The IPCC Made Three Fatal Errors in Assumptions about CO_2

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Abstract: In 2013, and following from 1990, the Intergovernmental Panel on Climate Change (IPCC) issued Climate Change 2013:The Physical Science Basis (AR5) claiming the concentration of CO_2, air temperature, and water vapor go up and down together; the air can hold more water vapor and the increased warming by water vapor adds to the warming by CO_2. Pictorially: CO_2↑, T↑, WV↑. Although no scientific evidence is offered, this concept has become widely accepted because of the fear that CO_2 might increase the Earth's temperature to dangerous levels. In developing research to evaluate the IPCC claims, it is noted that the temperature at the Equator is always higher than that in the Arctic and Antarctic. The Gas Law of Charles/Gay-Lussac states that at constant pressure the volume of a gas is proportional to the absolute temperature. Thus by applying this law, the CO_2 concentration is always higher at the Poles than at the Equator. Thus, when moving from the Poles to the Equator, temperature goes up, CO_2 goes down and water vapor goes up. Pictorially: T↑, WV↑, CO_2↓. The warming effects of CO_2 and water vapor do not add; they oppose each other. This is a robust conclusion based on hard numbers. It is opposite to the claim by the IPCC and proves there are errors in the assumptions.

Keywords: IPCC, CO_2, water vapor, Gas Laws, AccuWeather.

INTRODUCTION

A competent analysis of the role of carbon dioxide (CO_2) in climate change must first include understanding of its role as reported by the Intergovernmental Panel on Climate Change (IPCC). In the IPCC First Assessment Report in 1990 [1] is the following claim on page xxvii under Feedbacks. It does not directly mention CO_2:

> "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 therefore amplify the warming."

This statement implies that the warming by water vapor, a greenhouse gas, can be added to any warming by CO_2.

Later, in the Fifth Assessment Report, *Climate Change 2013: The Physical Science Basis (AR5)* [2], is the following claim on page 667*:*

> "Currently, water vapour has the largest greenhouse effect in the Earth's atmosphere. However, other greenhouse gases, primarily CO_2, are necessary to sustain the presence of water vapour in the atmosphere. Indeed, if these other gases were removed from the atmosphere, its temperature would drop sufficiently to induce a decrease of water vapour, leading to a runaway drop of the greenhouse effect that would plunge the Earth into a frozen state. So greenhouse gases other than water vapour provide the temperature structure that sustains current levels of atmospheric water vapour. Therefore, although CO_2 is the main anthropogenic control knob on climate, water vapour is a strong and fast feedback that amplifies any initial forcing by a typical factor between two and three. Water vapour is not a significant initial forcing, but is nevertheless a fundamental agent of climate change."

This statement claims that as carbon dioxide (CO_2) concentration goes up air temperature and water vapor (WV) go up, and if CO_2 concentration goes down, temperature and water vapor go down. Symbolically: CO_2↑, T↑, WV↑ and CO_2↓, T↓, WV↓.

There is another approach with terms more familiar to the general public that support the AR5 conclusion:

> "Burning of fossil fuels has added two trillion tonnes of CO_2 into the atmosphere since about 1800. Approximately one half of the CO_2 remains in the atmosphere thereby increasing concentration of CO_2 from 275 to 400 ppm. The result is an increase in radiative forcing (RF) of 2.3 W/m^2 relative to that in 1750. Positive RF causes an increase in the Earth's average temperature. With an increase in

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temperature, the air can hold more water vapor and this increase amplifies the warming by CO_2."

These three statements all rely on the same three assumptions:

1. CO_2 and air temperature go up and down together
2. CO_2 and water vapor go up and down together
3. warming by water vapor can be added to that of CO_2 to give enhanced warming

Even though it might appear to be logical that air temperature and CO_2 go up together and the warming by water vapor adds to that of CO_2 as in Figure **1**, no scientific proof is provided or is available.

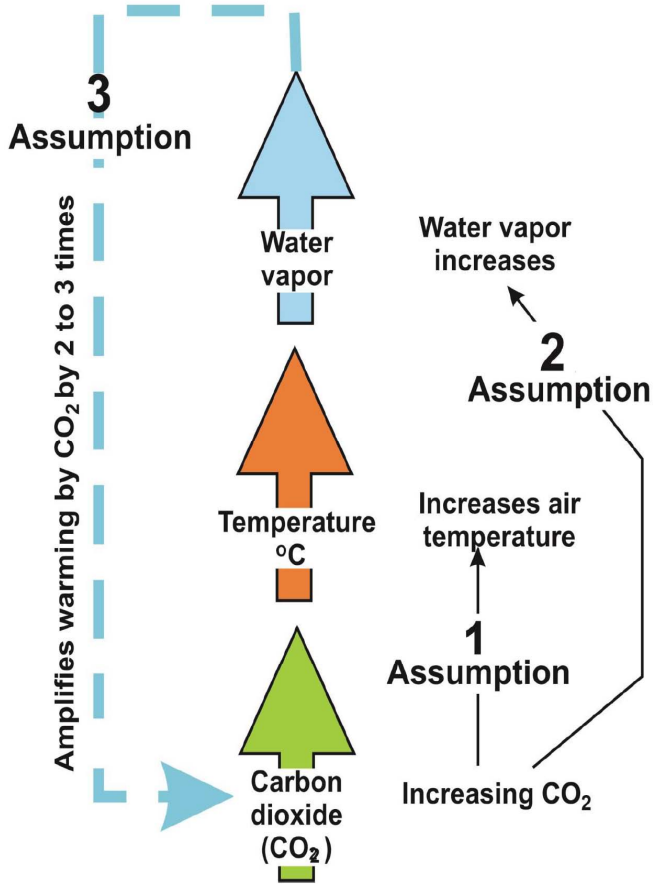


Figure 1: Diagram of the IPCC concept that increasing CO_2 increases temperature that increases the water content of the warmer air and that amplifies warming by CO_2.

