Monthly Update

Technical Study in the Relationships of Solar Flux, Water, Carbon Dioxide

To Global Weather Patterns

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The purpose for this paper

This paper is not meant to be a peer-reviewed work; but it is meant to give a foundation for a more serious study of the subject matter presented here which is of determining the basis of developing a global temperature. There are three areas of interest.

1) The amount of thermal energy that reaches the planet from the sun.
2) The amount of thermal energy that is initially absorbed by the planet.
3) The process on the planet that 'temporarily' holds thermal energy on the planet.

In this paper, I will give a frame work for determining all three aspects.

Part One, the blackbody temperature of the planet
Part Two, the planetary greenhouse effect
Part Three, the probable range of temperatures on the planet

Appendix
NASA Table Land Ocean Temperature Index (LOTI) April 2008
NASA Table Land Ocean Temperature Index (LOTI) current to the date of this paper

Part One, the Blackbody Temperature of the Planet Earth

Determining the 'exact' blackbody temperature of the planet is the first step in determining what the "greenhouse' effect is; for without that value all else is either speculation or based on an unreliable value. This leads us to a quandary since the planet is a globe spinning around a titled axis of rotation and with an elliptical orbit around the sun **Figure 1** which is the source of virtually all the energy that heats the planet. Clearly, with these facts there cannot be one temperature for the planet and so, in theory, an average could be calculated but it will also be very misleading and lead to false conclusions; especially as it hides very large energy flows on the planet.

Traditional calculations of the planets black body temperature ignore the variables which then lead one to assume a steady state situation verses the real dynamic situation that actually drives climate. To justify this assumption a general statement that the variances are too small to have any meaningful effect are promoted. In some cases, maybe with fewer variables, this might be true but in this case, I think not.

These are the main variables, constants, and forces:

1. The sun has a primary and secondary cycle the primary is Magnetic of about 22 years (Pi times 7) which changes the polarity of the suns magnetic field which therefore gives a variation in the suns solar wind which is the more important.
2. The secondary cycle is the number of sun spots which is half the magnetic at about 11 years and that gives a small variation in the suns output of about 1%
3. The planet has an elliptical Orbit that varies by 3.34% or 4,999,849 miles, at this time.
4. The axial tilt of the planet is 23.4 degrees which causes winter and summer to alternate between Aphelion and Perihelion about every 10,000 years
5. The planet is a sphere so only one side faces the sun at any given moment
6. The sun's energy reaches the planet on a line drawn from the center of the sun to the center of the planet which only intersects the equator twice a year.
7. Actually, the line from the sun to the earth is to the barycenter (center of mass) of the earth and the moon system. Which changes the distance to the sun to the earth's surface by +/- 2,858 miles per lunar month; however, this complication is ignored in the study.
8. The energy from the sun is concentrated around this line, a hot spot.
9. The planet is a sphere so the suns radiation drops off in all directions from this line by a Cosine factor to zero at the edge 90 degrees from the center line
10. The spin and tilt of the planet means that the center line, in effect, moves up 23.4 degrees from the equator and then down 23.4 degrees from the equator during the course of one orbit
11. That movement means the distribution of the energy in the hot spot also moves
12. The distribution of land and ocean are not uniform on the planet and therefore the absorption of the solar flux is very different at points the hot spot travels over.
13. The albedo of the planet is a variable not a constant mainly as a factor of the amount and kind of clouds.
14. Energy from the core adds a small amount of energy, but not enough to matter.
15. Tidal forces from the sun and the moon also add some energy, again to small to matter

16. Energy is carried North and South from the hot spot, centered on the line described in item 6, by the atmosphere and the ocean
17. The Coriolis Effect along with tidal forces drive thermal transfer north and south at an angle and these are the main contributors to the climate

