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Decoupling CO_2 from Climate Change

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Abstract

This study determines if there is a correlation between rising carbon dioxide levels and global warming. Historical data were reviewed from three different time periods spanning 500 million years. It showed that the curves and trends were too dissimilar to establish a connection. Observations from CO_2/temp ratios showed that the CO_2 and the temperature moved in opposite directions 42% of the time. Many ratios displayed zero or near zero values, reflecting a lack of response. As much as 87% of the ratios revealed negative or near zero values, which strongly negate a correlation. The infrared spectra showed the Greenhouse Gases had an exceptionally low absorption band between 11.67 μm to 9.1 μm, which is a zone called the infrared atmospheric window. Most of the Greenhouse Gases absorb little infrared inside that zone. And that zone is where the Earth's surface emits almost all infrared radiation. Even with minimal absorbance, water vapor captures the most infrared radiation. It absorbs 84 times more than CO_2, 407 thousand times more than methane, 452 thousand times more than ozone and 2.3 million times more than nitrous oxide. The Intergovernmental Panel on Climate Change (IPCC) and the United States EPA excluded water vapor because it was not associated with man-made activities. They reported that water vapor and clouds were simply feedback mechanisms from CO_2. Clouds reflect radiation from the sun. The Northern Hemisphere is 2.7˚F warmer than the Southern Hemisphere because of clouds. The world cloud cover has gone down 4.1% from 1982 to 2018. Calculations show that this could be responsible for 2.4˚F of the 2.7˚F. The research shows that most of the recent increase in temperature (89.9%) is because of fewer clouds.

Keywords

Climate Change, Greenhouse Effect, Greenhouse Gases, CO_2, Water Vapor, Clouds

1. Introduction

During the day, sunlight passes through the Earth's clear atmosphere and heats the surface. Clouds, snow, ground, and other objects reflect about 29% of that sunlight. The Earth dissipates that heat by emitting infrared radiation into space. Radiation emitted by the sun is responsible for most of the incoming heat, *i.e.* 44 quadrillion (4.4×10^{16}) watts [1]. But there are other sources, including 44 tera-watts (4.4×10^{13}) from nuclear processes, and 4×10^{12} watts from the radioactive decay of potassium [2]. The moon's tidal forces create another 2.5×10^{13} watts. Biology is responsible for the release of vast amounts of energy. Meteorites and cosmic rays add to the incoming energy. The Earth's temperature is influenced by complicated thermodynamics, and it cannot be attributed to a single cause. This study concentrates on the radiation sources.

The United Nations has taken the lead in the "climate change" movement through a division called the "Intergovernmental Panel on Climate Change," aka IPCC. According to the IPCC, certain gases in the atmosphere, such as water vapor, carbon dioxide, methane, nitrous oxide, and ozone, partially absorb infrared radiation, trapping some of the heat. This process is referred to as the Greenhouse Effect, and the gases are called Greenhouse Gases. However, the IPCC's analysis was restricted to man-made Greenhouse Gases, specifically carbon dioxide. They warn of dire consequences if the world doesn't drastically reduce the burning of fossil fuels. You can find this information in the IPCC 1990 First Assessment on Climate Change on pages XIII-XIV, Fig 8 on page XXII, and Fig 12 on page XXX [3].

2. Observations and Historical Records

The dictionary defines science as the study and behavior of the physical and natural world through observations and testing. This means that science starts with a review of the historical observations. And the more data, the better. Therefore, a longer time period yields more data and a deeper understanding of the subject.

2.1. Five Hundred Million Year Time Period

Figure 1 compares changes in temperature and CO_2 over 500 million years. Since written records and thermometers were absent, scientists used scientific proxies to indirectly measure the temperatures and CO2 concentrations. A proxy is like the use of canaries in a gold mine to detect when oxygen levels drop.

These proxies are based on isotopes of boron, oxygen, and hydrogen, radioactive decay dating, analysis of marine sedimentary cores, testing of glacial ice cores, and other methods.

2.1.1. Climate Change

The top curve shows the temperature changes over 500 million years. Since temperature has a direct effect on rain, snow, winds, etc., the curves prove that

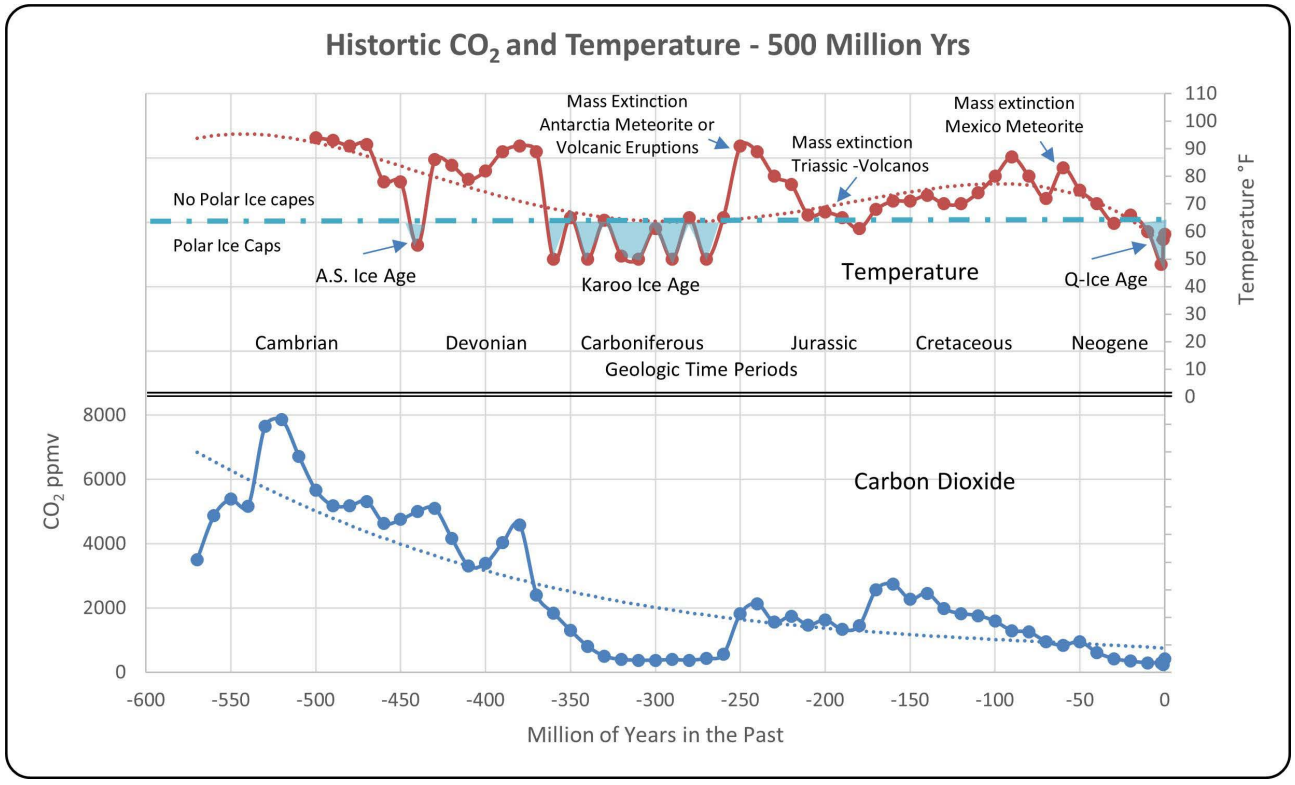

Figure 1. This figure is a combination of the variations in temperature (top) and CO_2 concentration (bottom). It begins today at time zero and goes back almost 600 million years. The top curve is an extrapolation of a project by the Smithsonian Institute led by Scott Wing and Paul Huber [4] and updated to a 2023 current world average temperature of 59˚F. The bottom curve is from data assembled by Berner, R.A. and Z. Kothavala [5], and updated to 2023 with a current CO_2 concentration of 421 ppmv.

climate changes over long periods. It provides sound evidence that Climate Change is real. The proxy measurements are estimates only. Results can vary between different locations.

Figure 1 does not determine the causation or if CO_2 had any influence on temperature. While some may consider Climate Change and CO_2 a single issue, this study shows they are entirely separate and distinct.

2.1.2. Curve Similarities or Disparities

The lack of correlation between the curves is clear. Between 350 and 260 million years ago, the temperatures oscillated ten degrees while the CO_2 concentration decreased steadily. This indicates that CO_2 concentration and temperature appear unrelated. The slopes and magnitudes of the two curves are also different.

Table 1 displays five representative points. In the table, column one is the applicable time period. Column two is the temperature change during that period, with a negative value representing a dropping temperature. Column three illustrates changes in CO_2 concentration, with positive numbers showing an increase and negative numbers showing a decrease.

The ratio is calculated by dividing the CO_2 change by the temperature change for the same time period. The ratio is important because it shows both the slope of the curve and the magnitude. When the ratio is negative, it means CO_2 and

Table 1. CO_2/Temp ratio analysis.

