rules and is not doing science.

1.4 Papers that show H(1) is false

Ato (2025) shows the assumption that the CO2 level was at 280 ppm in 1750 is flawed and the reconstruction of ice core data, as used by CO2C is also flawed. He concludes that human CO2 has no significant effect on the CO2 level and that natural CO2 cause the CO2 increase.

Roth (2025) shows natural CO2 emissions are the primary cause of the CO2 increase and that CO2C’s arguments are flawed. The 13C/12C data are not useful because of unresolved contradictions. The only good isotope data for resolving the effect of human CO2 on the CO2 level are the Delta14C data.

Robbins (2025) shows how SST and CO2 data since 1995 indicate the human-caused CO2 increase is less than 10 percent of the total increase and “perhaps” closer to 5 percent.

Humlum et al. (2012) show incoming solar radiation modulated by cloud cover controls SST.

Berry (1967, 1969) and Berry and Reinhardt (1974 a, b, c, d) showed how the distribution of cloud droplet nuclei controls how fast warm clouds rain, which influences cloud lifetime and may influence average cloud cover.

Koutsoyiannis et al. (2023) show global temperature changes lead CO2 level changes by an average of 12 months. Humlum et al. (2013) also found temperature leads CO2 level by about 12 months.

MacRae (2008) found temperature changes lead CO2 changes by an average of 9 months for data from 1980 to 2007. Kuo et al. (1990) found temperature change leads CO2 change by 5 months from 1960 to 1990.

Since global temperature changes can control natural CO2 emission but not human CO2 emissions, these studies show the natural CO2 level dominates over the human CO2 level.

Munshi (2017) found the correlation between human CO2 emissions and changes in the CO2 level is zero, which means human CO2 has little effect on the CO2 level.

CO2C ignores published papers by Ato (2025), Berry (2018, 2019, 2021, 2023 a, 2023 b), Harde (2017, 2019), Harde and Salby (2021), Humlum, Stordahl, and Solheim (2012), Jaworowski (1994, 2007), Jaworowski, Segalstad and Hisdal (1992), Jaworowski, Segalstad

and Ono (1992), Koutsoyiannis (2023, 2024), Kuo et al. (1990), MacRae (2008), Munshi (2017), Robbins (2025), Roth (2025), Salby (2012), Salby and Harde (2021, 2022), Schroder (2022), Segalstad (1998) that prove or help prove H(1) is false.

1.5 The null hypothesis

The null hypothesis says we must assume weather and climate changes are natural unless proven to be human caused. The burden of proof is upon the side that argues for human cause.

In the 1960's and 1970's, America's National Science Foundation and other agencies funded weather modification research that carefully followed the scientific method. Climate scientists must assume the null hypothesis which is that climate changes are natural until proven to be human caused.

While we cannot do randomized climate experiments with only one Mother Earth, we still must use the null hypothesis in theoretical research about human-caused climate change.

CO2C ignores the null hypothesis when it fails to prove wrong the many papers that prove H(1) is false.

1.6 CO2C's high-level errors

The IPCC claims H(1) is true "with a very high level of confidence." Yet, the IPCC censors and ignores evidence that proves H(1) is false. CO2C follows the IPCC.

On censorship, RLWH wrote,

> *"ignoring contradictory facts and science … to support a theory … [is a] egregious violation of the scientific method."*

CO2C thinks its evidence proves H(1) is true. CO2C chooses only data that support their belief that H(1) is true. This is confirmation bias and it contradicts the scientific method.

The scientific method requires scientists to evaluate hypotheses by checking their predictions. Science progresses not by claiming a hypothesis or theory is true but by proving a hypothesis or theory is false.

Aristotle warned us that claims of evidence, consensus, and authority – which CO2C uses – do not prove a hypothesis is true.

IPCC's Executive Summary assumes human emissions caused all CO2 increase above 280 ppm,

> *"Abundant published literature" shows with "considerable certainty" that human CO2 caused all the increase in atmospheric CO2."*

The US Global Change Research Program Climate Science Special Report (USGCRP) parrots the IPCC with similar claims,

> *"This assessment concludes, based on extensive evidence, that it is extremely likely that human activities, especially emissions of greenhouse gases, are the dominant cause of the observed warming since the mid-20th century."*

The IPCC and GCRP claim there are "*no convincing alternative explanations*" other than their theory to explain the "observational evidence." Therefore, they censor all such evidence.

CO2C follows the IPCC and claims to do what the scientific method says is impossible, namely, to "conclusively" prove a hypothesis is true.

CO2C says,

> *"We use multiple lines of scientific evidence to demonstrate that nearly all the increase in atmospheric CO2 is from human emissions, most of which are from fossil fuel use. Each of these lines of evidence confirms humans' role in the increase of atmospheric carbon dioxide. Together, they provide conclusive proof that the recent CO2 increase is primarily due to human activity, not nature."*

CO2C adds the irrelevant claim of consensus, showing the authors need emotional support for their position,

> *"Most scientists accept that human use of fossil fuels … is the main cause of the recent increase in CO2 concentrations in the atmosphere."*

On consensus, RLWH wrote,

> *"Instead, they based their analysis and thus all recommendations on peer review and consensus, which provide opinions but have no value as scientific evidence."*

CO2C acknowledges that some scientific papers disagree with its conclusions:

> *"Some recently published studies allege that most of or all the recent carbon dioxide increase is the result of natural causes rather than from human emissions."*

CO2C does not reference the opposing publications, nor does it prove any of them are wrong. This means the proofs in the opposing publications still stand and override all CO2C's claims that H(1) is true.

CO2C has science backwards. It argues H(1) is true without showing there are errors in the published papers that prove H(1) is false. CO2C censors important information.

CO2C claims evidence can prove a hypothesis is true. It can't. It is impossible to prove a hypothesis is true but it is possible to prove a hypothesis is false.

All CO2C's arguments fail because, according to the scientific method, no amount of evidence or "lines of evidence" can prove a hypothesis is true.

2. Berry's carbon cycle formulation

2.1 The Climate Equivalence Principle

The *Climate Equivalence Principle* (Berry, 2018, 2020,2021, 2023) is that human and natural carbon atoms and their CO2 molecules behave the same and follow the same rules because they are identical.