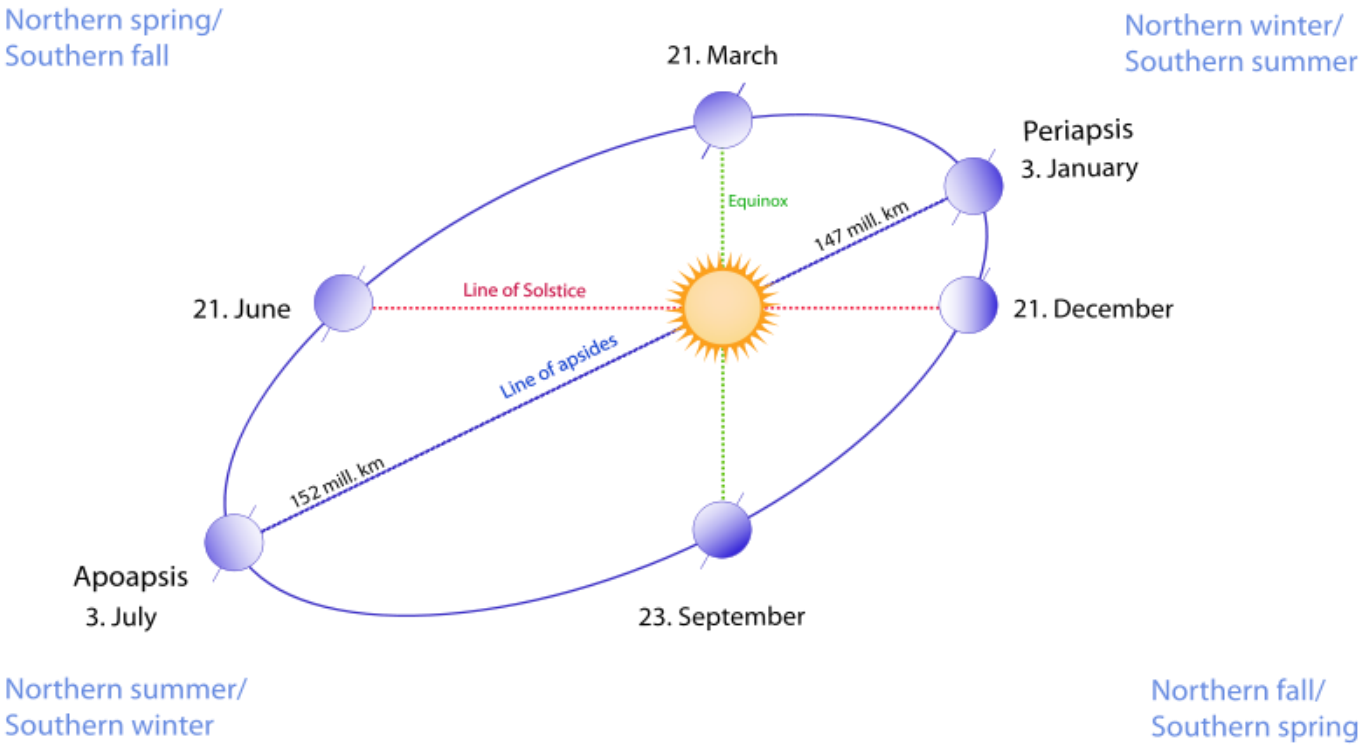
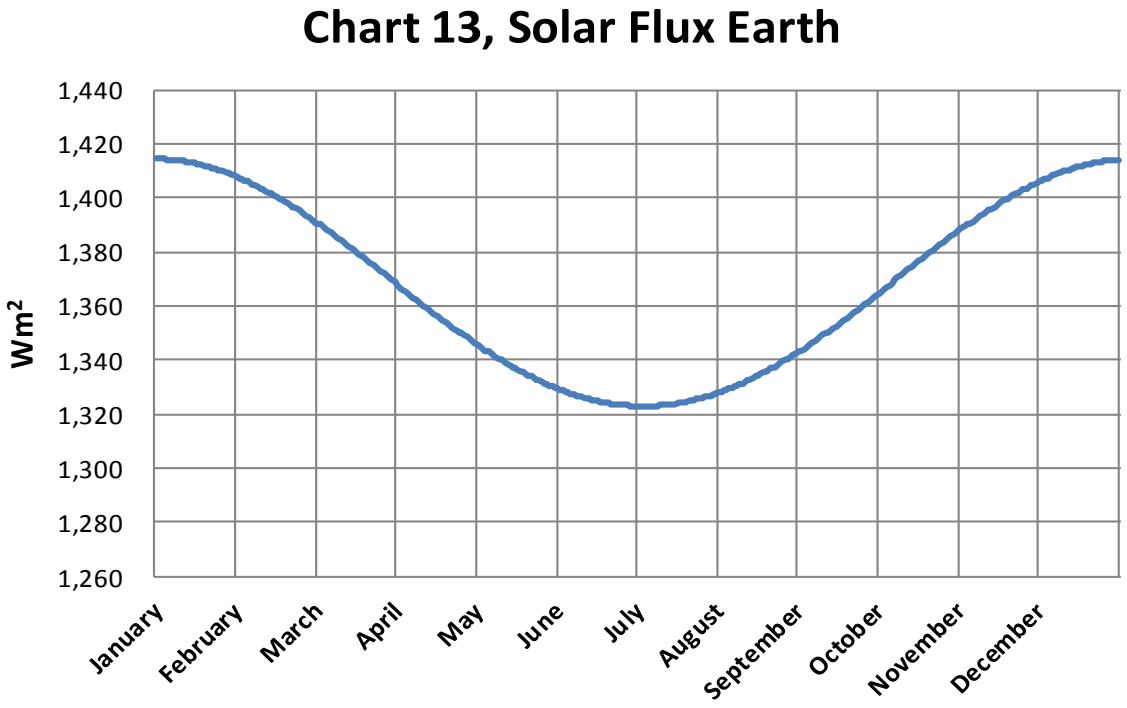


Figure 1, the Earth's orbit



There are three sources of energy that determine the climate on the earth: the radiation from the sun which is said to be 1366 Wm^2 The actual value based on the orbital range is from 1414.4 Wm^2 in January to 1323.0 Wm^2 in July see **Chart 13** and there is also an eleven year sun spot cycle with a range of 1.37 Wm^2. The hot core of the planet adds ~0.087 W/m^2 and the gravitational effects of the moon and the sun (tides) adds another ~.00738 Wm^2. Of these three, the sun's radiation is by far the most important but considering all three the range during an eleven year solar cycle is from a high of ~1415.3 Wm^2 to a low of ~1322.4 Wm^2 so a more accurate mean would be 1368.34 Wm^2.