Time Period Millions of Years	Temp Change ˚F	Change in CO_2 (ppmv)	Ratio
450 to 440	−23	+249	−10.8
390 to 380	+2	+554	+277
270 to 250	+15	+129.5	+8.6
100 to 90	+7	−294.93	−42
50 to 40	−5	−333	+66.6

temperature move in opposite directions; when positive, they move in the same direction. The ratio value represents magnitude, with the higher number meaning more CO_2 for each ˚F.

2.1.3. Trends

A second observation in Figure 1 shows general trends. The CO_2 curve declined noticeably, the temperature remained remarkably stable, exhibiting many ups and downs.

2.1.4. Curve Slope and Magnitude

A third assessment deals with the slope and magnitude of the changes.

The first row in Table 1 illustrates that the temperature dropped 23 degrees in the same time period that CO_2 concentration rose 249 ppmv. Since they were going in opposite directions, the ratio was negative. In row four. It showed that the temperature rose 7 degrees while the CO_2 concentration dropped 294.9 ppmv. Since they were also going in opposite directions, the ratio was again negative. The second row illustrates a situation where both the temperature and the CO_2 were rising and reflects a positive value. Both the CO_2 and temperature in the fifth row declined (negative values), which caused a positive ratio since they moved in the same direction.

2.1.5. Causation

Neither Figure 1 nor Table 1 proves causation. That is, whether carbon dioxide influenced the temperature to change, or vice versa. The cause is more likely attributed to other independent factors. Studies have reported that the rise in the CO_2 concentration lagged behind temperature increases by 400 to 1000 years [6]. In 2007 the IPCC stated at page 105 [7] "*However, it now appears that the initial climatic change preceded the change in CO_2 but was enhanced by it (Section 6.4)*" But there was no proof provided in section 6.4 supporting the enhancement theory. They stated on page 442 "*it* may be *the result of increased ocean heat transports due to either an enhanced thermohaline circulation*" (citations) "*or increased flow of surface ocean currents.*" A lagging CO_2 concentration after the temperature changes contradicts the Greenhouse-CO_2 hypothesis, *i.e.* a rise in CO_2 concentration results in warming.

2.1.6. Absence Other Factors

The fact that the curves were wildly divergent suggests there were major factors in play that were not considered. Excluding water vapor from the analysis may be one reason, as explained in sections 4 and 5. The list of other contributing factors is extensive. For example, changes in the orbital paths of the sun and planets, as suggested by the Milankovitch Cycles, may have had an effect. Changes in the sun's radiation intensity may play a role. The Earth's volcanism, nuclear fission at its core, radioactive decay, or changes in the magnetic fields may have an effect over millions of years. These are only a few possibilities not considered in the hypothesis.

2.1.7. Biology Observations

How will biology respond if the Earth warms to 74˚F from the present 59˚F? History suggests that it will thrive. According to **Figure 1**, for most of the last 500 million years, the temperature was 20˚F to 30˚F hotter than it is today. There were no polar ice caps then, and yet the plants and animals thrived.

There were mass extinctions, but none were caused by the higher temperatures. Over the course of 500 million years, three mass extinction events occurred. The first one occurred 250 million years ago in Antarctica when a meteorite caused a crater the size of Ohio. There were also significant volcanic eruptions in Siberia, potentially linked to the impact. The second one occurred about 200 million years ago. The origin of that one is uncertain, but it is likely related to either an asteroid impact or volcanic eruptions. About 66 million years ago, a meteorite collision in Mexico led to the third extinction event. The dinosaurs perished in that event.

2.2. Fifty Million Year Time Period

Figure 2 compares changes in CO_2 and temperatures over 50 million years. This period is an expansion of the first segment of **Figure 1**. Relative calm characterized this period. It covered the time when humans first appeared, 7 million years ago. It also contains the beginning of the Quaternary Ice Age at 2.6 million years, which continues today.

2.2.1. Comparative Analysis of Data

Both CO_2 and temperature experienced a general downward trend during this period. This supports a potential connection. However, the slope and magnitude ratio showed a greater than expected disparity. The number of negative ratios (CO_2 and Temp going in opposite directions) rose from 32% to 43%.

The positive ratios varied from 0.7 CO_2 ppmv/˚F to 420 CO_2 ppmv/˚F. Like the 500-million-year graph in **Figure 1**, there seems to be no direct correlation between a certain amount of CO_2 and a specific temperature change. The negative ratios varied from −1.8 CO_2 ppmv/˚F to −210 CO_2 ppmv/˚F. Like the 500-million-year graph in **Figure 1**, there seems to be no direct correlation between a certain amount of CO_2 and a specific temperature change.

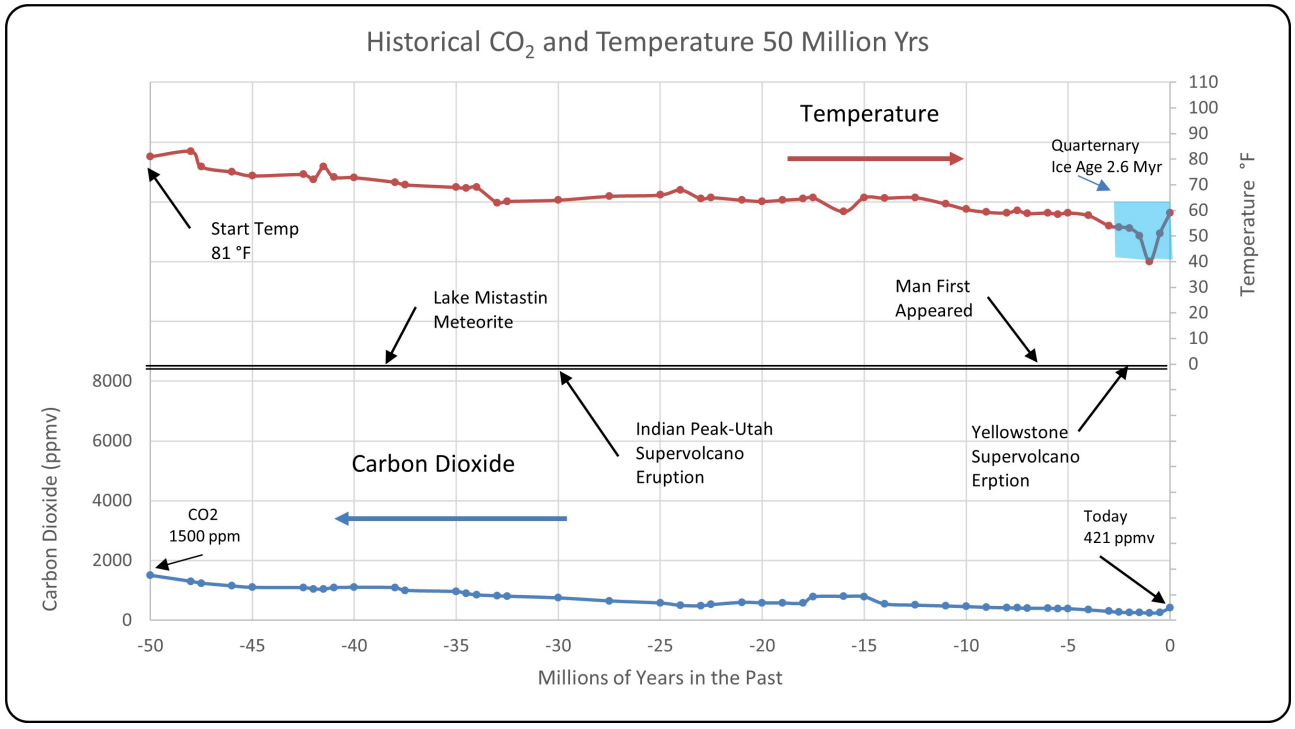

Figure 2. This figure is a combination of the variations in temperature (top) and CO_2 concentrations (bottom) from today going back 50 million years. The top curve is an extrapolation of a project by NOAA Climate.gov, with data from Zachos and Hansen [8] and updated to a 2023 current world average temperature of 59˚F. The bottom curve is from extrapolations of data assembled by James Rae *et al.* [9] and updated to 2023 with a current CO_2 concentration of 421 ppmv.

2.2.2. Other Observations

Super volcano eruptions occurred at thirty million years and at 1 million years. Neither one showed a significant long-term effect on the temperature or CO_2 concentration.

2.3. One Million Year Time Period

This is the shortest time period considered and appears very near the zero timeline in **Figure 1** and close to the zero timeline in **Figure 2**. The Temperature varies from 81˚F a million years ago to 59˚F today. The CO_2 varies from 1500 ppmv to 421 ppmv during the period. The same scale was used in **Figures 1-3**. The temperature scale was from 0 to 100˚F and the CO_2 scale was from 0 to 8000 ppmv. The scale was intentionally maintained the same throughout all three periods to show how temperature and CO_2 have changed. By changing the scale between graphs, it could mislead the reader into believing there has been a drastic change in carbon dioxide, when, as shown in **Figure 3**, that is not the case.