The IPCC concept generates fear of the possibility of dangerously high air temperatures. As this concept is widely promoted, Governments are making policies that affect the lives of their citizens based on this fear.

2. THE PURPOSE OF THIS STUDY

The purpose of this study is to provide scientific evidence about whether or not the three assumptions by the IPCC are correct. At the same time, it will be determined whether or not the same assumptions apply to the other greenhouse gases (GHG), such as methane and nitrous oxide.

This study begins with the observation that CO_2 concentration is always lower in the Tropics than at the Poles of the Earth because the temperature is always higher. Figure **2** adapted from a NASA figure shows the CO_2 concentration is lower in the Tropics than either farther north or farther south [3]. This is consistent with similar data issued by NOAA in July 2009 [4]. The warmer air at the Equator expands to reduce the CO_2 concentration, such as the number of molecules per cubic meter in accordance with the gas law equation (1):

$$PV_i = n_iRT \quad (1)$$

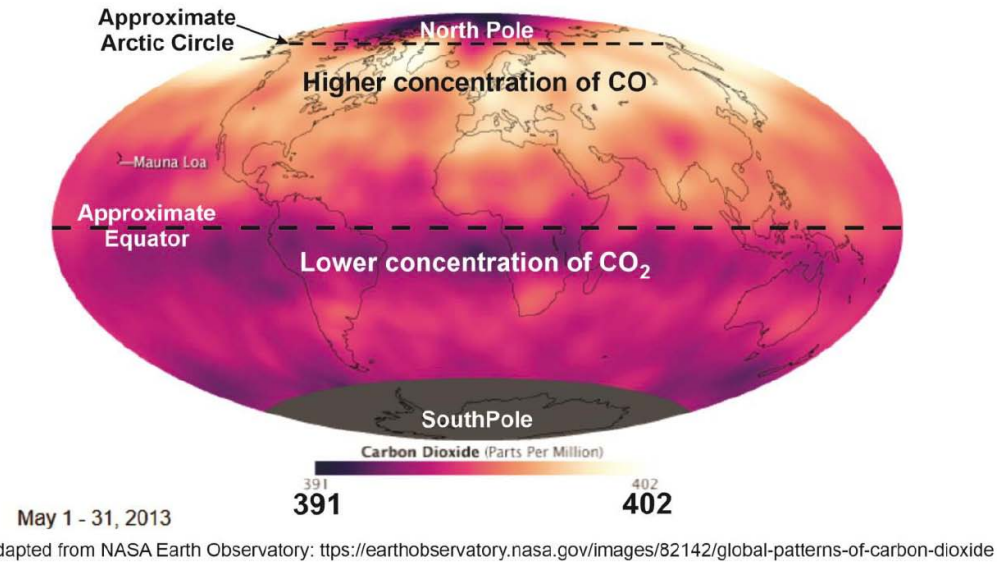
3. THE EQUATOR IS ALWAYS WARMER THAN THE ARCTIC AND ANTARCTIC

The Equator always receives much more of the Sun's energy annually than the Poles. The Equator receives 100% of the Sun's energy at the equinoxes when the Sun is directly over the Equator. At the summer and winter solstices, the Equator receives 91.7% of the Sun's energy. In contrast, the North Pole receives a maximum of 39.9% at the summer solstice, and 0% at the spring and autumn equinoxes and essentially 0% from the autumn equinox through the winter solstice when the Sun is below the horizon to the spring equinox. The situation is similar at the South Pole.

The difference in heating by the Sun is so large it is reasonable to assume the Equator is always warmer than the Poles at any time of the day or night or season.

4. TEMPERATURE RECORDS SHOW TEMPERATURE IS ALWAYS HIGHER AT THE EQUATOR THAN AT THE POLES

Temperatures at the exact North and South Pole are not available. As substitutes, the historical records of #1-Pond Inlet above the Arctic Circle [5] and #20-McMurdo Station below the Antarctic Circle [6] are used. The Equator is represented by #11-Libreville, Gabon on the west coast of Africa [7]. The numbers for each location are on Figure **4**, a map of the Earth, and



Adapted from NASA Earth Observatory: ttps://earthobservatory.nasa.gov/images/82142/global-patterns-of-carbon-dioxide

Figure 2: Global Patterns of carbon dioxide from NASA Earth Observatory showing lower CO_2 concentration in the Tropics.

the numbers with the names are in Table **1**. The latitudes of the Arctic and Antarctic Circles are given in Table **1** for reference.

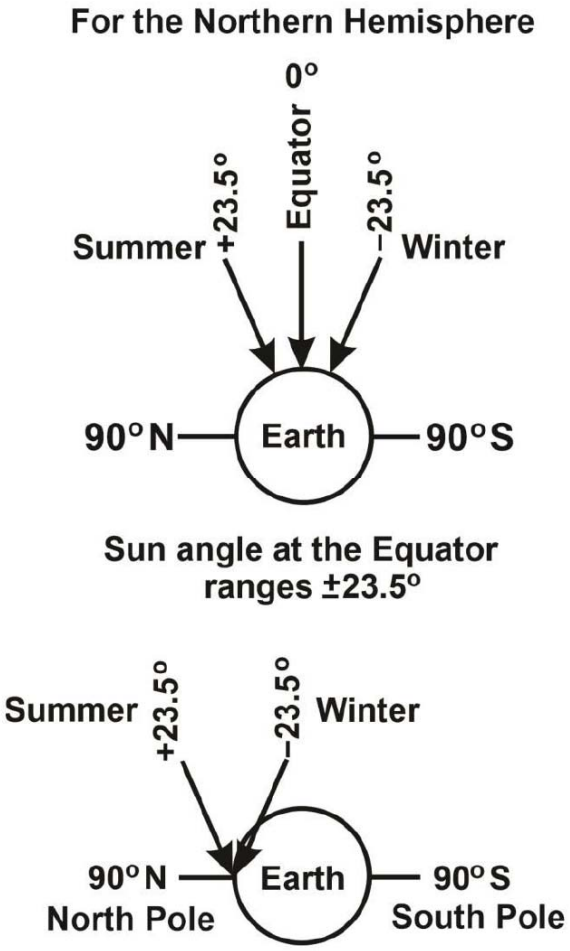


Figure 3: Sun angles for the Northern Hemisphere from summer to winter at the Equator and at the Poles.