The energy emitted by the planet must equal the energy absorbed by the planet and we can calculate this using the Stefan-Boltzmann Law. Which is the energy flux emitted by a blackbody is related to the fourth power of the body's absolute temperature. In the following example, the tidal and core temperatures are added after the albedo adjustment since they are not reduced by the albedo.

$E = \sigma T^4$

$\sigma = 5.67 \times 10^{-8}\ Wm^2\ K\ sec$

A = 30.6% (the planets albedo, this is not actually a constant)

$\sigma T_{bb}^4 \times (4 \pi R_e^2) = S\ \pi R_e^2 \times (1-A)$

$\sigma T_{bb}^4 = S/4 * (1-A)$

$\sigma T_{bb}^4 = 1368.24/4\ Wm^2 * .694$

$\sigma T_{bb}^4 = 247.46\ Wm^2$

$T_{bb} = 254.36\ K$

Earth's blackbody temperature Earth's surface temperature (when report first written)

$T_{bb} = 252.23^o$ K (-20.92^o C) low $T_s = \sim 287.75^o$ K (14.6^o C) today

$T_{bb} = 254.36^o$ K (-18.79^o C) mean

$T_{bb} = 256.54^o$ K (-16.51^o C) high

The difference between the blackbody and the current temperatures is what we call the 'greenhouse' effect that averages 33.36^o Celsius (C), today, although the range is from 35.52^o C to 31.11^o C from variations in the 11 year solar cycle. This documented variation means that the stated Blackbody radiation as shown here will give a 4.41^o C variation or let's say 14.0^o C plus or minus 2.2^o C because of the Stefan-Boltzmann Law which has a 4th power amplification. This will result in a slow 11 year cycling fluctuation of energy in the tropics where the bulk of the energy comes in that is not inconsequential.

If we add clouds to the picture it get even more complex as they have a significant effect on the planets albedo as we know from two major volcanoes' both in Indonesia; one in 1815 Tambora and the other in 1883 Krakatoa both of which threw enough particles into the atmosphere to significantly lower the temperature of the planet. Although dust is not a cloud the point is that if the albedo of the planet is changed it does have a major effect on global temperatures. The lack of thermometers in 1815 means

we really don't know what the effect was other than 1816 is known as the year without a summer. The other eruption in 1883 is well documented and is estimated to have dropped world temperatures by 1.20^{o} C which would be equivalent to about a 4.2% reduction in the global albedo. The importance of clouds can be seen in the following Chart Figure 3. A reasonably estimate of the total effect of clouds on the global albedo would be about 50% if nothing else changed or a reduction in Albedo from 30% to 15%. Just for reference the Albedo of the moon is 13.6% which if the earth had no clouds or water but still had an atmosphere the black body temperature of the planet would be 268.71^{O} K or -4.4^{O} Celsius.