Also, the figures show actual CO_2 concentrations and actual temperatures. They are not anomalies, which are changes in those values over time and compared to a reference time. Using anomalies is a valuable tool in science. However, when comparing charts, one based on actual numbers and one based on anomalies, it is important to know the differences. It is often a source of confusion. Two figures set forth from a publication by M Nelson and D Nelson [10]

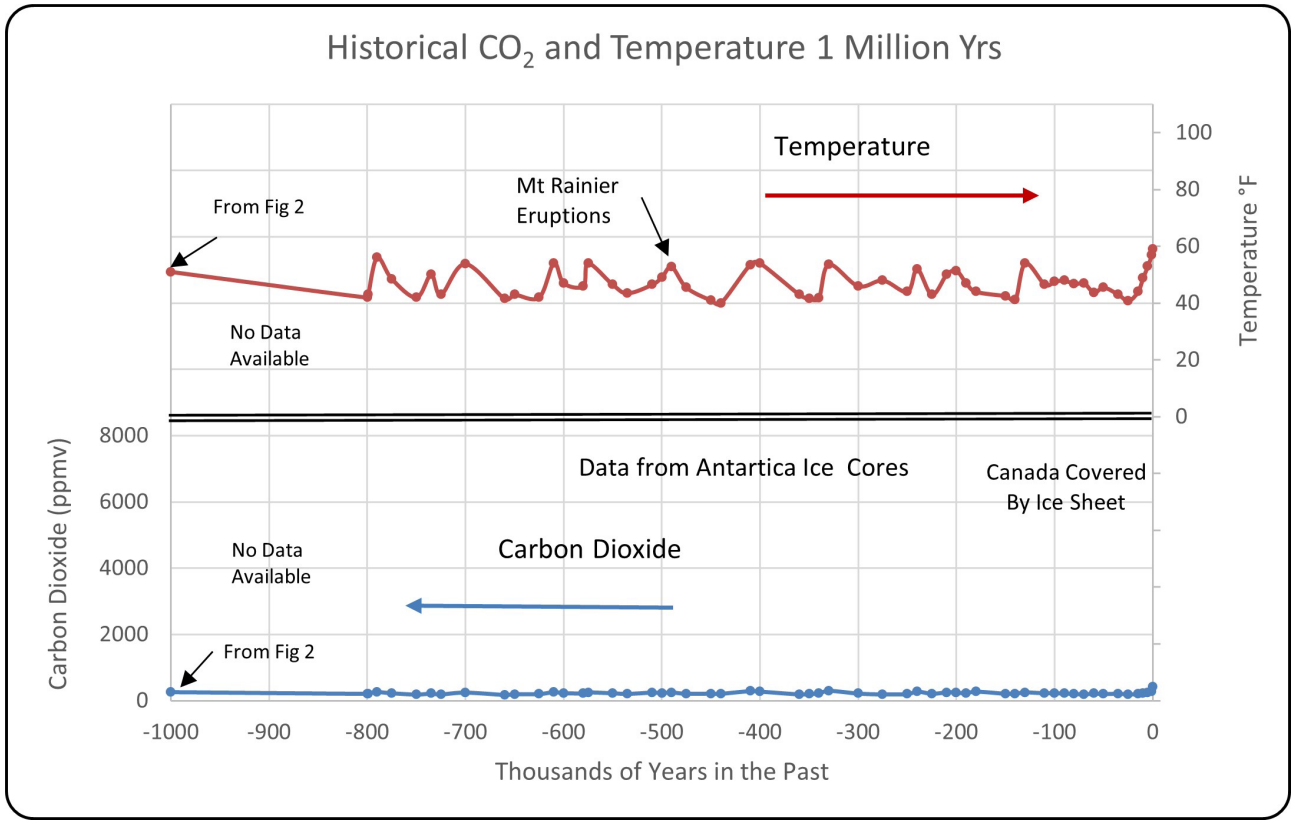

Figure 3. This figure shows the temperature changes (top) and CO_2 concentration changes (bottom) from today going back nearly 1 million years. The curves are an extrapolation of a figure by Jeremy Shakun based on data from Lüthi *et al.* [11], and Jouzel *et al.* [12] and updated to a 2023 current world average temperature of 59˚F.

(Fig 4 and Fig 5 on page 1328) illustrate this point. It shows major differences in the shape, slope, and magnitude of the curves, even though they used the same data.

2.3.1. Data Analysis

The temperature and CO_2 both experienced an almost level long-term trend. But significant deviations persisted in both the slope and magnitude. The negative ratio (CO_2 and Temp going in opposite directions) was 26% of the total.

During this time period, there was a duplication of 7% of the values. Like the previous two figures, there appears no direct link between CO_2 and temperature changes.

2.3.2. Biology Observations

During the 1-million-year period, few noticeable biological issues arose. However, there was a major hidden biological issue. The CO_2 levels fell to 175 ppmv about 660 thousand years ago and dropped to 190 ppmv only 25,000 years ago. The proximity to the 150 ppmv limit poses a serious threat to all plant life on Earth. Without CO_2.plants cannot survive. If the plants perish, then animals that feed on plants will soon die.

2.3.3. Extremely Low CO_2 Concentrations

The Climate Change-CO_2 hypothesis is that CO_2 can change the temperature of

the entire atmosphere. But CO_2 is present in an extremely low concentration. It is 24 times lower than the definition of a trace gas, which is anything below 1% [13]. Based only on the parameter of concentration, and nothing else, most scientists would demand to see non-refutable proof that 0.04% can control the other 99.96%. Everyone can grasp the concept of relative size. The scientist Thomas Huxley once said, "Science is simply common sense at its best" [14]. The following Table 2 shows the atmospheric gas percentages when expressed in parts per million at ground level. When expressed in parts per million, it shows that the average water vapor content is 30,000 as compared to 421 for CO_2. The infrared absorption area of water vapor molecules is also larger than CO_2. The absorption area is a measure of the ability of the molecules to absorb infrared radiation. Section 4 provides a more detailed explanation of this.

3. Do the Historical Observations Support or Dispute the Climate Change-CO_2 Hypothesis?

3.1. Visual Curve Comparison

The 500-million-year period shown in Figure 1 illustrates that the two curves are markedly different with very few similarities. The 50-million-year curves in Figure 2 are considerably flatter, and both have a general declining trend. The 1-million-year curve in Figure 3 revealed that the temperatures fluctuated up and down repeatedly over the entire period, while the CO_2 appeared to be remarkably constant. Overall, the curves' general shapes, slopes, and changes are not similar enough to support the hypothesis.

3.2. Peak, Average, and Normal Fluctuations

Table 3 shows the highest temperature occurred 500 million years ago, and the highest CO_2 level happened at 520 million years ago. That could be a connection, *i.e.* highest temp and highest CO_2 occurring about the same time. The lowest temperature was 40˚F, occurring 440 million years ago, and the lowest CO_2 was 175 ppmv, which appeared about 660,000 years ago. Because they were about 439 million years apart, they neither support nor dispute the hypothesis. The difference between the high and low temperatures were similar for both the 500 million and 50 million time periods, *i.e.* 46˚F and 43˚F illustrating a 3˚F decline (6.5% reduction) while the CO_2 dropped 6356 ppm (83%). That would reflect a

Table 2. Composition of air in parts per million.

Composition of Atmosphere	Concentration (ppmv)
Nitrogen (76%)	760,000
Oxygen (20%)	200,000
Water Vapor (3%)	30,000
Argon (0.93%)	9300
CO_2 today (0.042%)	421

Table 3. General observations.

Time Period	Highest	Lowest	Difference	Stan Dev	Average
TEMP ˚F					
500 million	94	40	54	26	72
50 million	83	40	43	7.7	64.5
1 million	59	40	19	4.86	47.1
CO_2 ppmv					
500 million	7854	175	7679	2200	2531
50 million	1500	175	1325	324	648
1 million	300	175	125	39	228

2118 ppmv drop per ˚F.

The high differences are inconsistent with supporting a relationship.

Table 3 displays the values for each of the three time periods. Column 1 is the three time periods shown in Figures 1-3 for both the temperature and the concentration. The second column is the highest observed temperature or concentration, and the third column is the lowest value observed. Column four is the difference between the highest and lowest values. Column five is the standard deviation of the observed temperatures and CO_2 concentrations and column six is the average of all the temperatures and concentrations.

The average values also show the disparity. The average temperature between 500 million and 1 million went down 24.9˚F for a reduction of 34% while the average CO_2 experienced a drop of 2303 ppmv or 91%. A comparison of the changes in the standard deviation was slightly different. The temperature standard deviation went down 81%, while CO_2 went down 98%.

Between the 500 million and 1 million time periods, the peak high temperatures dropped 35˚F, representing a 37% reduction. The peak high CO_2 experienced during these periods showed a 96% reduction. Using the difference between the highs and lows, the temperature change dropped 64% while the CO_2 change experienced a reduction of 98%. All three time periods show serious inconsistencies and do not support the hypothesis.

The dramatic decrease in CO_2 throughout the three time periods raises a different question. The 175 ppm concentration came exceptionally close to a plant extinction event. Laboratory tests confirm that when the CO_2 concentrations drop below 150 ppm, the plants experience severe stress and their seed production is suppressed [15].