It is impossible for human CO2 to act differently in the atmosphere than natural CO2 at any time and place because they are identical. At any given time and place, human and natural CO2 flow out of the atmosphere and out of any carbon reservoir at the same rate.

Physics requires that human and natural carbon cycles obey the same rules at the same times. Yet, CO2C says human carbon stays in the atmosphere longer than natural CO2. It can't.

The IPCC and the CO2 Coalition argument violate the *Climate Equivalence Principle*.

The IPCC, CO2C, and Koonin (2023) assume incorrectly that human and natural CO2 flow out of the atmosphere at different rates. This error leads to the faulty conclusion that human CO2 causes most of the CO2 increase.

The Climate Equivalence Principle is why we cannot directly measure the amount of human and natural CO2 in the air. We can measure only their total.

Therefore, we must use other means to estimate the relative effects of human and natural CO2 on the CO2 increase above 280 ppm (or 590 GtC).

2.2 IPCC's carbon cycle data

IPCC makes it clear that H(1) is about the "fast" carbon cycle that changes CO2 levels during human lifetimes. Human CO2 emissions move carbon from IPCC's slow carbon cycle to the fast carbon cycle.

IPCC's fast carbon cycle has four primary carbon reservoirs, Land, Air, Surface Ocean, and Deep Ocean.

Figure 2 is IPCC's (2013, p. 471, Fig. 6.1) that shows IPCC's natural carbon cycle and human carbon cycle.

These IPCC data are IPCC's best estimates. These data are starting points for calculating how much human CO2 emissions increase the CO2 level.

IPCC shows 589 PgC (278 ppmv) of natural carbon and 240 PgC (113 ppmv) of human carbon is in the atmosphere as of about 2010.

In Figure 2, IPCC's natural carbon cycle is at equilibrium, by IPCC's definition. This means its levels are constant and the flows between each pair of reservoirs are equal.

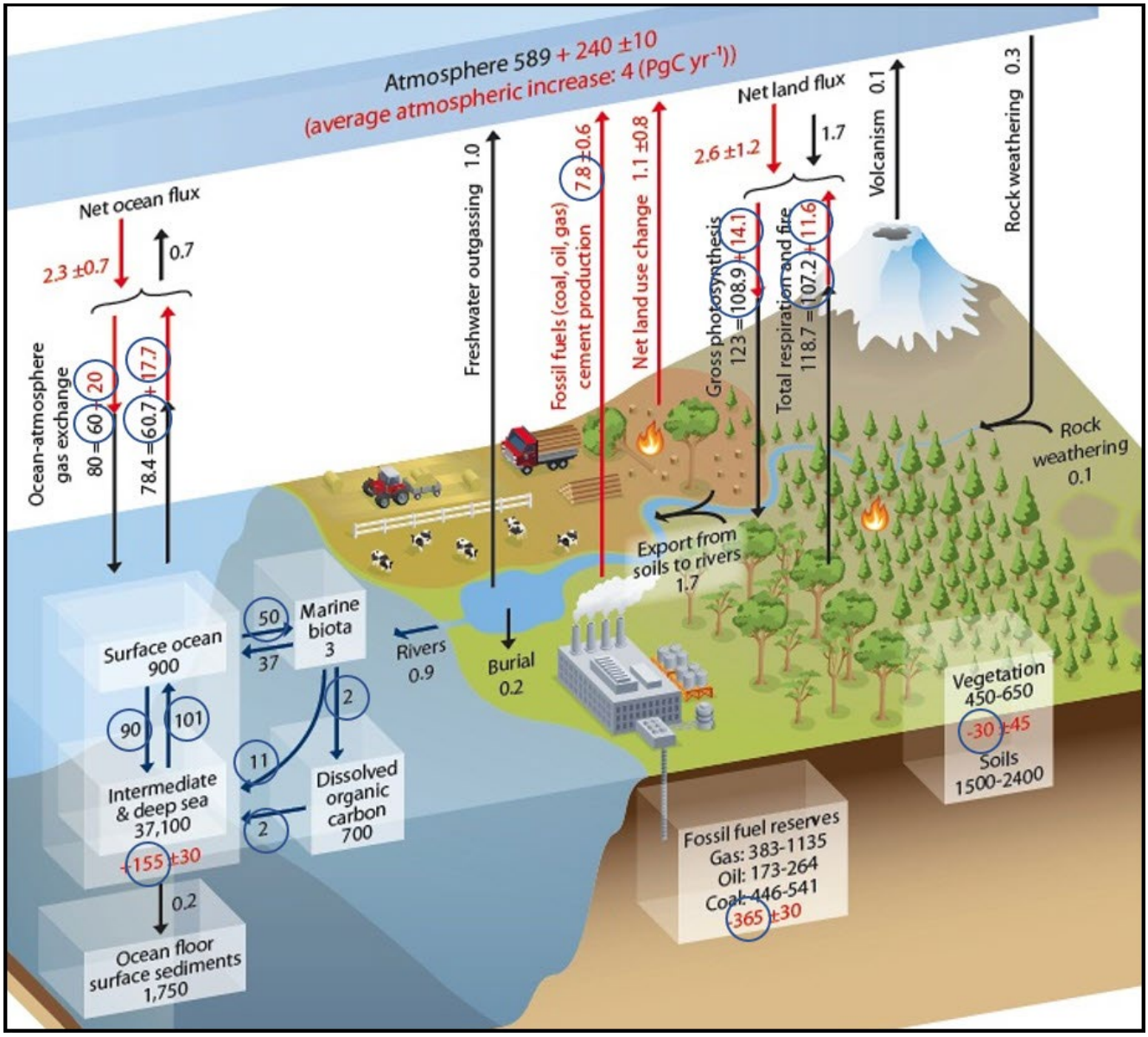

Figure 2. IPCC's (2013, p. 471, Fig. 6.1) that shows IPCC's natural carbon cycle (in black) and human carbon cycle (in red).

Figure 3 is a simple view of IPCC's level and flow data in Figure 2 for IPCC's natural fast carbon cycle and human carbon cycle.