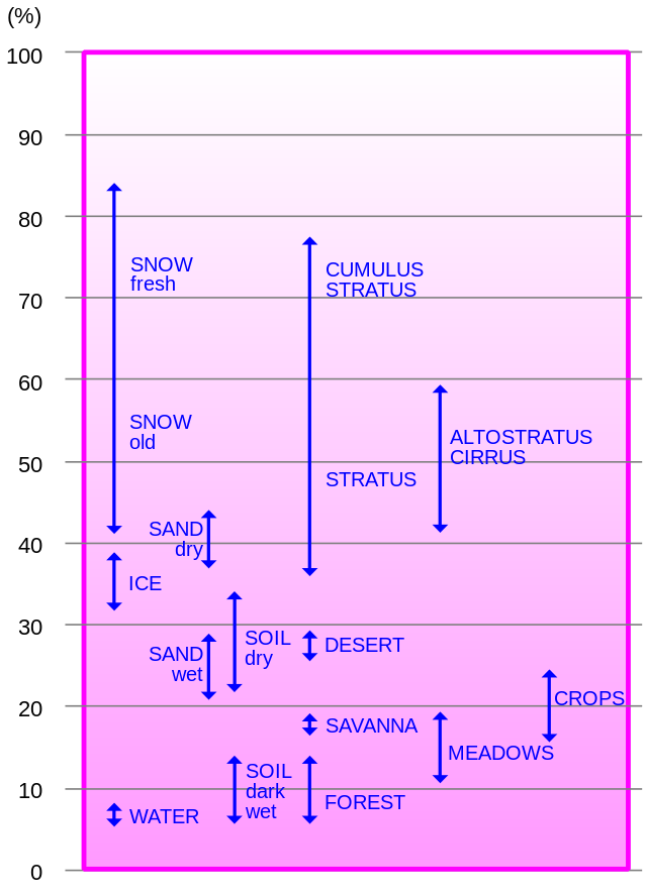


Figure 3, Albedo of various surfaces

Just for sake of argument if we varied the cloud levels by +/- 10% we find that at low solar flux and high clouds the Blackbody temperature would be 249.46^{o} K and with high solar flux and low clouds the Blackbody temperature would be 259.32^{o} K a range of 9.86^{o} C. The reason this is so important is that properly modeling cloud levels is the area with the most uncertainly in the present climate models as clouds form at much lower mesh resolutions (an aspect of the process used) then the present models can deal with even if the formation could be properly modeled.

Despite this variation in incoming solar flux the planet's temperatures has been very stable as shown in **Figure 4** so we know there are no positive or negative feedback process of any consequence on the planet that would create a runaway temperature scenario. Other factors are also important in doing climate work such as 52.3% of the solar energy is concentrated within 45.0 degrees of the hot spot and 77.6% within 60 degrees of the hot spot. And the heat from the core and probably the tides is concentrated where the crust is the thinnest under the oceans and this concentration of energy core

heat and tides) combined with Coriolis forces is probably what drives the ocean currents. In my opinion these other important factors are not being considered properly in the climate models, and that results in climate models that don't work properly e.g. the inability to explain why there has been a pause in the warming calculated by NASA and NOAA over that past ten years despite a continuing increase in the level of CO_2 in the atmosphere.

We also know from geological studies **Figure 4** that the planets temperature has been relatively stable over the past 600 million years with a mean of about 17^{o} C or 290^{o} Kelvin (K) and with a range of plus or minus 5^{o} K or C based on the information in **Figure 4**. During the past 250 million years CO_2 concentrations have ranged from a low of ~280 ppm (a historic low) in 1800's to the present low of 410 ppm to a high of over 2,000 ppm probably averaging around 1,500 ppm. There was only one other period in the past 600 million years with CO_2 this low. Going back, further CO_2 was estimated to be as high as 7,000 ppm, but we will ignore that for now.

This means that whatever the processes are that relate to determining the thermal balance of the planet they must work within this range of ~12^{o} C to be valid. Although **Figure 4** shows a range of 10^{o} C it would be prudent to spend resources to determine these values with as great accuracy as possible. We'll suggest a mean of 17^{o} C with a range from 10^{o} to 24^{o} C as being more reasonable in this work. Also, we are now in one of only three cold periods which are very rare in the past 600 million years and if we count that partial dip 150 million years ago that means that there is probably a 150 million year cycle there; maybe one of those first determined my Milutin Milankovic.