There has been a continuous decline in temperatures during these three periods. This may have been the reason most scientists in the 1970s believed that the world was going into a dangerous cooling trend. A group of 42 climate scientists, led by Dr. George Kukla from Czechoslovakia, made that judgment. They sent a letter to President Nixon, which resulted in the establishment of the US Climate Analysis Center (CAC) within NOAA [16]. A convened scientific

council later proposed a plan to address the expected glacial advances.

3.3. Detailed Data Analysis

The hundreds of data points reflected in **Figures 1-3** were analyzed. It involved calculating changes between adjacent points in both CO_2 and temperature. Then ratios were computed by dividing the change in CO_2 by the change in temperature. We excluded three null values from the analysis due to the indeterminate result that occurs when dividing by zero. There was one ratio with a magnitude of 1089 CO_2/temp (at the 380-million-year period) and one with a magnitude of 1200 CO_2/temp (at 15 million years ago). Those two ratios were considered outliers and excluded. The following are the results.

3.3.1. Repetitions

If there is a relationship between CO_2 and temperature, it should reveal itself by the number of repeating ratios. Those repeating values would normally line up around its mean. However, no such repeating ratios were observed. The average ratio used by the IPCC in making future projections was +92.6 CO_2 ppmv/temp. Neither that number nor its equations were disclosed by IPCC in their various assessment reports. But it could be reversed engineered from a comparison IPCC Fig 8 and Fig 9 dealing with future projections under a Business-as-Usual scenario [3].

3.3.2. Negative Ratios

Many of the ratios had a negative value. As discussed earlier, a negative value shows that the CO_2 and temperature move in opposite directions. Such as, if the CO_2 rises the temperature goes down or if the CO_2 drops then the temperature rises. This negative ratio is directly contrary to the Climate Change-CO_2 hypothesis, *i.e.* that a rising CO_2 causes the temperature to increase.

In the 500-million-year period, there were 35% of the ratios with negative values. During the 50-million-year span, 42% had negative values. Over a period of 1 million years, 27% of the ratios had negative values. The high percentage of ratios with negative values represents a direct contradiction of the hypothesis.

3.3.3. Zero Effect or Near Zero Effect

When a test yields zero effect, it usually means there is no measured response and as such there is no correlation. This is called the stimulant response test, since a failure to respond will yield a zero value. The same is true for those data points that are near zero. In this specific analysis, a low ratio signifies an absence of correlation. For example, CO_2 levels below 10 ppmv cannot absorb enough infrared radiation to measurably impact the temperature. This is discussed in Sections 4 and 5. A plot of the ratio data is shown in **Figure 4**.

3.3.4. No Repetition

There were no repeating values around 92.6 ppmv/˚F. None of the 160 ratio data points had that value. The closest two ratios were 91.3 ppmv/˚F that occurred

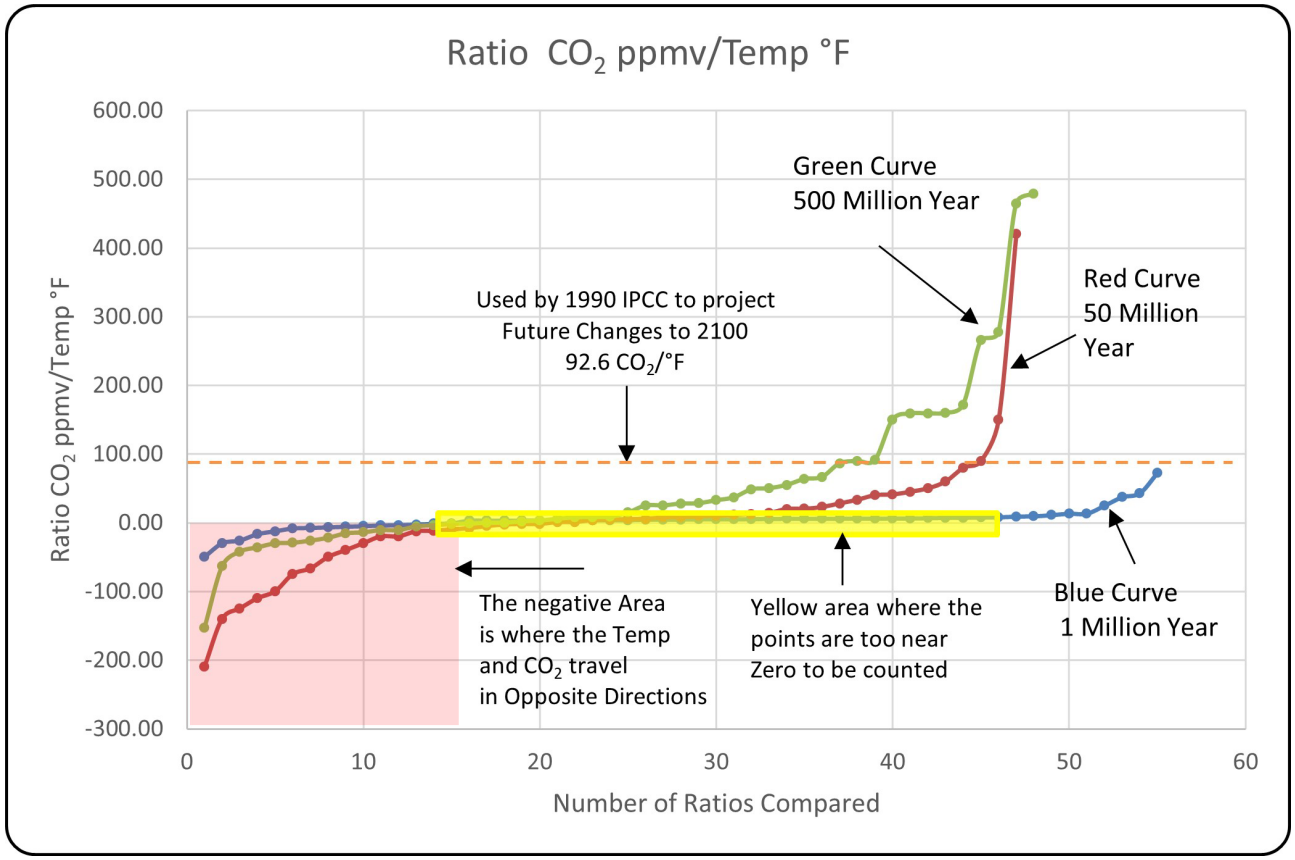

Figure 4. This graph is a plot of the CO_2/Temp ratios taken from the three time periods shown in **Figures 1-3**. The ratios and their methodology are described in the comparative analysis discussion for each time period. The CO_2/temperature ratios were organized in ascending values and plotted for all three time periods.

400 million years ago and 90 ppmv/˚F that happened 38 million years ago. In the last 1-million-year time period, there was no ratio above 73 ppmv/˚F.

3.3.5. Ratio Data Variations Reject Correlation

70% of the ratios covering all three time periods are either in the negative area where the temperature and CO_2 travel in opposite directions, or the magnitude is zero or near zero. A comparison in the last million-year time period showed that 87% of the ratios were negative or had a magnitude of zero or near zero. Those high percentages provide significant evidence rejecting the Climate Change-CO_2 hypothesis.

4. The Infrared Absorption Spectra of the Greenhouse Gases

The Greenhouse theory was based on a publication in 1896 by Svante Arrhenius. He postulated that the atmosphere allows visible high energy light to pass through and heat the Earth's surface. The Earth radiates this heat back into space as infrared radiation. Greenhouse gases trap and absorb a portion of this radiation, preventing heat loss. In 1938, G.S. Callendar [17] concentrated on CO_2 as the main culprit in this greenhouse effect.

The Greenhouse Effect is based on the infrared absorption abilities of the

Greenhouse Gases and the infrared wavelengths radiated from the Earth. This was acknowledged as fundamental by the IPCC [3] in a statement on page 48.

"The absorption strength and the wavelength of this absorption in the thermal infrared are of fundamental importance in dictating whether a molecule can be an important greenhouse forcing agent, this effect is modified by both the existing quantities of that gas in the atmosphere and the overlap between the absorption bands and those of other gases present in the atmosphere".

The Earth's infrared emission wavelengths and the infrared absorption wavelengths of the Greenhouse Gases are set forth in **Figures 5-9**.

4.1. Infrared Radiation Emitted from the Earth

All physical bodies absorb and radiate radiation. Its emission wavelength depends upon the temperature. For example, nitrogen gas absorbs and radiates infrared that has a wavelength between 1 μm to 5 μm. The μm represents one millionth of a meter. Wien's law can express a peak temperature for each wavelength. The 1 μm to 5 μm wavelength represents a temperature of 4756˚F to 583˚F. The selection of nitrogen was an example since those temperatures rarely exist on the surface of the Earth. The normal surface temperatures are between −13˚F to 113˚F [18]. That corresponds to a wavelength from 11.67 μm to 9.1 μm. The shorter the wavelength, the higher the temperature and vice versa. Ocean temperatures typically range from around freezing (32˚F) to 86˚F. These temperature ranges cover the vast majority of the infrared emissions from the Earth's surface. Under Wein's law, the temperature signifies the peak of the emissions curve. It does not represent a single wavelength. Diminishing amounts of wavelengths exist on both sides of the peak [19].