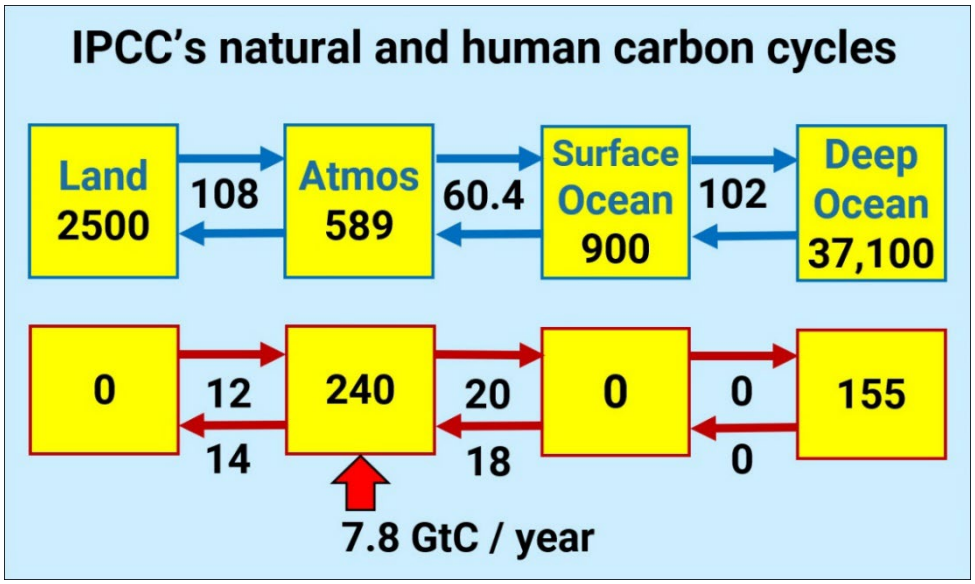

Figure 3. Data from Figure 2 show the carbon levels and flows for IPCC's natural carbon cycle (top row) and human carbon cycle (bottom row). Levels are in GtC or PgC of carbon. Flows are in GtC per year. Human-caused carbon inflow varies from year to year.

CO2C does not recognize that IPCC's natural carbon cycle at equilibrium contains information that allows one to calculate IPCC's true human carbon cycle.

Berry used the information in IPCC's natural carbon cycle to obtain IPCC's e-times and then to prove IPCC's human carbon cycle is incompatible with H(1). Berry proved H(1) is false according to IPCC's own data.

2.3 Berry's formulation of IPCC's carbon cycle.

Berry's formulation of IPCC's carbon cycle broke the consensus on H(1).

On consensus, RLWH wrote,

> *"Historically, the consensus of scientists has often turned out to be wrong. Many of the greatest scientists in history are great precisely because they broke with consensus."*

The scientists who prove H(1) is false broke with the consensus.

Here are the first eight equations of Berry's carbon cycle formulation taken from Berry (2019, 2021, and 2023a)

Yes, it's a little math but without it, there is little basis to argue that H(1) is true or false. The IPCC should have done this formulation. CO2C should have studied this formulation.

Berry's first hypothesis is the universally accepted continuity equation for the conservation of carbon mass:

$$dL / dt = \text{Inflow} - \text{Outflow} \qquad (1)$$

where,

L = carbon level (PgC)

t = time (years)

dL / *dt* = rate of change of *L* (PgC / year)

Inflow = carbon inflow (PgC / year) into the carbon reservoir.

Outflow = carbon outflow (PgC / year) out of the carbon reservoir.

When,

Outflow = Inflow

then

dL/dt = 0.

The flows continue while the level is constant. CO_2 does not accumulate in the atmosphere. CO2 simply seeks the balance level defined by the inflow.

Berry's second hypothesis is that outflow is proportional to level divided by a time,

Outflow = L / Te (2)

where *Te* is the "e-time," so defined because it is an exponential time. Berry's e-time *Te* is the same as IPCC's turnover time, *T* (IPCC, 2007, p. 948).

Berry uses *Te* as his only reference time because *Te* is the ONLY reference time that has an exact, meaningful, mathematical definition and *Te* is the only time-response definition that agrees with systems engineering models.

Te is the time for the level to move (1 - 1/e) of the distance from its present level to its balance level.

Substituting (2) into (1) we get,

dL / dt = Inflow – L / Te (3)

When *dL*/*dt* is zero, the level will be at its balance level, L_b, defined as,

L_b = Inflow * Te (4)

Substitute (4) for *Inflow* into (3) to get,

$dL / dt = -(L - L_b) / T_e$ (5)

Equation (4) shows how inflow sets the balance level. Equation (5) shows the level always moves toward the balance level set by the inflow. The variables *L*, L_b, and T_e are functions of time.

In the special case when L_b and T_e are constant, which means *Inflow* is constant according to (4), there is an analytic solution to (5). Rearrange (5) to get,

$$dL / (L - L_b) = - dt / T_e \quad (6)$$

Then integrate (6) from L_0 to L on the left side, and from 0 to t on the right side to get,

$$\ln [(L - L_b) / (L_0 - L_b)] = - t / T_e \quad (7)$$

where

L_0 = Level at time zero (t = 0)

L_b = the balance level for a given inflow and T_e

T_e = time for L to move (1 – 1/e) from L to L_b

e = 2.7183

We define half-life, T_h, as the time for the level to fall to half its original level. Then (7) becomes,

$$\ln (1/2) = - T_h / T_e \quad (7a)$$

$$T_h = T_e \text{ Ln } (2) = 0.6931\ T_e \quad (7b)$$

The original integration of (6) has two absolute values, but they cancel each other because both L and L_0 are always either above or below L_b.

Raise e to the power of each side of (7), to get the level as a function of time,

$$L(t) = L_b + (L_0 - L_b) \exp(- t / T_e) \quad (8)$$

Equation (8) is the analytic solution of (5) when L_b and T_e are constant.

Equations (1) and (2) are the only hypotheses in Berry's (2021, 2023) mathematical formulation of IPCC's carbon cycle. The rest of Berry's formulation is deductive. No one has found any errors in Berry's deduction.