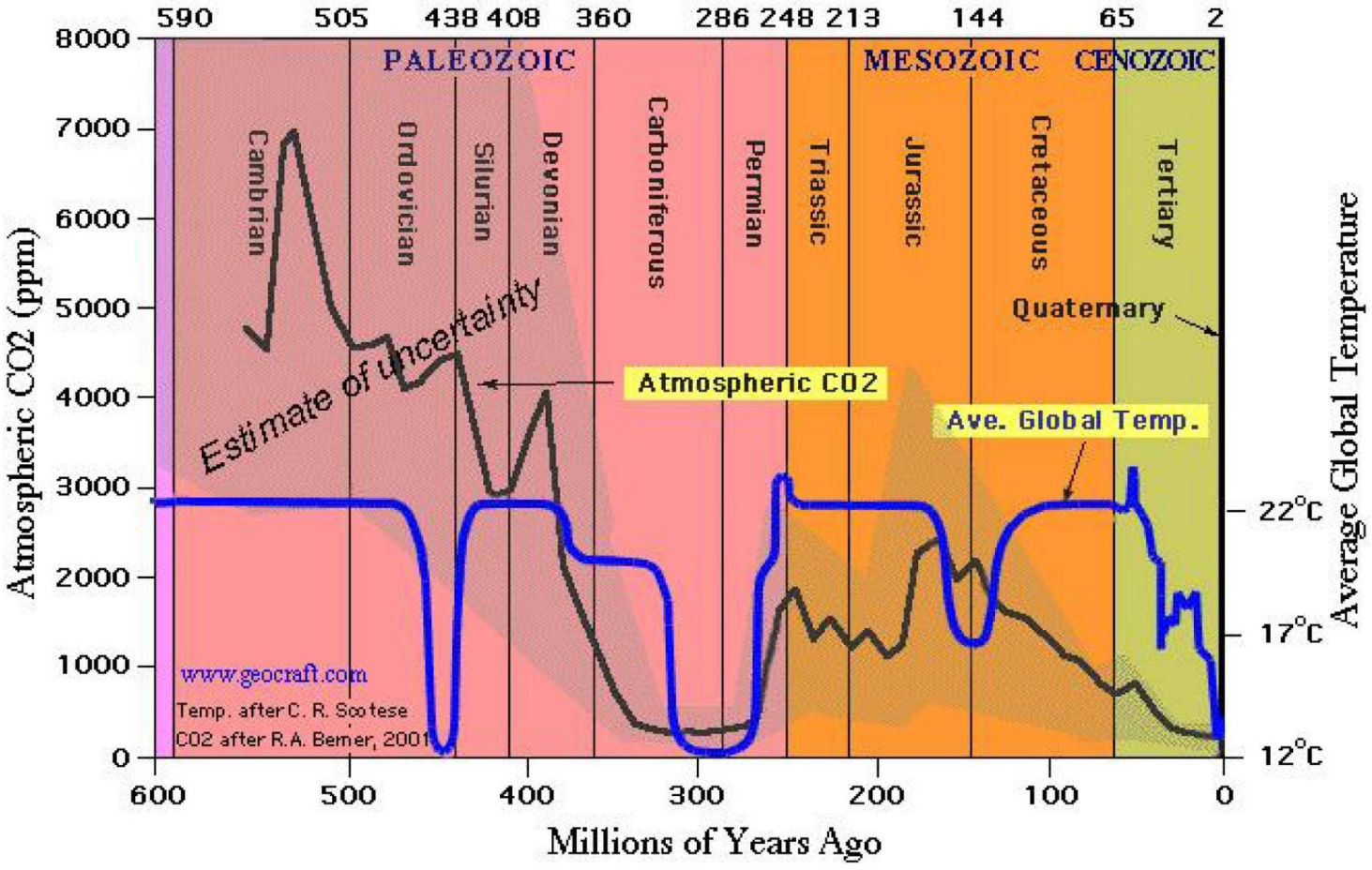


Figure 4, Geological temperatures, and Carbon Dioxide

Additional discussion as to the so called "greenhouse" effect must start with the important correction that this process is not a true greenhouse effect, since it is not the same process that occurs in a greenhouse used to grow food, not even remotely close to it.

The actual process that occurs is based on the structure of the atoms involved and how they interact with the various frequencies of visible and infrared radiation that are in play on the planet after arriving here from the sun. However at this point in time there is no way to correct for the misuse of the words so we are stuck with it and all the complications that therefore arise in trying to properly discuss the issue with lay people and even some with technical knowledge.

The greenhouse effect occurs within the earth's atmosphere and the main constitutes of wet air, by volume ppmv (parts per million by volume) are listed in the following table. Water vapor is 0.25% over the full atmosphere but locally it can be 0.001% to 5% depending on local conditions. Water and CO_2 are mostly near the surface not in the upper atmosphere so the bulk of the greenhouse effect must be close to the surface. This table is slightly different than most as it shows water.

Gas	Volume	Percentage
Nitrogen (N_2)	**780,840 ppmv**	**78.8842%**
Oxygen (O_2)	**209,460 ppmv**	**20.8924%**
Argon (Ar)	**9,340 ppmv**	**0.9316%**
Water vapor (H_2O)	**2,500 ppmv**	**0.2494%**
Carbon dioxide (CO_2)	**400 ppmv**	**0.0399%**
Neon (Ne)	**18.18 ppmv**	**0.001813%**
Helium (He)	**5.24 ppmv**	**0.000523%**
Methane (CH_4)	**1.79 ppmv**	**0.000179%**

There are only two of these gases that are relevant to determining how that 33^O C (today) happens. That is not to say the others do not contribute but that at the present concentrations of Water H_2O and Carbon Dioxide CO_2 they are the main determinants. And since we know the range of temperatures that have existed geologically then we have set the range which these two gases must interact in, meaning that any set of equations, models, or theories that predict values outside this range must be suspect based on geological evidence.

Also, it must be kept in mind that the solar flux falls on a spot centered on a line drawn from the center of the earth to the center of the sun and because of the 23.4^O axial tilt of the planet, this "Hot" spot moves up and down as the planet moves through its orbit. Because of the shape of the planet, the intensity falls off quickly as we move north, south, east, and west according to a cosine factor so the heat energy is mostly over oceans near the equator where the atmosphere is the densest.
The first image below **Figure 5** shows a recent distribution of water across the planet, it is clearly concentrated over the oceans close to the equator, and that results in the heat imbalance and therefore movement north and south as shown in the second image **Figure 6.**