4.2. Infrared Radiation Absorbed by Greenhouse Gases

In order for the Greenhouse Effect to work, the Greenhouse Gases must absorb the infrared radiation being emitted by the Earth. The Greenhouse gases must be able to absorb the infrared radiation being emitted in order to use that energy. If they cannot absorb it, then the Greenhouse Effect doesn't work.

4.2.1. Greenhouse Gases

A greenhouse gas is any gas that can absorb infrared radiation being emitted by the surface of the planet. **Table 4** sets forth the relative atmospheric concentrations

Table 4. Greenhouse gases.

Greenhouse Gas in Atmosphere	Concentration, ppm
Water Vapor (3%)	30,000
CO_2 (0.042%)	421
Methane (0.00019%)	1.9
Nitrous Oxide (0.000033%)	.33
Ozone (0.000001%)	0.01

of these gases. The table regarding water vapor does not include ice or liquid water that are contained in the clouds. NASA has estimated that clouds cover 67% of the Earth's atmosphere [20].

The IPCC listed CFC's (chlorofluorocarbons) as a Greenhouse Gas. But those compounds are present in concentrations that are measured in parts per trillion. And they have absorption spectra in the UV zone and the very cold infrared (−430˚F) area, and neither are significant zones for the Greenhouse Effect.

4.2.2. Absorbance Spectra for the Greenhouse Gases

The following **Figures 5-9** are absorbance spectra for each Greenhouse gas. It is also representative of the absorbance spectrum of the other gases. The normal land temperature range and normal ocean temperature range stand out in shades of green. The absorbance band is shown at the bottom near zero and highlighted in blue. **Figures 5-8** show an extremely small absorbance band within the Earth's normal surface temperature range. This is because the spectra were within the infrared window.

The water vapor and carbon dioxide have a slight absorption band (about 3%) in this wavelength zone. Methane and nitrous oxide had almost no absorption. However, ozone, shown in **Figure 9**, has significant absorption. The absorption area is the topic of discussion in paragraph 4.2.3. A 100% absorption would result in the entire area within the normal land temperature zone being highlighted in blue.

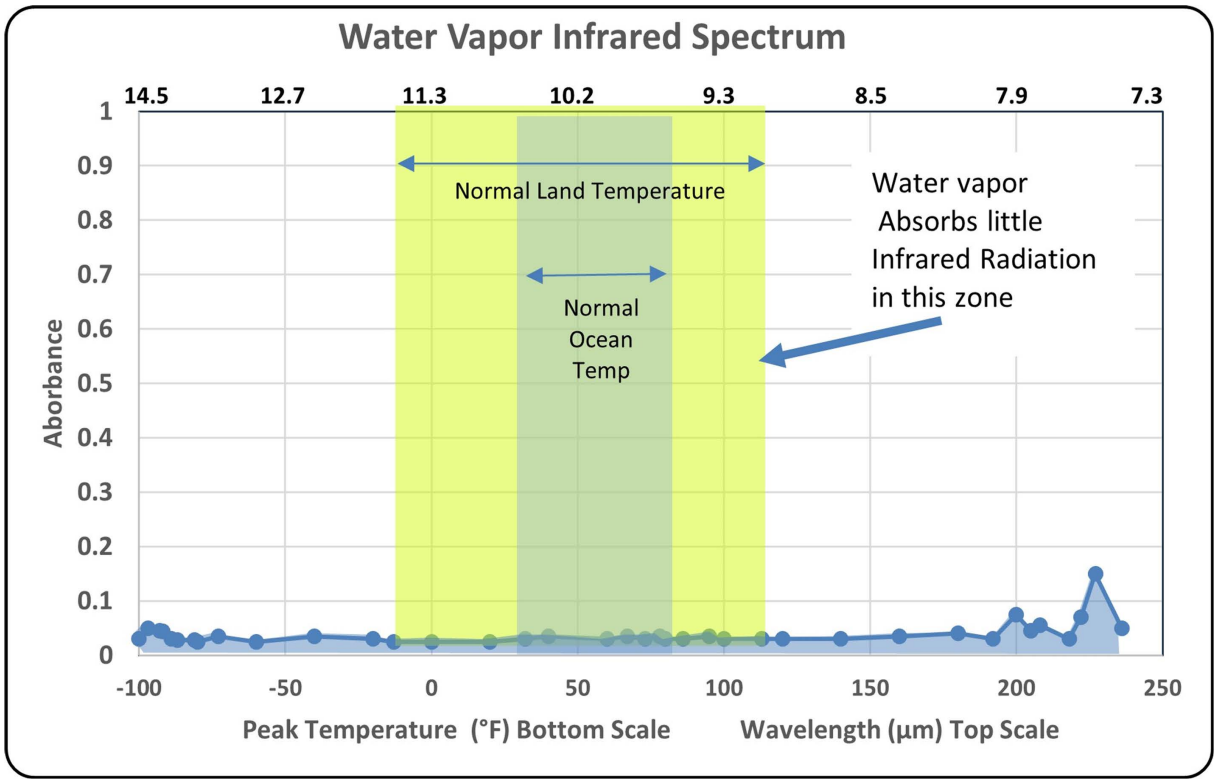

Figure 5. The absorbance spectra for each gas were extrapolated from information from the NIST Mass Spectrometer Data Center [21] and information from Department of Astronomy, University of Washington [22]. The absorbance is on the vertical scale with zero representing no absorbance.

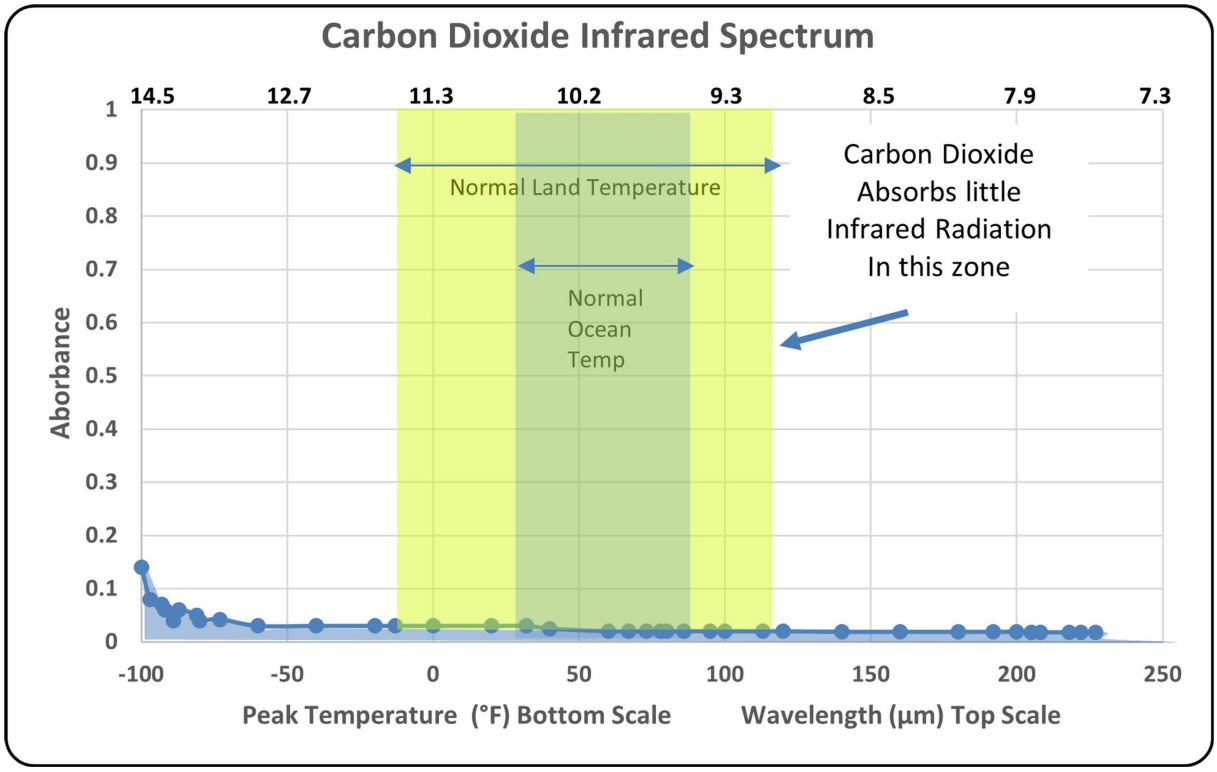

Figure 6. Carbon Dioxide Infrared Spectrum.