The weather station locations in Figure **4** are located to be representative of the Arctic, Antarctic, Mid-latitudes North and South and the Equator. They are located such that half are always in sunlight and half in darkness and half are moving towards mid-summer and half are moving towards mid-winter.

The Libreville temperature range is compared with those of McMurdo and Pond Inlet in Figure **5**. The actual Poles at 90° N and 90° S are very likely colder than Pond Inlet just above the Arctic Circle and McMurdo just below the Antarctic Circle. Libreville is always above 68°F (20°C) and Pond Inlet and McMurdo are always below 68°F (20°C). Thus, with theoretical and practical knowledge we can say with confidence the Earth's temperature is always higher at the Equator than at the Poles, and at any time of the day or night or the season.

5. CALCULATE THE ACTUAL WATER VAPOR FROM TEMPERATURE AND RELATIVE HUMIDITY (RH) BETWEEN THE ARCTIC AND ANTARCTIC AND THE EQUATOR

The methodology is to record the temperature and RH at the three locations in Figure **5** and in Table **2** at the same time. This is done using AccuWeather on a cellphone that only became available in 2007 [8]. The current temperature and RH on AccuWeather are updated hourly [9]. As it does not matter the time of day or the season, November 1, 2020 at 13:33 Montreal time was chosen as an example because of convenience. All times are 24 hour times.

In this example, the difference in temperature between the Arctic and Antarctic and the Equator is

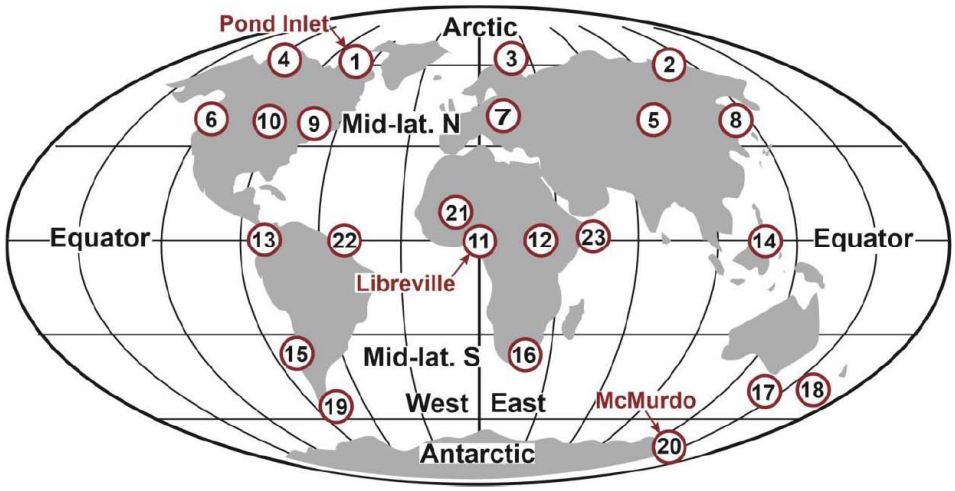


Figure 4: Map of the Earth showing weather station locations above the Arctic Circle, Mid-latitudes North and South, at the Equator and below the Antarctic Circle.

Table 1: These Three Weather Station Locations are from Figure 4

No.	Location	Latitude	Longitude	Elevation, m.
1	Pond inlet, Canada	72° 42' N	77° 58' W	31
11	Libreville, Gabon	0° 25' N	9° 28' E	30
20	McMurdo Antarctica	77° 50' S	166° 41' E	10
	Arctic Circle	66.5° N		
	Antarctic Circle	66.5° S		

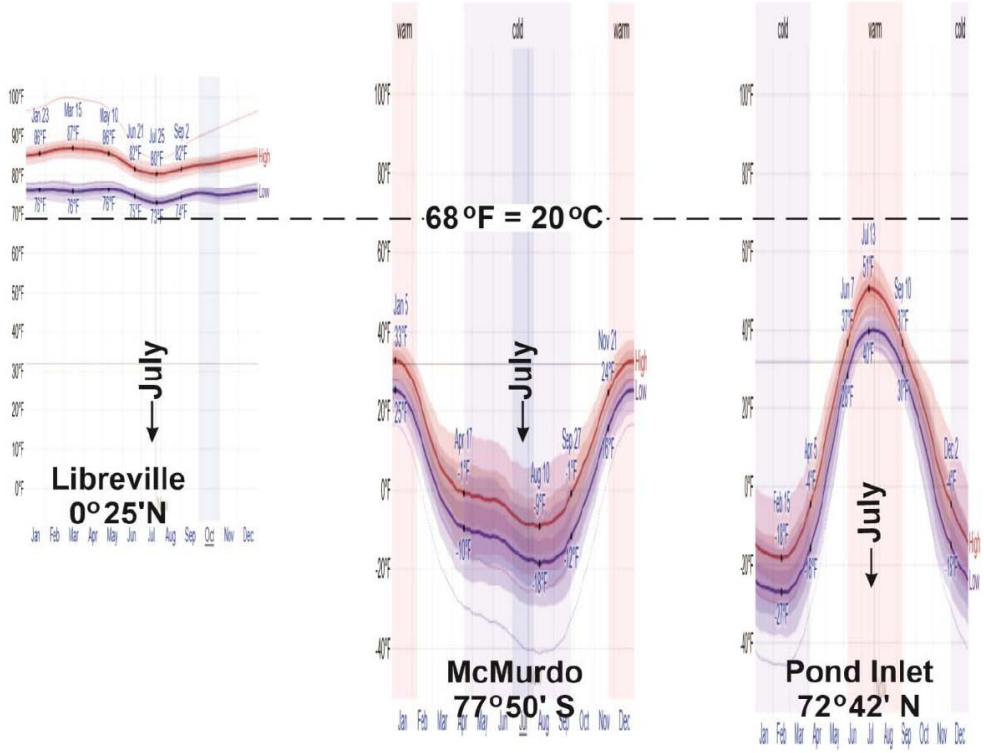


Figure 5: Historical temperature records from WeatherSpark for Libreville, McMurdo and Pond Inlet.