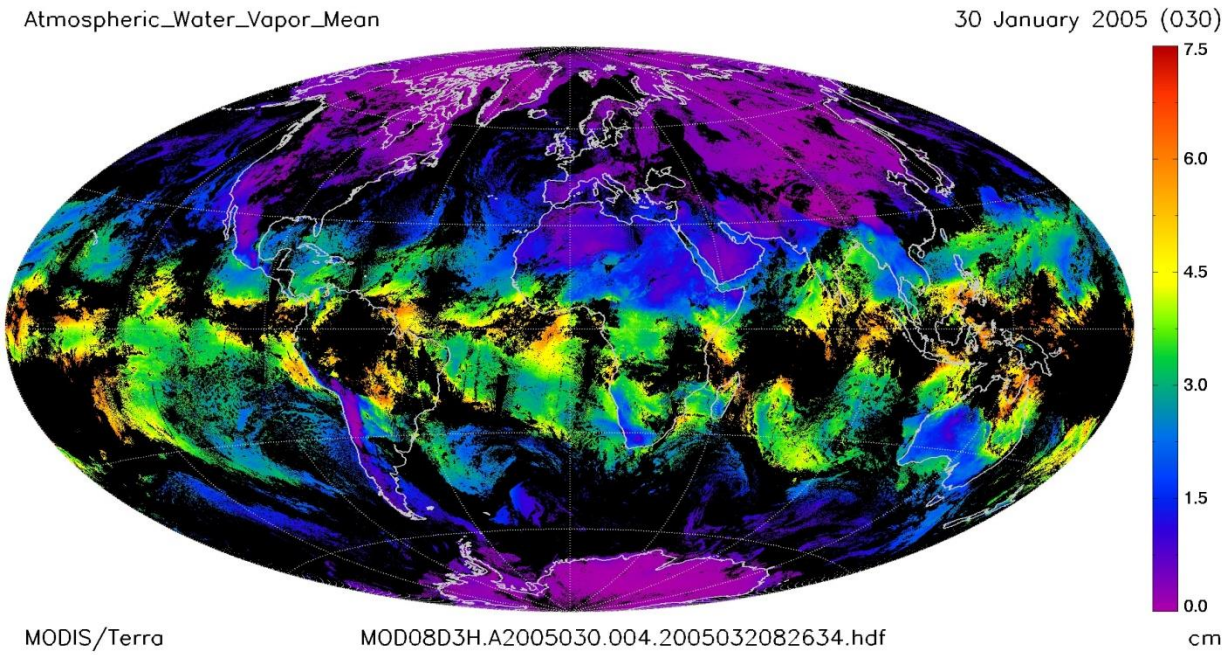


Figure 5, water vapor concentrated near the equator

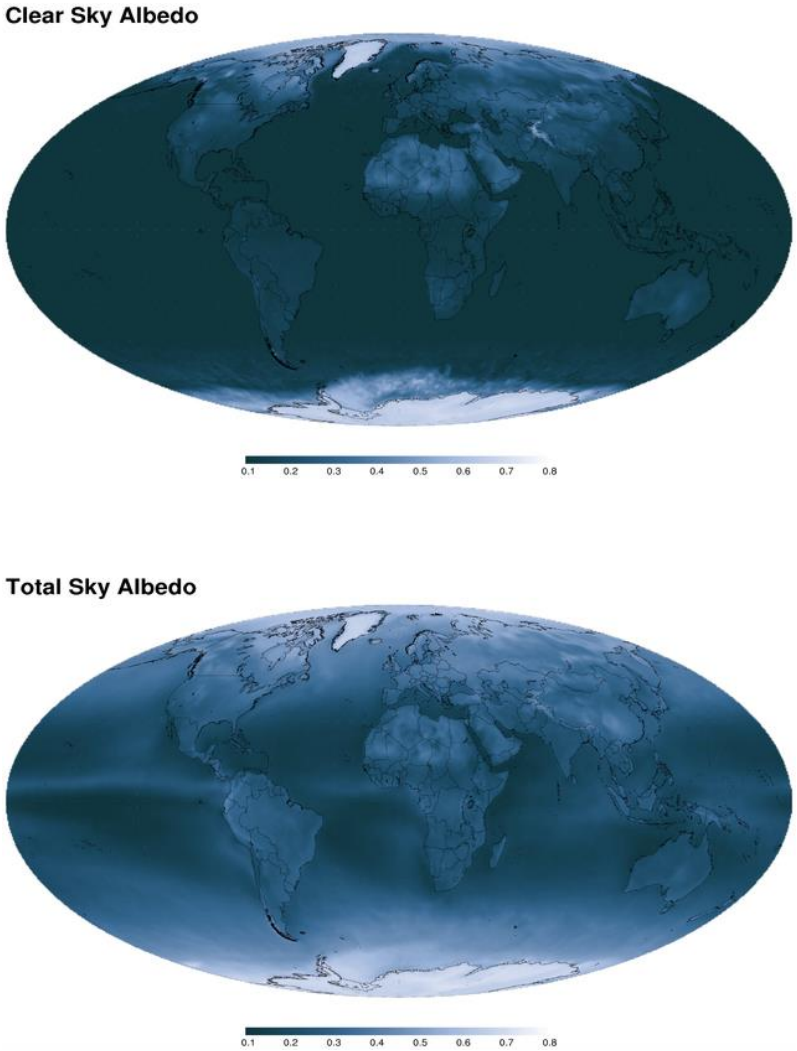


Figure 6, change in albedo

In summary we now know that the Blackbody temperature of the planet is a variable.