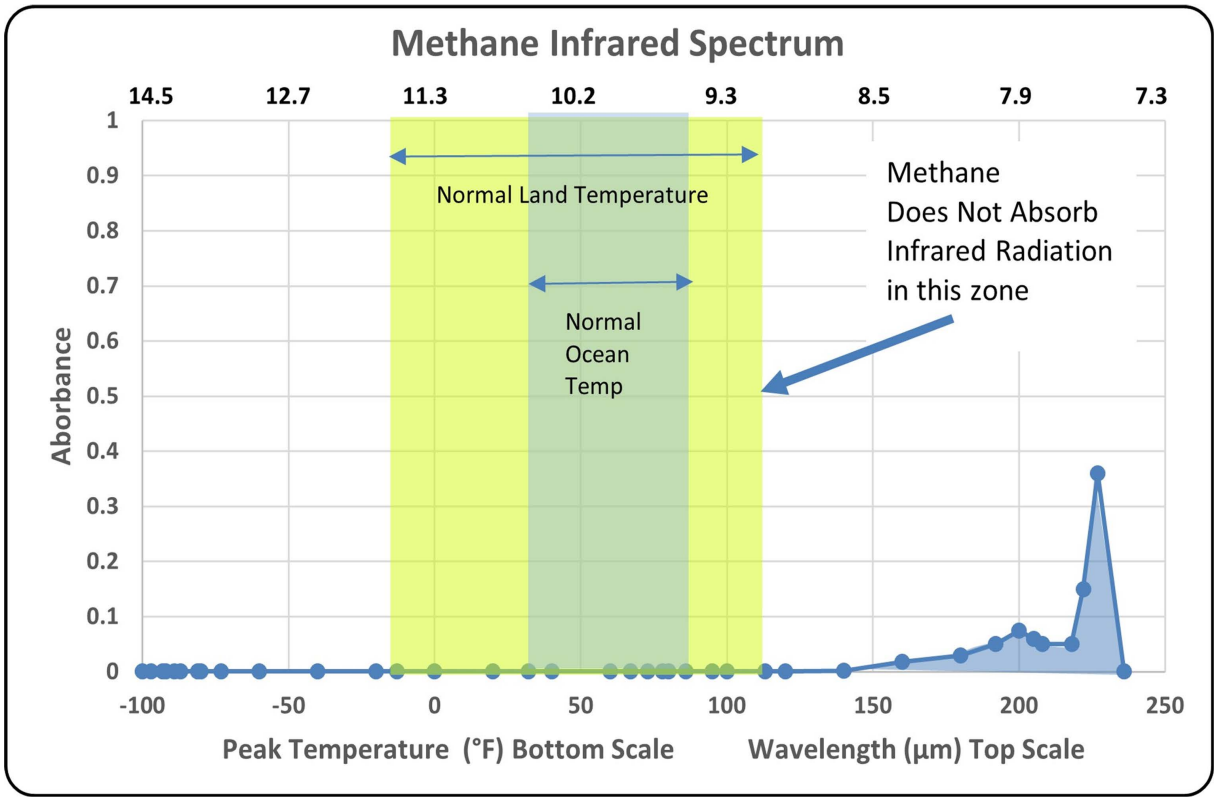

Figure 7. Methane Infrared Spectrum.

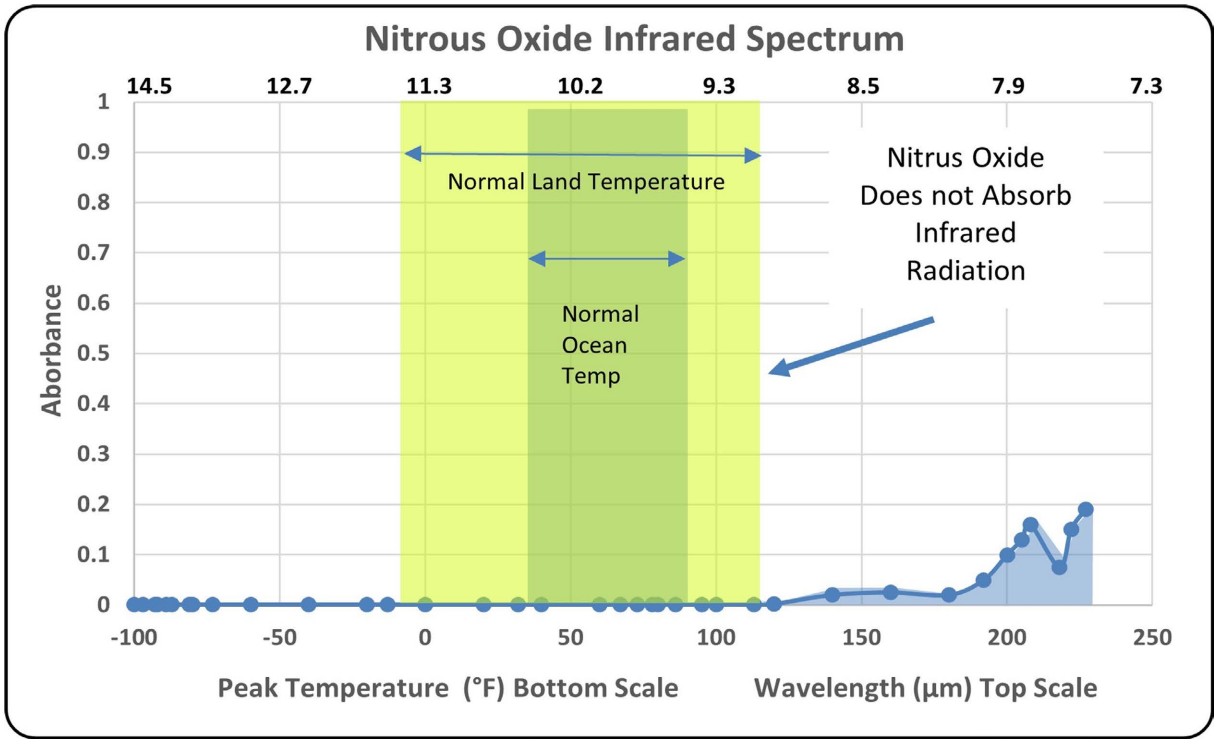

Figure 8. Nitrous Oxide Infrared Spectrum.

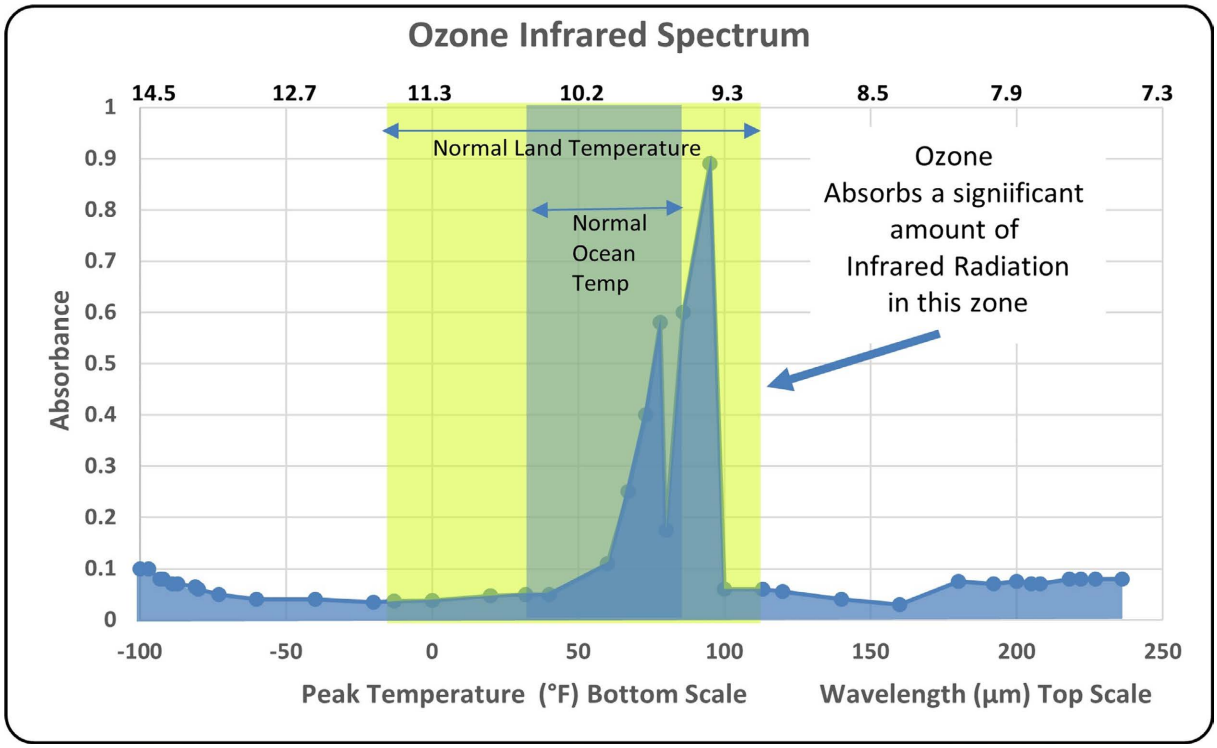

Figure 9. Ozone Infrared Spectrum.

4.2.3. Absorbance Area for the Greenhouse Gases

There is a range of wavelengths contained within the normal land temperature zone. The area under the curve is called the absorbance area. This area was cal-

culated for each of the Greenhouse Gases from the absorbance spectra shown in the Figures 5-9.