Table 2: Temperature and RH Recorded at the same Montreal Time of 13:33 above the Arctic Circle, at the Equator and Below the Antarctic Circle

No.	Location	Date	Local Time	Temp., °C	RH, %	Water vapor, kg water/kg dry air
1	Pond inlet	Nov 1	13:33	-14	85	0.96
11	Libreville	Nov 1	19:33	25	94	19.18
20	McMurdo	Nov 2	07:33	-14	42	0.48

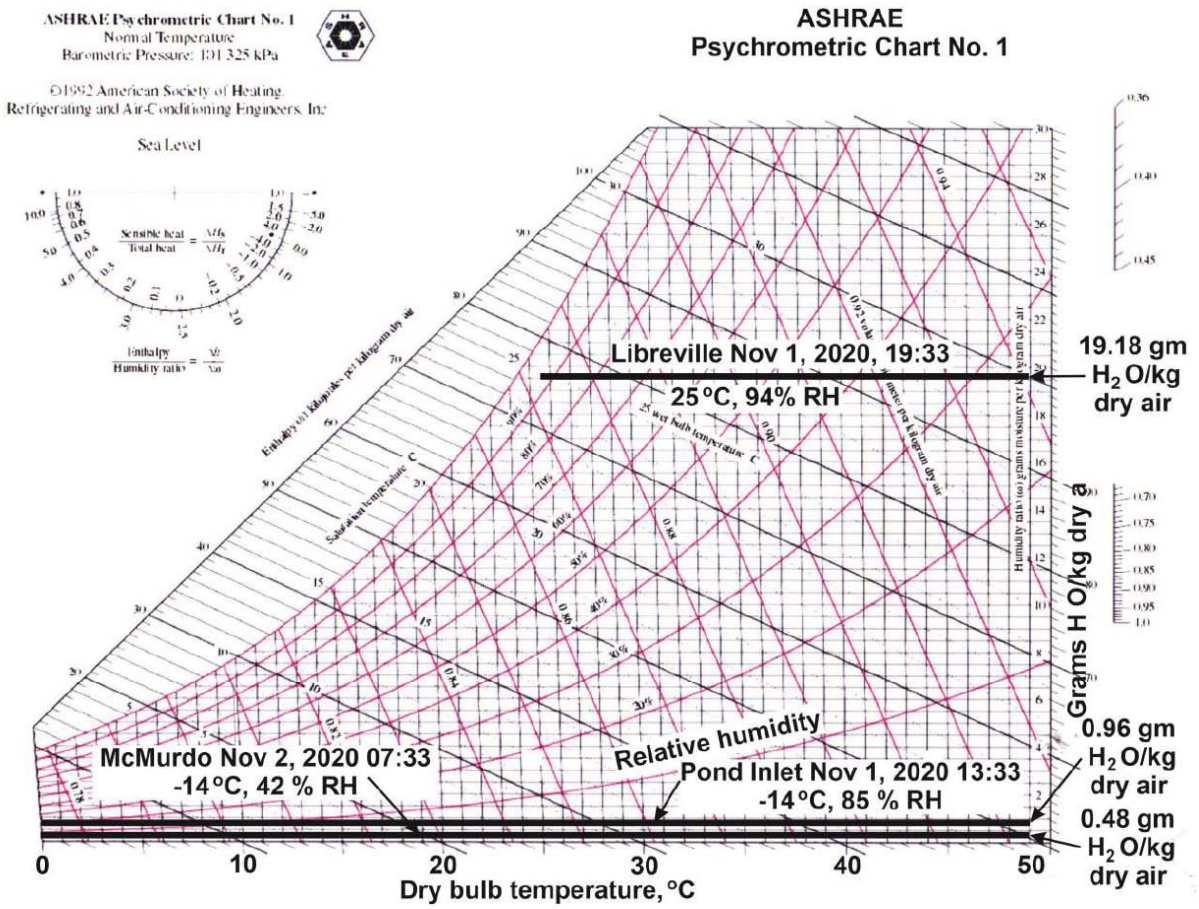


Figure 6: Psychrometric Chart for Libreville, McMurdo and Pond Inlet for determining water vapor content.

39°C. It is pure coincidence that the temperature is the same at Pond Inlet as it is at McMurdo Station. The temperature and RH at each of the three locations are used to determine water content of the air by using the psychrometric chart in Figure **6**.

Psychrometric charts [10] were invented in 1904 by William Carrier and are used by engineers to design heating, ventilating and air conditioning systems for a wide variety of buildings worldwide. Computer psychrometric programs, such as Humidair [11], are available and are easier to use and more accurate than the charts. In this example, water vapor content at the Equator is 20 to 40 times that in the Arctic and Antarctic.

6. THE GAS LAWS DETERMINE THE DIFFERENCE IN CO_2 CONCENTRATION BETWEEN THE ARCTIC, ANTARCTIC AND THE EQUATOR

The Gas laws currently represented by Equation (1) are used to estimate the difference in CO_2 concentration between the Poles and the Equator.