Using only equations (1) and (2), Berry derived in mathematical form all the flow equations necessary to replicate IPCC's carbon cycle. Neither the IPCC nor anyone else has done this.

Even the IPCC accepts Berry's two hypotheses which are standard in physics, chemistry, pharmacological models, and systems engineering.

Berry's formulation is the only known published formulation of IPCC's natural carbon cycle. Berry's formulation follows systems engineering principles, where levels set outflows and outflows set new levels. Berry's formulation also follows the method of Markov Chains.

Berry (2021) shows how his formulation of IPCC's natural carbon cycle reduces to an R-C electrical circuit that reproduces the well-known equations for electrical circuits, which gives additional credibility that Berry's formulation is valid.

Figure 4 illustrates how Inflow sets the Balance Level and Outflow equal the Level divided by the e-time, which causes the level to move to the Balance Level.

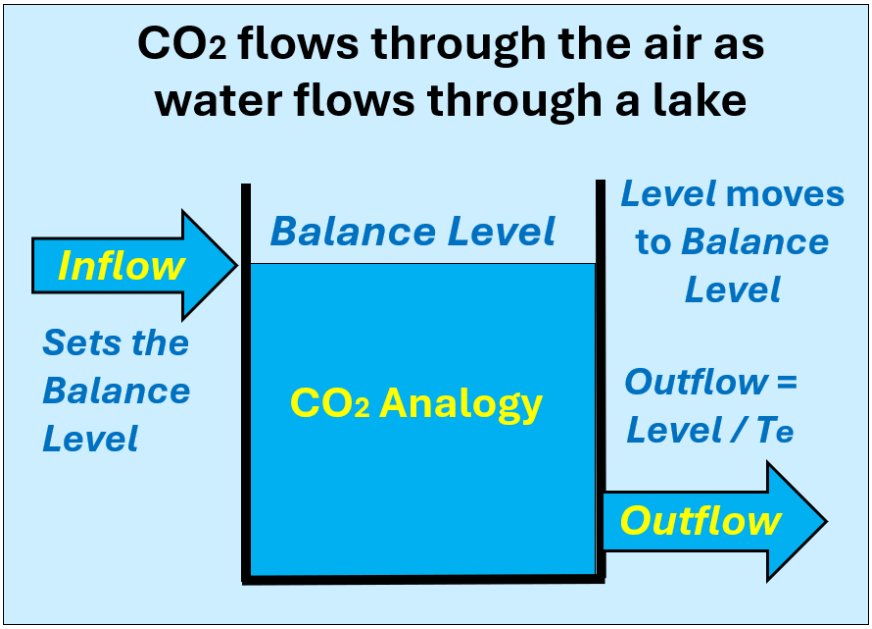

Figure 4. Inflow sets the Balance Level. Outflow equal the Level divided by the e-time. This causes the level to move to the Balance Level.

Berry's equation (4) defines balance levels and shows how *Inflow* and *Te* set the balance level for each reservoir in the system.

Equation (4) explains how the natural CO2 level could stay constant at 280 ppm. The only thing required is a constant inflow which sets a balance level.

Similarly, human CO2 inflow sets a balance level for human CO2. If the inflow remains constant, its level will move to its balance level where outflow equals inflow. Thereafter, there is no change in the CO2 level.

CO2 does not "accumulate" in the atmosphere. CO2 in the atmosphere increases vegetation that absorbs more CO2.

CO2C cites no formulation to explain how the natural CO2 level might have stayed constant even though this explanation is necessary to support CO2C's conclusions. Berry explains this with equation (4).

Without an explanation, CO2C has no basis to argue that H(1) is true.

Figure 5 illustrates how fast a level approaches its balance level.

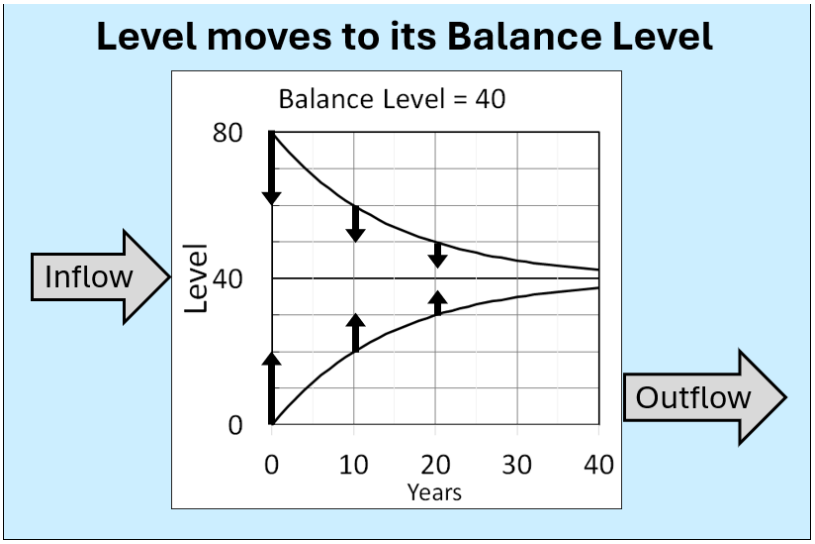

Figure 5. A level moves toward its balance level in proportion to the difference between the level and its balance level. That causes the approach to decrease its rate as it gets closer to the balance level.

2.4 Berry e-times in IPCC's natural carbon cycle.

Berry's (2) calculates the e-times for IPCC's natural carbon cycle at equilibrium.

Figure 6 shows Berry's calculated e-times for each outflow node in red.