The calculations yielded an absorbance area of 0.06625 for water vapor and 0.0561 for carbon dioxide. It shows that the absorbance is very small. But it also indicates that each molecule of water vapor will absorb about 18% more infrared radiation than CO_2 can, regarding radiation with a wavelength within the normal land temperature zone. The absorbance area for methane is 0.00257, nitrous oxide is 0.00257 and ozone is 0.4391.

4.2.4. Total Infrared Absorbance

The concentration of the gas in the atmosphere and its absorbance jointly determine the total amount of infrared radiation absorbed. For example, if a Greenhouse Gas molecule is not present, it can't absorb any radiation, regardless of its absorbance area. This was addressed by the IPCC on page 48, quoted earlier.

Hence, as concentration increases, so does the amount of absorbed radiation. The following Table 5 is the relative total absorption based on the absorbance area and the atmospheric concentration. Column 1 is the Greenhouse Gas. Column 2 is the total absorption that the Greenhouse Gas can absorb. This value is the Greenhouse Gas concentration multiplied by its absorption area. Column three is the ratio of the absorption of the other gases as compared to water vapor. This factor provides a relative number.

Relative absorption refers to how it compares to other Greenhouse Gases. Relative values depend on other values. It is useful in situations where variables cancel out because they are present in the both values. In this case the numbers are relative to those of Water Vapor. For example, potential radiation absorption in the areas outside the normal land temperatures and not included, will cancel out.

Table 5 shows that water vapor can absorb 84 times more infrared radiation than carbon dioxide. If water vapor changes its absorption from 84 to 83, it would wipe out all of what CO_2 could have contributed. With respect to the other Greenhouse Gases, water vapor is 407 thousand times greater than methane, 452 thousand times more than ozone, and 2.3 million times greater than nitrous oxide relative to the infrared radiation absorbed under the Greenhouse Effect. The low concentration of ozone and nitrous oxide explains their minimal total

Table 5. Total relative absorption of infrared radiation by the greenhouse gases.

Greenhouse Gas	Total Absorption	Water Vapor/Other Gas
Water Vapor	1987.5	
CO_2	23.6	84
Methane	0.00488	407,000
Ozone	0.00439	452,000
Nitrous Oxide	0.000848	2,300,000-

absorption. It also explains why ozone with a high absorption area has a very low total absorption.

5. Why Was Water Vapor Excluded from Consideration in the Climate Change-CO_2 Hypothesis?

The IPCC excludes water vapor and clouds for reasons other than science. The statement by the IPCC on page xv of the Executive Summary identifies the purpose of excluding water vapor [3].

> "Two important greenhouse gases, water vapour, and ozone, are not included in this table. Water vapour has the largest greenhouse effect, but its concentration in the troposphere is determined internally within the climate system, and, on a global scale, is not affected by human sources and sinks." Emphasis added.
> "It was agreed at the first meeting of the IPCC that a new assessment of the whole issue of anthropogenic climate change should be prepared." [23] Emphasis added.

The dictionary defines anthropogenic as meaning "chiefly of pollution or environmental change originating in human activity." It means that the IPCC was formed not to determine if there is global warming or cooling, but to combat global pollution caused by human activity. They excluded Ozone from consideration for a different reason. The IPCC [3] stated at page xv of the Executive Summary that reason to be:

> "The concentration of ozone is changing both in the stratosphere and the troposphere due to human activities, but it is difficult to quantify the changes from present observations."

Hence, ozone was excluded because it was too difficult to quantify. That is strange since the quantity of ozone is continuously monitored by NOAA and NASA. The national parks have ozone monitoring stations in each of the 102 parks [24].

The United States EPA [25] mirrors much of what the IPCC has stated. They define Climate Change as:

> "Climate change refers to changes in global or regional climate patterns attributed largely to human-caused increased levels of atmospheric greenhouse gases." pg. 11 Emphasis added.
> "Greenhouse gases (GHGs) from human activities are the most significant driver of observed climate change since the mid-20th century." pg. 12, Emphasis added.

The IPCC and EPA both recognize that water vapor levels are rising and that it plays a vital role in the Greenhouse Effect. But they avoid the issue by stating that it's a feedback loop triggered by CO_2. The following quotes are representative.

"The simplest of these feedbacks arises because as the atmosphere warms the amount of water vapour it holds increases. Water vapour is an important greenhouse gas and will therefor amplify the warming." (Page xxxvii of the Executive Summary [3]).

At page 78 the IPCC further explained the feedback mechanism [3]:

"The ensuing global warming is, of course, the result of CO_2 being a greenhouse gas. This warming, however, produces an interactive effect, the warmer atmosphere contains more water vapour, itself a greenhouse gas. Thus, an increase in one greenhouse gas (CO_2) induces an increase in yet another greenhouse gas (water vapour), resulting in a positive (amplifying) feedback mechanism."

The exclusion of water vapor from consideration is perplexing. The Total Relative Absorption shown in **Table 5**, places it 84 times more effective than CO_2. None of the six IPCC assessment reports included an investigation on whether water vapor was the main cause of the Greenhouse Effect. They excluded water vapor because it is not linked to human-made actions. However, that is not true. Basic chemistry shows that burning fossil fuels produces more water than CO_2.

There are also valid scientific principles supporting a water connection rather than a CO_2 connection. First, CO_2 is only present in the atmosphere in trace amounts (0.04%) and lacks sufficient enthalpy to have any measurable effect on the atmosphere's temperature. Second, if the Earth is warming for reasons other than CO_2, then under Henry's Law, the solubility of CO_2 in ocean water goes down when the water temperature goes up [26]. Therefore, an increase in the ocean's temperature would cause CO_2 to be released into the atmosphere [27]. The oceans contain 93% of all carbon dioxide on the planet [28].

Many studies have shown that the CO_2 concentration only goes up **after** the temperature rises [6] [29]-[34]. That is, CO_2 lags behind the temperature. This is inconsistent with CO_2 being responsible for warming the atmosphere. In 2007, the IPCC admitted that the climatic changes preceded changes in CO_2 [7]. They changed their position to reflect that CO_2 enhances, rather than causes, the temperature changes. But they did not present any data showing such enhancements.

Third, the basis cited by the IPCC for CO_2 being responsible for the Greenhouse Effect was a comparison of Mars and Venus [3]. Mars' atmosphere is 80% CO_2 and has a temperature of a minus 47˚C. Venus has an atmosphere of 90% CO_2 and has a temperature of 477˚C. Earth is midway between the two, has only trace amounts of CO_2 (0.04%), and has an average temperature of 59˚F (15˚C). An exhaustive study in 2007 addressed this issue. The exhaustive study reached the conclusion that Venus or Mars did not support a Greenhouse-CO_2 relationship [35]. Earth has a significant amount of water vapor in the atmosphere and vast oceans, while Mars and Venus have extraordinarily little. The Greenhouse Effect argument using Mars and Venus would support the idea that water may

be the determining factor and not CO_2.

Fourth, the absorption studies presented in section 4, show that water vapor surpasses CO_2 in both concentration and infrared absorption abilities.

6. Clouds Are Critically Important

6.1. Heat Transfer

Much of the heat transfer in the troposphere is by convection [36], *i.e.* heat carried by the winds. Radiation is a fraction of that heat. However, there is another heat transfer that is often overlooked. It is called latent heat and involves a change in phase such as evaporation or condensation of water. An example better illustrates this point. To evaporate one gram of water it takes 540 calories. Raising the temperature of one gram of water one degree C takes one calorie. When water evaporates from the surface of the Earth, it absorbs an enormous amount of heat, thereby cooling the surface. When that water vapor condenses high in the atmosphere, it releases all that latent heat and forms clouds. The convection and latent heat transfers are necessary to push the heat into the higher parts of the troposphere where the air is thin, and the energy can be more effectively radiated to space.

6.2. Reflection

The clouds reflect a significant portion of sunlight away from Earth. It is a major component of albedo, which is the proportion of light radiation reflected away from Earth. Reflection also has another element. It reflects some of the infrared heat back to Earth. Many believe it's a major component of keeping the Earth warm. Reflection is different from absorption and re-emission by the Greenhouse Gases. Clouds do both. On cloudless nights, crops often freeze by a process called radiation freezing. But not when there are clouds present. It shows that the clouds have a wider range of properties to dissipate heat as compared to the Greenhouse Gases.

6.3. Cloud Fraction and Temperature Relationship

The data mainly focus on recent years due to the availability of satellites. **Figure 10** is a plot of the cloud fraction and atmospheric temperatures from 1982 to 2018. The trendlines show an inverse relationship between cloud percent and atmospheric temperature. As the cloud cover goes down, the temperature goes up and vice versa. Scientific principles discussed under the paragraphs 6.1 and 6.2 above support a cloud temperature connection. Changes in cloud cover adjust the amount of sun's radiation hitting the ground. As a result, the ground warms up and the temperature rises.