The Gas laws were developed as an explanation for observations of what was happening in the atmosphere. Boyle's Law [12, 13] applies to the pressure part of the equation. It states that for a gas at constant temperature the volume varies inversely with pressure. It was developed from observations that air pressure decreased with increased altitude. This causes expansion of the air and reduces the

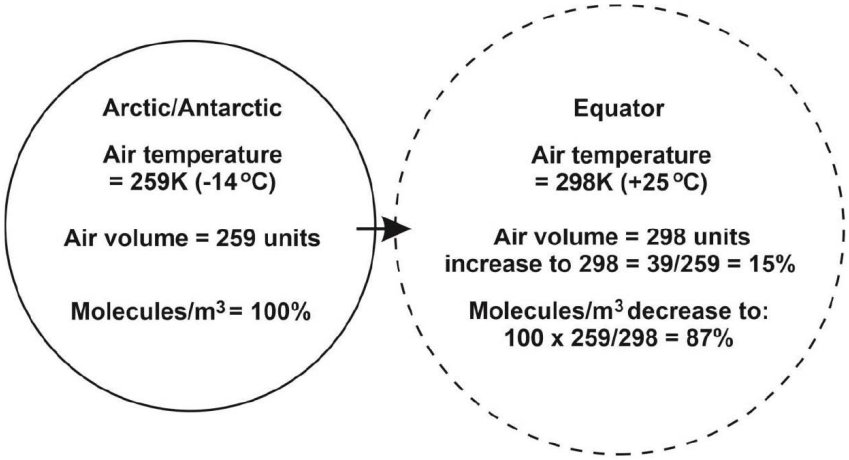


Figure 7: The Law of Charles/Gay-Lussac applied to the example in the text.

concentration of oxygen. That is why aircraft are pressurized to about 2400 meters and climbers on Mount Everest carry oxygen bottles.

The Gas Law of Charles/Gay-Lussac [14] was developed in 1787 and is the volume part of Equation (1). It is an explanation of why hot air balloons rise in the air. It is also an explanation of why thermals, rising columns of air, were observed. This Law states that the volume of a gas at constant pressure is proportional to the Absolute temperature. As a gas expands or contracts in response to temperature, the concentration, in terms such as molecules per cubic meter, falls or rises.

In the example used in Tables **1** and **2** and in Figure **7**, the difference in elevation between the locations is too small to have as significant effect on air pressure and is ignored. Thus, Boyle's Law is ignored and only the Gas law of Charles/Gay-Lussac is used. For example, Pond Inlet at -14° C is 259K, McMurdo at -14° C is also 259K and Libreville at 25° C is 298K. The reduction in concentration of CO_2 from the Arctic and Antarctic to the Equator is (39/259) = 15%. For more detail, see Figure **7**.

These real and reproducible values prove that moving from the Arctic and Antarctic towards the Equator causes the temperature to go up by 39° C, the CO_2 goes down by 15% and the water vapor goes up from 0.48 and 0.96 kg of water per kg of dry air to 19.18. The concentration reduction of CO_2 is actually larger than 15% because of dilution by water vapor at the Equator [15]. For example, if the CO_2 concentration were 400 ppm at McMurdo, the concentration at Libreville would be (400 x 0.85) = 340 ppm less because of dilution by water vapor of 12 ppm = (340 – 12) = 328 ppm. The actual reduction in CO_2 is then (400 – 328)/400 = 18%. Pictorially: T↑, CO_2↓ and WV↑ and as in Figure **7**. This shows warming by water vapor cannot be added to that of CO_2 as promoted by the IPCC because the warming effects of CO_2 and water vapor oppose each other [15].

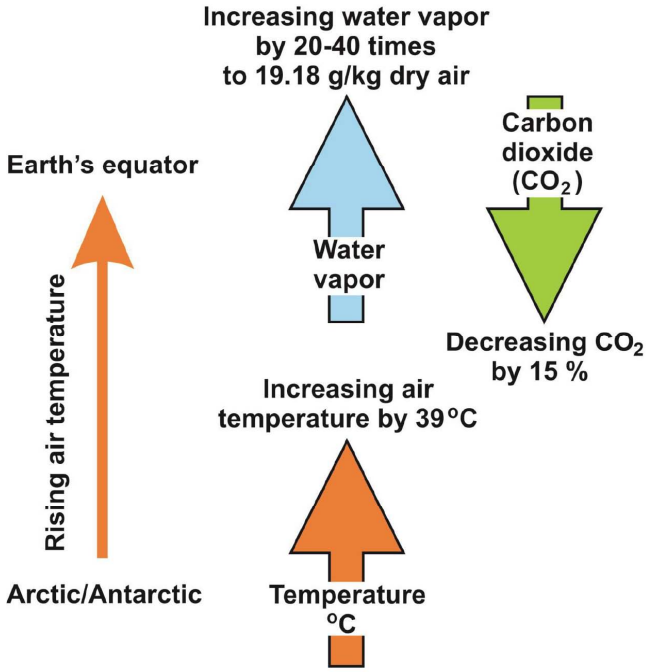


Figure 8: Actual relationship between temperature, water vapor and CO_2 when moving from the Poles to the Equator.

7. ALL 52 OF THE IDENTIFIED GHG BEHAVE EXACTLY LIKE CO_2

Since August of 2018 when the value of AccuWeather on a cellphone began to be explored, enough information has been collected to construct Figure **9** for CO_2. The values in Table **2** and the 15% reduction of CO_2 are within these ranges.

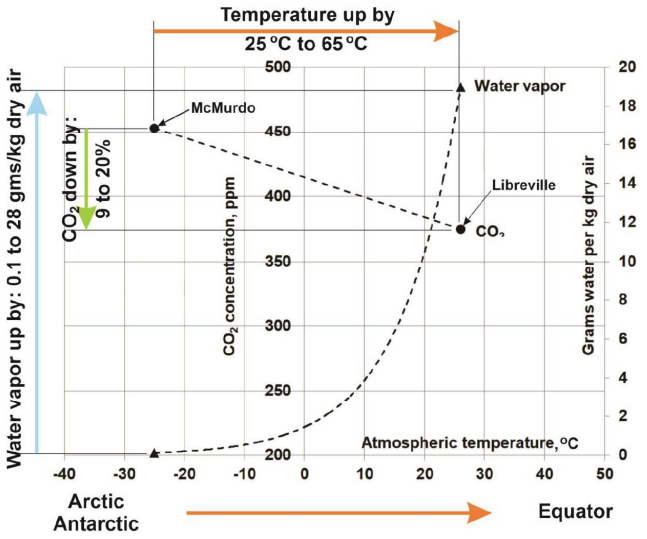


Figure 9: Expected ranges of temperature, reduction in CO_2 and increase in water vapor content between the Arctic/Antarctic and the Equator.