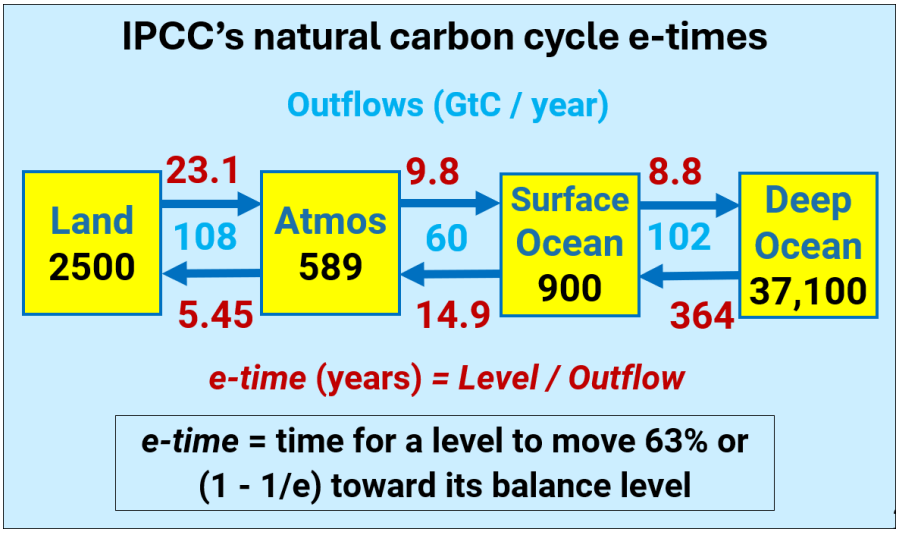

Figure 6. The red numbers show IPCC's e-times for each outflow node.

The overall e-time for CO2 in the atmosphere is the combination of the two natural outflows from the atmosphere. IPCC's data shows the overall *Te* for CO2 in the atmosphere is 3.5 years, approximating IPCC's claimed value of about four years.

Using the sum of Atmosphere outflows, we get,

Outflow(a+b) = Outflow(a) + Outflow(b)

Level / *Te(a+b)* = Level / *Te(a)* + Level / *Te(b)*

1 / *Te(a+b)* = 1 / *Te(a)* + 1 / *Te(b)*

1 / *Te(a+b)* = 1 / 5.45 + 1 / 9.8 = 1/ 3.5 (9)

Therefore, IPCC's overall *Te* for atmospheric CO2 is 3.5 years.

IPCC (2007, p. 948) says the overall e-time for atmospheric CO2 is about 4 years. The close agreement between IPCC "about 4 years" with the 3.5-year e-time (9) inside its own data suggests some scientists who once worked for the IPCC may have figured out IPCC's carbon cycle.

Berry used these six e-times to calculate how IPCC's carbon cycle evolves with time.

Such a formulation is necessary if we are to determine the cause of the CO2 increase.

2.5 Human and natural carbon cycles are independent.

According to (2), outflow is a linear function of level. This means we can, and should, calculate human and natural carbon cycles independently. We should also calculate all different forms of carbon independently, e.g., human CO_2, natural CO_2, $^{12}CO_2$, $^{13}CO_2$, $^{14}CO_2$.

This is the *superposition principle* that applies to all linear systems. It says the net response caused by two or more stimuli is the sum of the responses caused by each stimulus individually. So, if input A produces response X and input B produces response Y then input (A + B) produces response (X + Y).

Dalton's law of partial pressures applies to a linear system. It says the total pressure in a mixture of non-reacting gases equals the sum of the partial pressures of the individual gases. It also says each individual gas flow independently.

Equation (2) is compatible with all applicable physical and chemical laws. It is the simplest hypothesis for carbon cycle models (thereby obeying Occam's Razor) and IPPC agrees with it. Berry's formulation uses it to exactly replicate IPCC's natural carbon cycle. No one else has done this.

By replicate, we don't mean a static solution. We mean a dynamic solution where we can begin with levels out of equilibrium and the numerical solution moves the levels back to their original balance levels.

Berry's carbon cycle model, using IPCC's e-times, exactly predicts IPCC's carbon cycle based on IPCC's data. This makes Berry's model prediction of IPCC's true human carbon cycle credible.

CO2C has no alternative explanation of IPCC's carbon cycles.

2.6 The long-term effect of human carbon is small.

The total amount of human carbon added to the carbon cycle as of 2025 is about one percent of the carbon in the fast natural carbon cycle. One percent. Yet, humans are quick to believe that their one percent distorts the equilibrium CO2 level of nature's 99 percent.

Figure 7 shows IPCC's equilibrium percentages for its natural and human carbon cycle, assuming human-caused CO2 inflow stopped. The *Climate Equivalence Principle* says the human equilibrium percentages are identical to the natural equilibrium percentages.

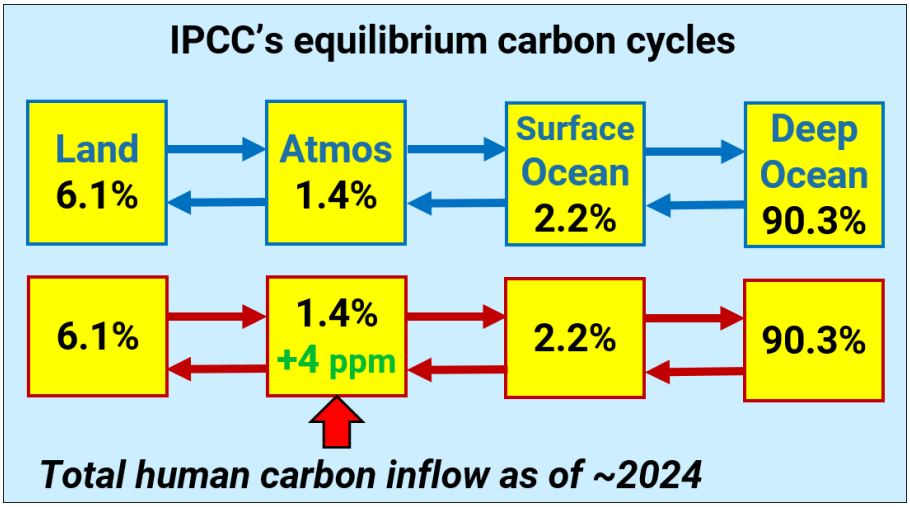

Figure 7. IPCC's equilibrium percentages for its natural and human carbon cycle, assuming human-caused CO2 inflow stopped. As of 2024, only 1.4% (about 4 ppm) of human carbon will be in the atmosphere at equilibrium using IPCC's data.

According to IPCC's data, only 1.4% of human carbon will be in the atmosphere at equilibrium. This 1.4% is about 4 ppm for all human CO2 emissions through 2024.