The similarity between the two trendlines is remarkable. They have nearly identical slopes (0.0717x verses 0.066x both round to 0.7x, except for the inverse relationship). The graph shows that the observational studies are consistent with scientific principles and physical laws. But the Figure standing alone does not

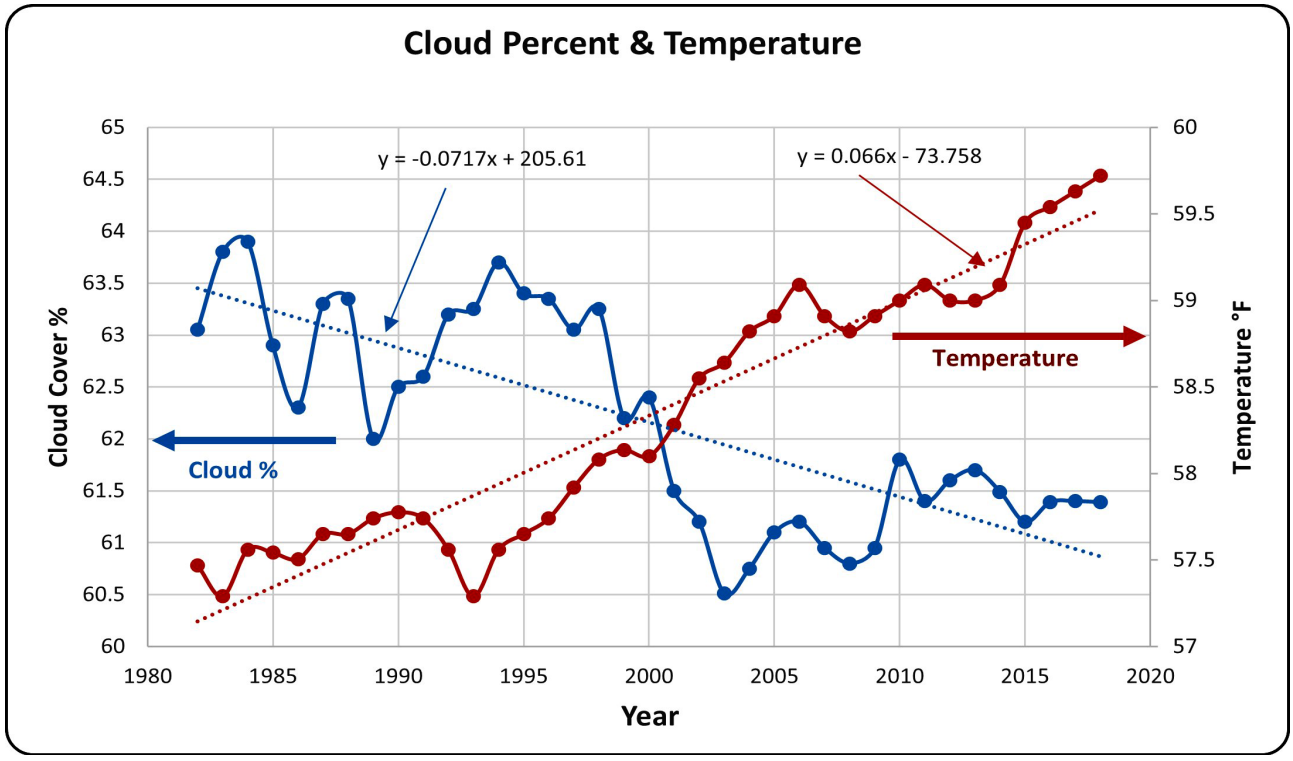

Figure 10. This graph is the cloud fraction and is set forth on the left vertical axis. The temperature is on the right vertical axis and the horizontal axis represents the observation year. The information was extrapolated from figures prepared by Hans-Rolf Dubal and Fritz Vahrenholt [37].

prove causation. That is, did temperature cause the clouds to diminish or vice versa. However, the heat transfer and reflection analysis support the view that clouds were the driving force.

Experts like Charles Blaisdell have pointed to individual deviations that may have caused some spikes. He points to the volcanic ash from Mount Pinatubo in the early 90s and the clear cut logging in the Amazon rain forest. But that does not explain the trend. Some opined that it could be a combination of the AMO (Atlantic Multi-decadal Oscillation) in the Northern Hemisphere, which has a 60 - 80 year reoccurring period, and the PDO (Pacific Decadal Oscillation) also called El Nino. Other experts opine that cloud formations are sometimes like Black Swan Events, *i.e.* an unpredictable event that is beyond what is normally expected. But there may be some observational evidence of causation.

6.4. Empirical Evidence of Causation

The Northern Hemisphere is 2.7˚F (1.5˚C) warmer than the Southern Hemisphere [38]. The Southern Hemisphere contains more clouds (68% southern and 62% northern). There are fewer clouds [39] over land (55%) than ocean (72%). The oceans constitute 81% of the Southern Hemisphere surface area with the Northern Hemisphere occupying only 61% [40]. This 2.7˚F difference appears to be connected to the reflection by the clouds and the cooling and the latent heat transfer from the cloud forming process.

6.4.1. Does Figure 10 Support a 2.7˚F Temperature Change?

Using the cloud trendline in **Figure 10**, it shows a reduction of clouds of 4.1%. The trendline temperature at the end of the observation period (2018) was 59.6˚F. Multiplying 59.6˚F by 4.1% yields a temperature change of 2.4˚F. This is remarkably close to the 2.7˚F difference observed between the Hemispheres. It suggests that the clouds may be responsible for 89% of the temperature rise. The remaining 11% may be attributed to other factors including the Greenhouse effect applicable to water vapor. The water vapor over the oceans (specific humidity) appears to be slightly higher in the Northern Hemisphere [10]. It indicates that clouds have a greater impact on short-term world temperatures than anything else, except for catastrophic events such as meteorites and super volcanic eruptions. As used herein, short-term means less than a thousand years.

Regarding long-term changes in temperature, there are many factors that must be considered. Some of those factors include orbital deviations, changes in the sun's illuminance which changes every second and every day, volcanic activity, frequency of meteorite strikes, changes in the wind patterns and ocean currents, deviations in the nuclear reactions taking place in the core of the Earth, changes in magnetic properties of the Earth, the moon progressively moving further away which changes the water and atmospheric tides, and a long list of other factors, including biology. There is also a massive ocean heat sink that modulates the temperature over the long term.

6.4.2. How Does CO_2 Fit into the Causation Picture?

The author could not find any substantial proof indicating that CO_2 has had a measurable impact on global temperatures, either in the short or long term. Scientists have not experimentally evaluated the Greenhouse Effect using normal Earth surface temperatures as the infrared heat source. The IPCC did not cite the existence of any such tests in their six assessment reports.

7. Summary

The purpose of this study was to analyze data for a potential correlation between carbon dioxide and global temperatures. It involved looking at the historical data from three time periods: 500 million years, 50 million years, and 1 million years. All three time periods showed that the curves and trends were too dissimilar to establish a connection. Observations of CO_2/temp ratios showed they moved in opposite directions 35% of the time during the 500-million-year period, 42% in the 50 million period, and 27% in the 1 million time period. Moving in opposite directions directly contradicts the Climate Change-CO_2 hypothesis. The data also showed a lack of recurring values, and many ratios were zero or near zero. If something does not respond, it manifests itself by a zero or near zero ratio. This indicates a lack of relationship. Combining the negative numbers with the zero or near zero data points for all three time periods shows that 70% of the ratios rejected a connection. Using only the last 1-million-year time period showed that 87% of the ratios were negative or zero or near zero.

The study next analyzed the absorption spectra for the main Greenhouse Gases. The absorption spectra showed that for the normal temperatures of the Earth's surface, *i.e.* between −13˚F to 113˚F, there is an atmospheric window. In that window, the Greenhouse Gases absorb less than 4% of the long wave infrared radiation. For example, methane and nitrous oxide had about 0.1% or less absorbance, CO_2 had less than 4% and water vapor less than 4%. When coupled with the concentrations in the atmosphere, the data showed that water vapor dominated. It absorbed 84 times more than CO_2, 407 thousand times more than methane, 452 thousand times more than ozone and 2.6 million times more than nitrous oxide.

The study analyzed why the Climate Change organizations such as the UN's Intergovernmental Panel on Climate Change (IPCC) and the United States EPA excluded water vapor from consideration. They addressed this issue in their action plan documents. Water vapor was not considered as a cause because it was not associated with man-made activities. They concluded that water vapor and clouds constituted a feedback mechanism based on CO_2.

The clouds reflect radiation from the sun. They also cool the surface by evaporation and release that heat by condensing high in the atmosphere where the air is thin. The cloud cover has gone down 4.1% from 1982 to 2018. Studies have shown that the Northern Hemisphere is about 2.7˚F warmer than the Southern Hemisphere because of cloud cover. Calculations show that the 4.1% lower cloud cover could be responsible for 2.4˚F of the 2.7˚F. This makes the reduction in cloud fraction the largest factor (89.9%) for short-term temperature rises.

Conflicts of Interest

The authors declare no conflicts of interest regarding the publication of this paper.

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