All of the 52 GHG identified in Table 2.14 of AR4 are above their boiling points and, therefore, act as ideal gases. In other words, methane and nitrous oxide reduction from the Arctic and Antarctic to the Equator is the same as for CO_2 because of the Gas Law of Charles/Gay-Lussac. Thus, Figure **9** applies to the percentage reduction in concentration of all 52 GHG. Because the warming effect of water vapor acts in opposition to warming by CO_2 it also acts in opposition to warming by any of the 52 GHG.

8. SUMMARY AND CONCLUSIONS

The Intergovernmental Panel on Climate Change (IPCC) made errors in three assumptions when it claimed increasing CO_2 causes climate change in its 1990 and 2013 reports. The first is that increasing CO_2 concentration warms the air, the second is that warming by CO_2 and water vapor go up together and the third is that the warming by water vapor adds to the warming by CO_2. They provide no scientific evidence to support these claims and none is available. For example, there is no physical scientific evidence to show whether or not warming by water vapor can be added to warming by CO_2. Pictorially: their claim is $CO_2\uparrow$, T↑ and WV↑.

The purpose of this study is to determine whether or not there is scientific evidence to support the assumptions made by the IPCC.

The NOAA diagram, Figure **2**, shows the concentration of CO_2 is lower in the Tropics than at the Poles of the Earth. Why is CO_2 always lower at the Equator? It is lower because the temperature is always higher at the Equator. This is first shown theoretically by using Sun angles and then practically by using actual temperature measurements in the Arctic and Antarctic and the Equator. These show that at any time of the day or night or season, the Equator is always warmer than the Arctic and Antarctic. Air when it warms expands and the concentration in terms such as molecules of CO_2 per cubic meter of dry air falls.

Temperature and relative humidity (RH) is recorded at the same time at Pond Inlet above the Arctic Circle, at McMurdo Station below the Antarctic Circle, and at Libreville on the Equator using AccuWeather on a cellphone. The latter technology became available only in 2007 and is the tool to record the temperature and RH values at the same time. Using a psychrometric chart, the water vapor content is determined using actual temperatures and RH. Then, the reduction in CO_2 from the Arctic and Antarctic to the Equator is calculated using the Gas Law of Charles/Gay-Lussac. For the example in this study, from the Arctic and Antarctic to the Equator, the temperature goes up by 39°C from -14°C to 25°C. The water vapor content increases from 0.48 to 0.96 kg per kg of dry air to 19.18, an increase of 20 to 40 times. The concentration of CO_2 falls by 15%. Pictorially: T↑, WV↑ and $CO_2\downarrow$. This is opposite to the claim by the IPCC.

The scientific evidence presented in this study proves air temperature and CO_2 concentration do not move up and down together as claimed by the IPCC. Furthermore, the warming effect of water vapor does not add to the warming by CO_2. In fact, as the warming effect of CO_2 concentration increases that of water vapor falls. This evidence for CO_2 also applies to all 52 of the greenhouse gases identified in Table 2.14 of AR4, including methane and nitrous oxide.

As this study shows, the authors of the IPCC reports in 1990 (FAR) and 2013 (AR5) made three errors in assumptions and the Administration of the IPCC did not find them. These errors are serious and are likely caused by not considering all of the science available at the time and by a lack of physical evidence.

This study presents hard evidence that increasing CO_2 in the atmosphere cannot physically increase the Earth's temperature by any amount and certainly not the 2°C claimed. There is no man-made global warming, often called anthropogenic global warming, and there is certainly no climate emergency. Higher

CO_2 is better for people because plants grow better and they are at the bottom of the food chain for every living thing.

Thus, policies designed to reduce carbon emissions are based on faulty science and will ultimately hurt our people. Net zero carbon emissions and carbon sequestration are useless government and corporate policies, prohibitively expensive with no return on investment.

Recommendations

It is recommended that:

1. The IPCC and the UN publicly admit the errors in the assumptions and correct them.
2. This paper is used in High School science classes.
3. Readers use their cellphones and replicate the results in Figure **9** as a learning experience.

9. APPENDIX A

The purpose of the Appendix is to present Tables **3** and **4** with details of the weather station locations selected for study. Figures **9**, **10** and **11** are plots of nine sets of readings representing several different times of day and the four seasons. The times for the readings taken at the locations on September 2018 are in Table **4**.

Table 3: These 23 Weather Station Locations are from Figure 1 and are Available on AccuWeather