Therefore, at equilibrium, total human CO2 emissions cause no significant change to the natural carbon cycle. So, any significant effect of human CO2 on atmospheric CO2 must be in the non-equilibrium condition caused by continuing human CO2 inflow into the atmosphere.

Increased use of nuclear power, for example, will allow the human CO2 level to move toward its balance level.

2.7 Berry's carbon cycle proof that H(1) is false.

Figure 8 shows the logical path Berry used to prove H(1) is false using IPCC's own data.

IPCC's carbon cycle data show its natural carbon cycle is in equilibrium at 20 ppm. But rather than allow IPCC's carbon cycle to use the same e-times and flow equations as IPCC's natural carbon cycle, IPCC simply forced its human carbon cycle to agree with H(1).

Berry derived IPCC's natural carbon cycle as explained above. Since IPCC's human carbon cycle must use the same e-times as IPCC's natural carbon cycle, according to the *Climate Equivalence Principle*, Berry calculated IPCC's "true" human carbon cycle.

IPCC's true human carbon cycle shows human CO2 causes only 8% of the CO2 in the atmosphere. This proves IPCC's H(1) that claims human CO2 is 33% of the CO2 in the atmosphere is wrong.

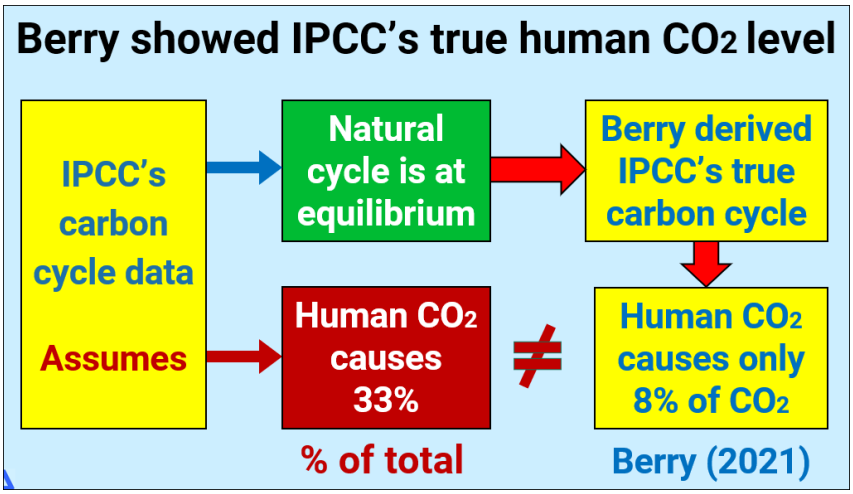

Figure 8. IPCC defines its natural carbon cycle (green) and postulates its human carbon cycle (red). Berry's formulation uses IPCC's natural carbon cycle e-times to calculate IPCC's true human carbon cycle (yellow), which proves IPCC's human carbon cycle (red) is false, according to IPCC's own data.

The late Richard Courtney, UK professional scientist and reviewer of climate physics papers, wrote three times that Berry's calculation of IPCC's true human carbon cycle is "the ONLY true breakthrough in climate science since 1980."

2.8 Berry's Delta14C proof that H(1) is false.

CO2C uses the 14C/C Ratio, or Delta14C, to argue that the decreasing Delta14C level proves human CO2 is a significant part of atmospheric CO2. The bomb tests increased Delta14C to about 170 percent of its long-term balance level of 100 percent.

CO2C concludes,

> *The decrease of the $^{14}C/C$ ratio in the atmosphere supports the fact that fossil fuels are the cause of the CO_2 increase in the atmosphere.*

No, it does not. Delta14C is decreasing because it is returning to its balance level, following Berry's equation (8). CO2C's interpretation is a significant error.

Figure 9 shows the complete Delta14C plot using data from Turnbull et al. (2017).

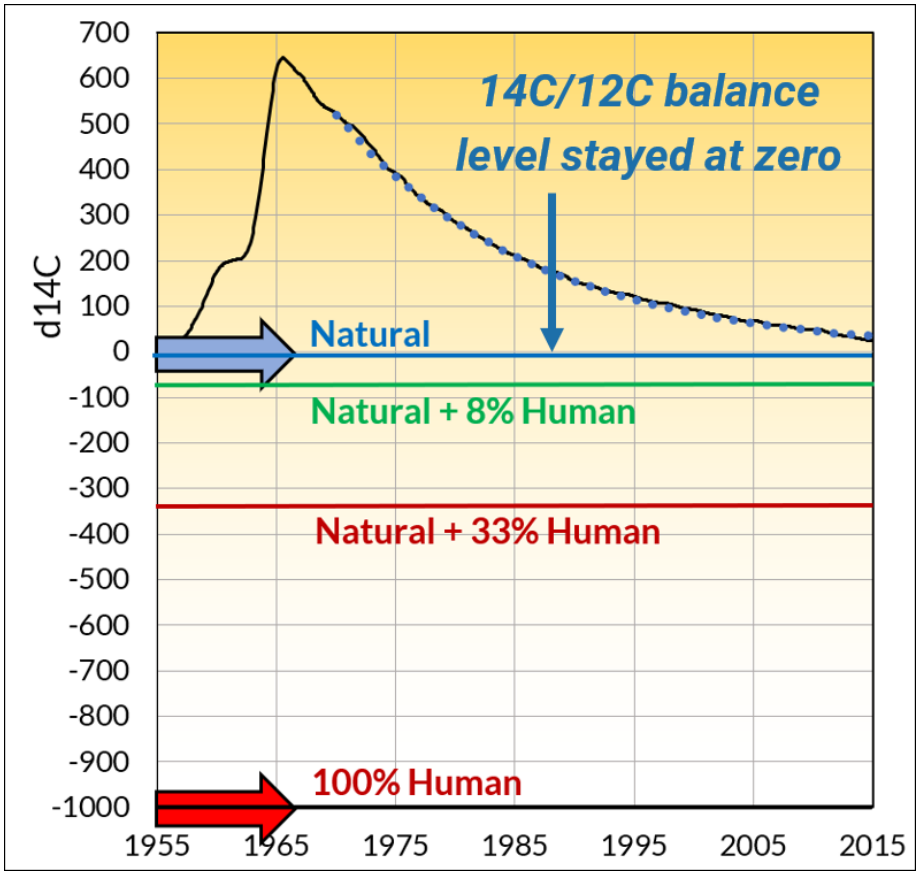

Figure 9. Full picture of Delta14C. Data show its natural level has remained near its original level of zero. This proves the human CO2 balance level is less than about 2 percent of total CO2 in the atmosphere, proving H(1) is false.