T_{bbl} = 252.23^{o} K (-20.92^{o} C) low at Aphelion
T_{bbm} = 254.36^{o} K (-18.79^{o} C) and the yearly mean
T_{bbh} = 256.54^{o} K (-16.51^{o} C) high at Perihelion

Therefore the 'greenhouse effect, with clouds as a constant, must be a variable.

T_s = ~287.75^{o} K (14.6^{o} C) today

$Gh_l = T_{bbl} + T_s$ = 35.52^{o} C
$Gh_m = T_{bbm} + T_s$ = 32.39^{o} C
$Gh_h = T_{bbh} + T_s$ = 31.11^{o} C

Considering there would probably be fewer clouds during cool period and more clouds during warm period the following would be more like the true effect considering both.

T_{bblc} = 252.98^{o} K (-20.17^{o} C) low at Aphelion
T_{bbmc} = 254.36^{o} K (-18.79^{o} C) and the yearly mean
T_{bbhc} = 255.83^{o} K (-17.32^{o} C) high at Perihelion

Therefore the 'greenhouse effect with clouds included must also be a variable. In this case we assume fewer clouds in cooler periods and more clouds in warmer periods of 2.5% which reduces the range and acts as a negative feedback on the process.

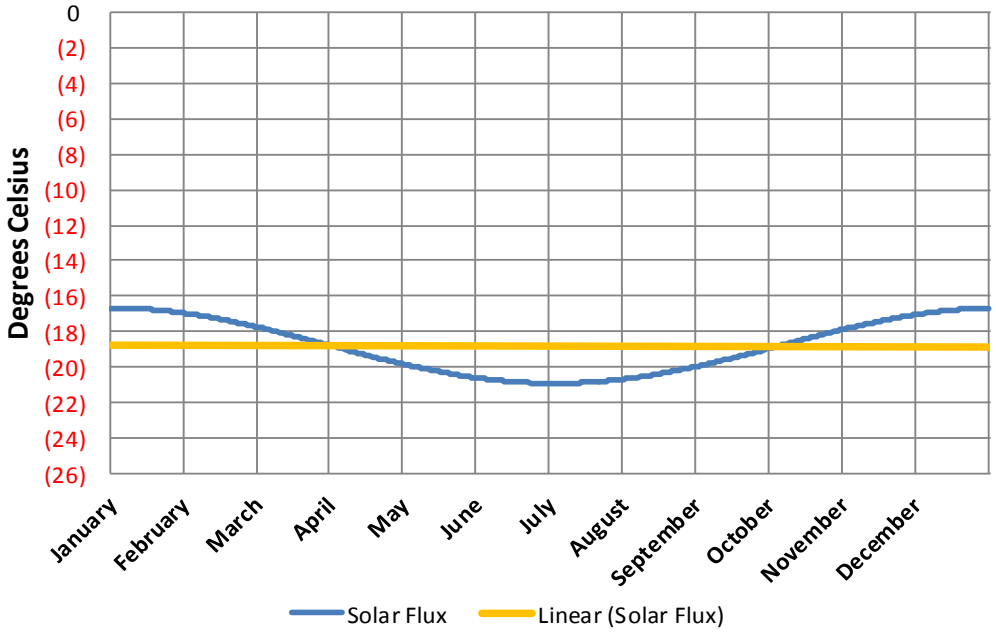
T_s = ~287.75^{o} K (14.6^{o} C) today

$Gh_{lc} = T_{bblc} + T_s$ = 34.77^{o} C
$Gh_{mc} = T_{bbmc} + T_s$ = 32.39^{o} C
$Gh_{hc} = T_{bbhc} + T_s$ = 31.92^{o} C

Chart 16 on the next page shows the true black body temperature of the planet over the period of one year assuming an atmosphere with no water or no CO_2. The blue plot is the actual and the yellow plot is the generally accepted average. The blue curve is plotted from the distance to the sun of the planet and accepted output of the sun in Wm^2 of the sun. Because of the Stefan-Boltzmann Law the small change in solar radiation, reaching the planet from the sun is magnified by the 4^{th} power such that it really does make a difference as is clearly shown in **Chart 16**.