No.	A Location	B Latitude	C Longitude	D Elevation, m.	E Air Pressure, Pa
Above Arctic Circle					
1	Pond inlet, Canada	72° 42' N	77° 58' W	31	100,953
2	Tiksi, Russia	71° 38' N	128° 51' E	41	100,833
3	Kirkenes, Norway	69° 40' N	30° 03' E	15	101,145
4	Inuvik, Canada	68° 22' N	133° 43' W	26	101,013
Mid-latitudes North					
5	Karamay, China	45° 35' N	84° 53' E	356	97,121
6	Portland, Oregon, USA	45° 31' N	122° 40' W	18	101,301
7	Milan, Italy	45° 28' N	9° 13' E	126	99,820
8	Harbin, China	45° 48' N	126° 32' E	120	99,892
9	Montreal, Canada	45° 30' N	73° 34' W	29	100,977
10	Minneapolis, USA	45° 59' N	93° 16' W	255	98,299
Equator					
11	Libreville, Gabon	0° 25' N	9° 28' E	30	100,965
12	Kampala, Uganda	0° 21' N	32° 35' E	1190	87,823
13	Quito, Ecuador	0° 11' S	78° 28' W	2922	70,807
14	Samarinda, Borneo	0° 30' S	117° 08' E	3	101,289
Mid-latitudes South					
15	Santiago, Chile	33° 27' S	70° 40' W	533	95,084
16	Port Elizabeth, S. Africa	33° 58' S	25° 36' E	61	100,594
17	Hobart, Australia	47° 53' E	147° 20' E	9	101,217
18	Dunedin, New Zealand	45° 53' S	170° 30' E	6	101,253
19	Rio Grande, Tierra del Fuego	53° 47' S	67° 42' W	15	101,145
Below Antarctic Circle					
20	McMurdo Station, Antarctica	77° 50' S	166° 41' E	10	101,205
Sahara Desert					
21	Taoudenni, Mali	22° 47' N	3° 59 W	138	99,678
Equator					
22	Macapa, Brazil	0° 02' N	51° 04' W	15	101,145
23	Mogadishu, Samolia	2° 03' N	45° 19E	61	100,594

Table 4: Date and Time for the Autumn Equinox of September 21, 2018 of Atmospheric Temperature, Relative Humidity, CO_2 Concentration in Dry Air and Water Vapor Concentration in Dry Air for Locations 1 to 20. Number 21 is in 2019 and 22 and 23 are in 2020

A		B	C	D	E	F	G	H
		2018		24 Hour			CO_2 in	WV
		Local	Local	Montreal	Temp.	RH	dry air	gms/kg
No.	Location	Date	time	time	°C	%	ppm	dry air
Above Arctic Circle								
1	Pond Inlet	Sep 21	6:15	6:15	-5	99	411.7	2.48
2	Tiksi	Sep 21	19:20	6:20	2	79	400.7	3.46
3	Kirkenes	Sep 21	12:25	6:25	12	57	387.9	4.97
4	Inuvik	Sep 21	4:13	6:13	0	59	404.4	2.23
Mid-latitudes North								
5	Karamay	Sep 21	18:25	6:25	24	10	357.4	1.92
6	Portland	Sep 21	3:24	6:24	12	86	388.5	7.54
7	Milan	Sep 21	12:18	6:18	25	66	366.1	13.36
8	Harbin	Sep 21	18:19	6:19	15	92	378.0	10.00
9	Montreal	Sep 21	6:12	6:12	15	81	381.7	8.64
10	Minneapolis	Sep 21	5:23	6:23	14	90	374.3	9.27
Equator								
11	Libreville	Sep 21	11:21	6:21	28	78	366.6	18.77
12	Kampala	Sep 21	13:17	6:17	25	70	322.1	16.18
13	Quito	Sep 21	5:16	6:16	10	54	273.5	5.84
14	Samarinda	Sep 21	18:17	6:17	30	66	365.4	17.79
Mid-latitudes South								
15	Santiago	Sep 21	7:22	6:22	9	52	368.5	3.96
16	Port Elizabeth	Sep 21	12:22	6:22	19	48	376.5	6.62
17	Hobart	Sep 21	20:24	6:24	16	48	382.8	5.46
18	Dunedin	Sep 21	22:14	6:14	7	97	395.2	6.06
19	Rio Grande	Sep 21	7:21	6:21	-2	92	407.9	2.95
Below Antarctic Circle								
20	McMurdo	Sep 21	20:19	6:19	-21	50	438.9	0.29
Sahara Desert								
21	Taoudenni	Dec 22	3:03	9:03	32	14	385.2	3.21
Equator								
22	Macapa, Brazil	Sep 24	5:12	3:12	33	57	366.3	16.46
23	Mogadishu, Samolia	Sep 25	00.15	13:15	26	79	372.8	17.05

11. APPENDIX B

Plots of Results for Sets of Data from September 2018 to September 2020

Figure **10** has Quito, Equador, and Kampala, Uganda, both of which are on the Equator. The CO_2 at Quito and Kampala are always the lowest because of the higher elevations of 2922m and 1190m respectively. Most of the other locations are much closer to sea level.

In Figure **11**, Quito is replaced by Taoudenni, Mali, in the Sahara Desert where the temperature is generally higher and water vapor is lower.