Berry (2023) measured the Delta14C e-time by curve-fitting it to equation (8) of his carbon cycle model that describes how fast a level approaches its balance level. This curve fit, shown by the dots in Figure 5, closely fits the Delta14C data, shown by the solid line.

This curve fit shows both the e-time and the balance level of Delta14C have remained constant even while the bomb tests increase Delta14C significantly.

This curve fit shows Delta14C has decreased since 1970 back to its original balance level of 100 percent with an e-time of 16.5 years, or a half-life of 11.4 years using (7b). Berry's accurate curve fit shows no measurable effect of human CO2 emissions or of a "Suess effect dilution."

CO2C says the e-time (that they call "atmospheric lifetime") is "about 20 years." This is incorrect.

Berry (2023, Section 5.3) found the e-time of 14CO2 is 10.0 years. Harde and Salby (2021) also calculated 10.0 years using a different method than Berry. This means the e-time of 12CO2 is less than 10 years.

CO2C used “Graven’s simulation” followed by a complicated, incorrect argument. CO2C missed the fact that Graven (2015) assumed H(1) is true in deriving his argument and conclusions.

Berry, Harde, and Salby simply used the measured data.

CO2C argues “the Suess Effect dilution also lowered $\Delta^{14}C$.” Figure 5 shows this did not happen. If human CO2 caused all the CO2 increase, it would have reduced the Delta14C balance level by 33 percent. Figure 5 shows human CO2 did not lower Delta14C by even 8 percent.

The “Berry dilution effect,” shown in Figure 5, applies to all assumed inflows of human CO2. The Suess effect is a special case that assumes H(1) is true. CO2C uses the Suess effect in its arguments without realizing their argument assumes H(1) is true.

CO2C’s Figure 1.3.2 shows Graven’s (2015) interpretation of the Delta14C data. But Graven assumes H(1) is true. Therefore, Graven’s argument cannot prove H(1) is true.

CO2C does not understand that only Graven’s “Observed” line is data. Graven’s “No Fossil” and “No Bombs” lines assume H(1) is true and have no meaning unless H(1) were true.

On this subject, RLWH wrote,

> *“Peer-reviewed climate science publications should not be viewed as reliable science and do not determine scientific validity. All must be ultimately tested by the scientific method and rejected if their theories are not validated by observations.”*

If human CO2 emissions caused the Delta14C balance level to decrease after 1970, Berry’s curve fit would have shown a continuing decrease in the Delta14C balance level accompanied by a change in e-time. Delta14C data show this did not happen.

Delta14C data show its natural level has remained near its original level of zero, proving the human CO2 balance level is less than about 2 percent of total CO2 in the atmosphere, and proving H(1) is false.

The Delta14C balance level has remained near 100 percent even while the bomb tests increased Delta14C to 170 percent and more recently even as carbon-12 has increased.

This shows natural CO2 is the primary cause of the CO2 increase. If human CO2 dominated the CO2 increase, then Delta14C would have decreased well below 100 percent.

3. The 2024 CO2C Paper

3.1 CO2C's Carbon Mass Balance error

CO2C' says its Carbon Mass Balance proves H(1) is true. Unfortunately, CO2C's Carbon Mass Balance is not physics.

CO2C says,

> ***Mass Balance Conclusions***
>
> *Anthropogenic emissions of fossil CO_2 are much larger than the measured increase in the amount of CO_2 in the atmosphere. Therefore, the natural CO_2 "sinks" are nearly always larger than natural CO_2 "sources."*
>
> *Any theory that leads to a substantial increase of CO_2 in the atmosphere due to natural factors violates the mass balance and thus cannot be correct.*

CO2C also says,

> *"This "mass balance" calculation shows that atmospheric CO2 has increased by less than the amount of CO2 emitted by human activity every year since 1958, ... So, the net natural CO2 fluxes have been negative in all the last 66 years....*
>
> *"That is, nature is removing CO2 from the atmosphere rather than adding to the total.*
>
> *"As long as the CO2 increase in the atmosphere is less than what humans emit per year, nature is a net sink and can't be the cause of the overall increase because that would violate the mass balance.*
>
> *"Since nature is removing large amounts ... every year ... the rise in atmospheric CO2 cannot be from natural causes."*

CO2C shows no concept of the physics that it tries to describe.

The **sum of natural CO2** emissions also exceeds the measured increase in the CO2 level. This proves CO2C's argument using the sum of human emissions is irrelevant and proves nothing about the cause of the CO2 increase.

Physics is about using mathematical equations to describe things like carbon mass balance. CO2C has no equations to describe its carbon mass balance hypothesis. CO2C makes big claims about carbon mass balance via handwaving arguments that are wrong.

By comparison, Berry uses simple math to describe IPCC's carbon cycles.

Berry's (1) applies equally to human and natural carbon flows:

$$dL / dt = \text{Inflow} - \text{Outflow} \quad (1)$$

CO2C agrees with (1) but CO2C does not understand that (1) applies to both human and natural carbon cycles independently.

Berry's (2) shows the Outflow of human and natural carbon cycles is a linear function of Level. This means the human and natural flows and levels are independent.

$$\text{Outflow} = L / Te \quad (2)$$

The IPCC correctly treats the human and natural carbon cycles independently and uses (2).

Berry's (4) show that inflow multiplied by the e-time set a balance level for each reservoir.

$$L_b = \text{Inflow} * Te \quad (4)$$

Human carbon inflow into the atmosphere sets a human balance level. Natural carbon inflow into the atmosphere sets a natural balance level. The human and natural carbon inflow and balance levels add up. But the equations keep track of human and natural inflows, outflows, and balance levels that we cannot directly measure.