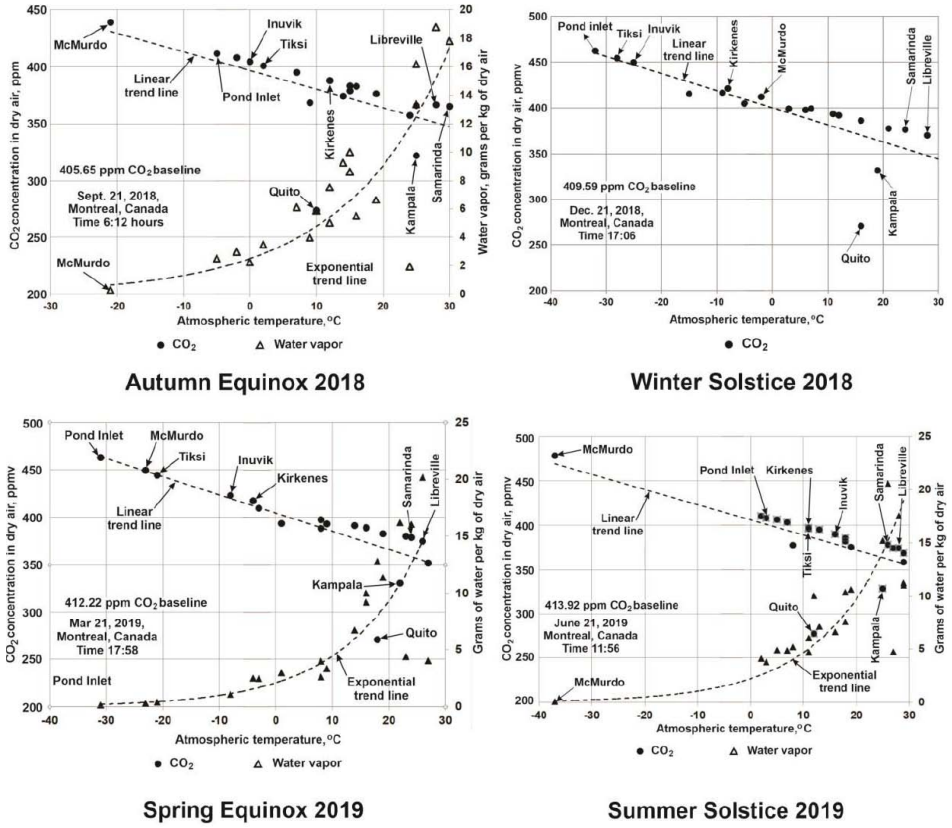


Figure 10: Plot of real time temperature, CO_2 and water vapor for specific dates in 2018 and 2019.

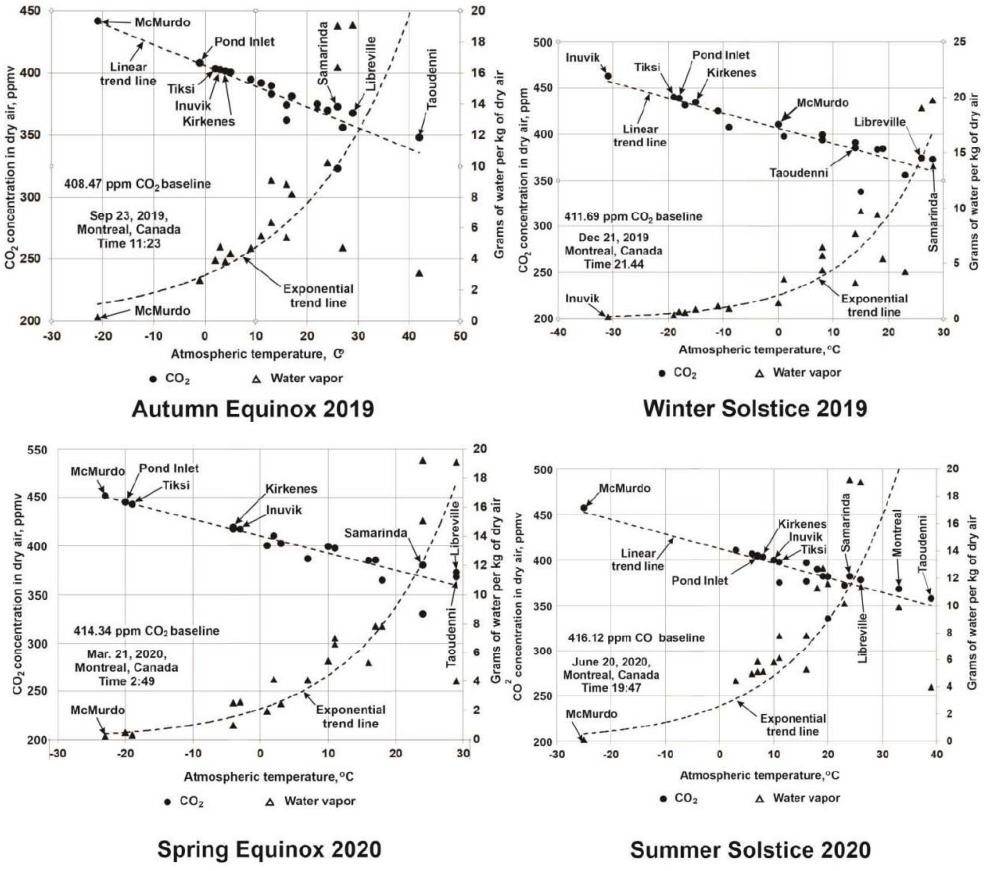


Figure 11: Plot of real time temperature, CO_2 and water vapor for specific dates in 2019 and 2020. Quito is replaced with Taoudenni, Mali, in the Sahara Desert.

In Figure **12**, Taoudenni and Kamapala are replaced by Macapa, Brazil, and Mogadishu, Samolia. These two locations are very close to sea level. As a result, for all of the locations, CO_2 is closer to the linear trend line.

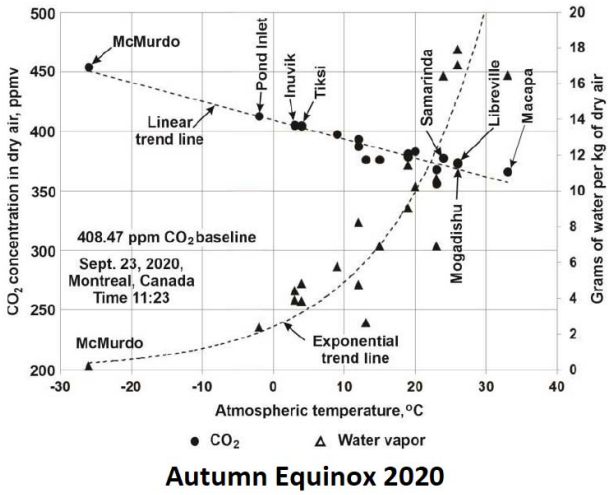


Figure 12: Plot of real time temperature, CO_2 and water vapor for September 23, 2020. Taoudenni and Kampala are replaced with Macapa, Brazil, and Mogadishu, Samolia. As most locations are now closer to sea level, the CO_2 points are now tighter around the linear trend line.

By observation, in all of the plots, locations in the Arctic and Antarctic are always colder than those on the equator. The concentration of CO_2 is always lower at the Equator and the water vapor content is always much higher.

Future plots will show reduction in CO_2 as a percentage. This will avoid any confusion that might arise over definitions of units for measuring CO_2 concentration.

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