CO2C's argues that *"natural CO_2 "sinks" are nearly always larger than natural CO_2 sources."*

CO2C's argument is wrong because it adds *human CO2 outflow* as an additional *natural CO2 sink*, which is a major physics mistake.

CO2C's arguments (quoted above) show CO2C has moved human outflow in the human (1) to the natural outflow in the natural (1).

CO2C's error makes the (1) for CO2C's human carbon cycle look like (10):

$$dL / dt = \text{Human Inflow} \quad (10)$$

And CO2C's (1) for natural carbon look like (11):

$$dL / dt = \text{Natural Inflow} - \text{Natural Outflow} - \text{Human Outflow} \quad (11)$$

This is CO2C's Carbon Mass Balance error. CO2C moved Human Outflow from (10 to(11).

CO2C relies on its invalid (11) to invalidly claim, "nature is an "absorber." CO2C extends this physics error to conclude the ridiculous idea that nature can't be a "source" because nature is an "absorber."

CO2C's carbon mass balance error disqualifies all CO2C's arguments and conclusions and makes the CO2 Coalition part of the scientific problem, not the solution.

CO2C's arguments are simply handwaving. CO2C has no model of IPCC's carbon cycle.

Berry keeps these flows independent and gets the correct answers. The CO2 Coalition censors Berry's correct answers, and gets the wrong answers, thereby dumbing down both itself and the public.

Imagine the CO2 Coalition as an accountant for two different businesses, *Human* and *Natural*. Here, the CO2 Coalition incorrectly assigns *Human* expenses to *Natural expenses*.

CO2C's bookkeeping error, made universally by the CO2 Coalition, the IPCC, and virtually all scientific organizations, causes them to believe human carbon causes all the CO2 increase.

This bookkeeping error is the basis of the whole climate-change fraud and the CO2 Coalition falls for this error.

3.2 CO2C's references are not clean.

CO2C uses references that assume H(1) is true, which makes CO2C's arguments circular. Battle et al. (2000), Bender et al. (2005), Graven (2015), IPCC documents, and the Bern model assume H(1) is true.

On this subject, RLWH wrote,

> *No matter how distinguished the group, their reliance on "peer reviewed literature" rather than the scientific method means their opinions have no value as scientific knowledge. Theories only become reliable science when their predictions agree with observations.*

3.3 CO2C claims cause-effect in absence of correlation.

Munshi (2017) shows there is no correlation between annual human carbon emissions and annual increase in the CO2 level. His detrended correlation analysis of annual emissions and annual changes in atmospheric CO2 found no evidence that changes in atmospheric CO2 are related to fossil fuel emissions at an annual time scale.

If there is no correlation, there is no cause-effect relationship. Therefore, we must reject H(1).

3.4 CO2C misinterprets the Bern model.

CO2C thinks the Bern model proves human CO2 slows the outflow of CO2 from the atmosphere.

CO2C says,

> "The IPCC uses the Bern and similar models, which predict a saturation of natural CO2 sinks and a consequent slowdown of natural CO2 removals from the atmosphere."
>
> "That leads to a prediction of a long atmospheric lifetime for CO2 additions to the atmosphere and a "long tail" in the theoretical CO2 decay curve should such additions cease."

The Bern model IS NOT "evidence" of a slowdown of the outflow of CO2 from the atmosphere because the Bern model assumes H(1) is true.

Berry's equation (8) produces a "long tail" as a level approaches its balance level. A "long tail" has nothing to do with the Bern model or with human CO2 "saturation" or slowing the outflow of natural CO2 from the atmosphere. Berry's carbon cycle formulation properly explains the "long tail."

3.5 CO2C violates the Climate Equivalence Principle

CO2C claims human emissions, which are about 5 percent of the total inflow of CO2 into the atmosphere, stays in the atmosphere longer than natural CO2 inflow, which is about 95 percent of total inflow. This would occur only if the e-time of human CO2 is greater than the e-time of natural CO2.

CO2C's claim violates the *Climate Equivalence Principle* and destroys CO2C's arguments.

IPCC (2013) assumes its Bern model applies only to human CO2. However, that hypothesis is invalid because it violates the Climate Equivalence Principle. All valid models must treat human and natural CO2 the same.

3.6 CO2C cannot explain how natural CO2 stayed at 280 ppm.

CO2C's Carbon Mass Balance model has no equations. Therefore, it cannot explain how natural CO2 emissions stayed constant at 280 ppm. Therefore, CO2C's model is invalid.

3.7 CO2C's other arguments are invalid.

CO2C's claims $^{13}C/^{12}C$, Oxygen, Ocean pH and pCO_2, Process Characteristics, Ice Core CO_2, and Stomata CO_2 prove H(1) is true. However, CO2C's argument's use CO2C's invalid Carbon Cycle Model, insufficient data, invalid data, prior assumptions that H(1) is true, and the scientific method that says evidence cannot prove a hypothesis is true.

4. Conclusions

Hypothesis H(1) says human CO2 emissions cause all or most of the CO2 increase.

UN IPCC, 97% of all scientists, all major scientific organizations, and the CO2 Coalition say H(1) is true. But the scientific method says these arguments are invalid. The only thing we can prove in science is that a hypothesis is false.

The CO2 Coalition says its "evidence" that proves H(1) is true. But the scientific method says evidence cannot prove a hypothesis is true. All CO2C's arguments fail.

CO2C's Carbon Mass Balance error nullifies all CO2C arguments.

Newton has an equation. Einstein has an equation. Heisenberg has an equation. Berry has an equation. All real physics has an equation.

CO2C has no equation. CO2C has no argument except handwaving. CO2C is not doing science.

Our proofs that H(1) is false include,

a. IPCC's carbon cycle data proves IPCC's H(1) is false.
b. Delta14C data show human CO2 is a negligible part of atmospheric CO2.
c. No correlation between human CO2 emissions and the increase in the CO2 level.

d. Temperature change leads CO2 change also proves human CO2 is negligible.
e. SST data show human CO2 is a negligible part of atmospheric CO2.

Our proofs that H(1) is false override all claims that H(1) is true.

Our proof that H(1) is false is a powerful argument that President Trump must use to defend his executive orders on climate from the *Our Children's Trust* (OCT) Lighthiser v. Trump climate lawsuit.

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