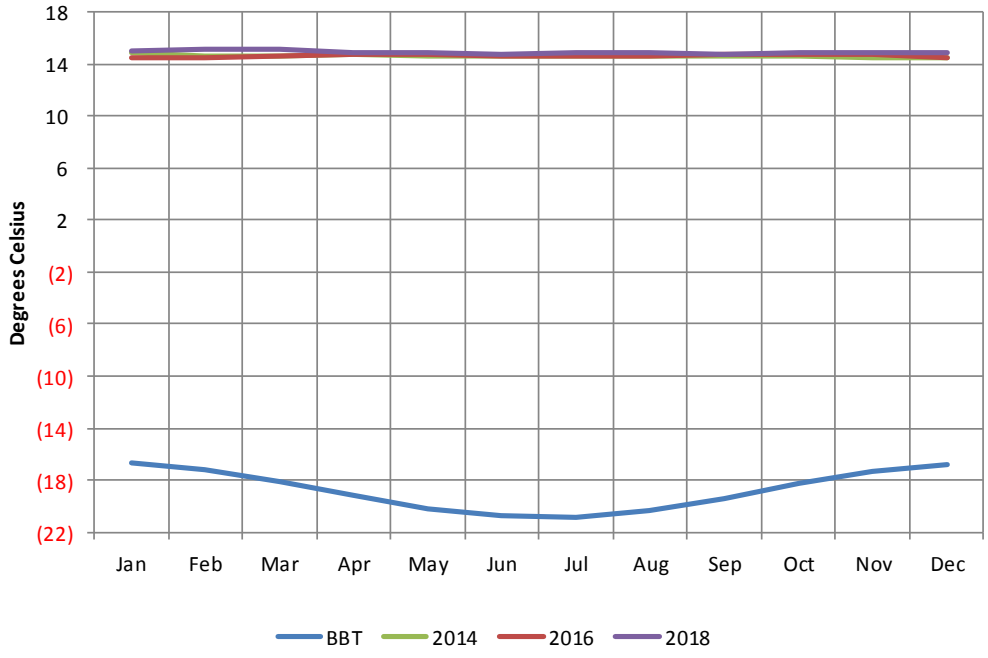
A swing of 4 degrees Celsius cannot be ignored when developing a climate model, especially when we are talking climate changes of a few degrees from CO_2 that are going to melt the planet. I cannot understand what has happened to science today it's like a belief in some bizarre pagan god demanding a sacrifice of a virgin girl every day to prevent the rest of us from being consumed by the environmental god Al Gore.

Chart 16, Black Body Temperature of planet -18.76 degrees Celsius



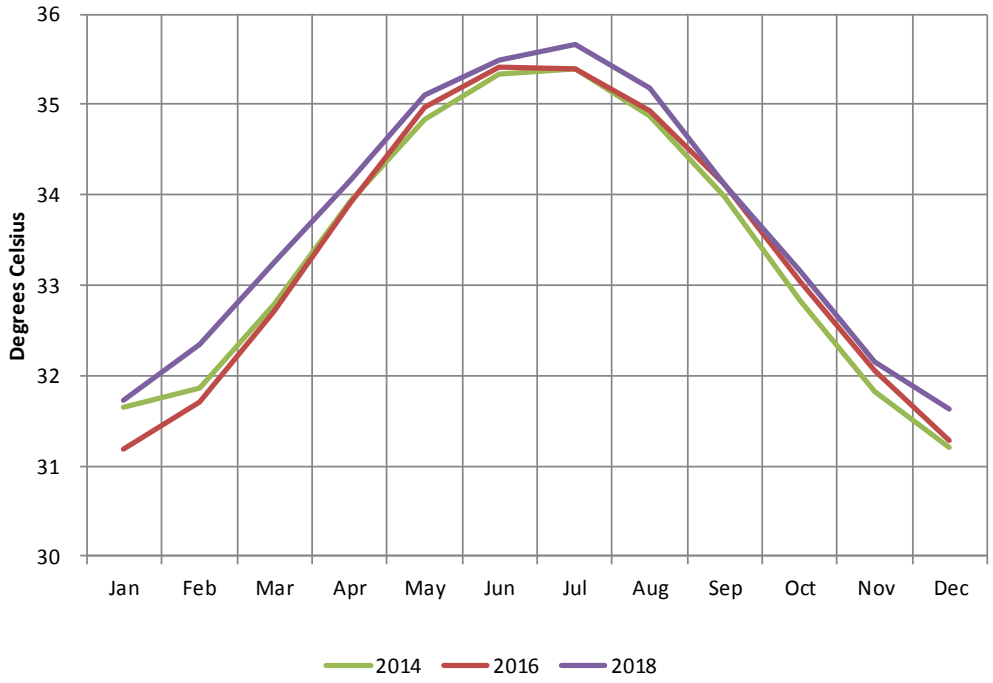
The next Chart, **Chrat 17** adds to **Chart 16** he NASA global temperatures from three years 2007, 2012 and 2017. The Black Body temperature and the NASA plots are not shown together because it will show a problem. If the planets black body temperature is dropping in the summer, as it must by orbital mechanics, then how can the NASA global temperatures remain constant? The issue that this Chart shows results from NASA using an average value for solar flux rather than the true value.

Chart 17, Black Body Temperature Verses Monthly LOTI Values



One more Chart, **Chart 18** shows the difference between the black Body temperature shown in **Chart 16** and **Chart 17** subtracted from the NASA temperatures. This seems to show that there is some mysterious energy that enters the planet atmosphere to add almost 5 degrees Celsius to the planet during the Aphelion phase of the planets orbit. Clearly, something is wrong here and I am reasonably sure that it is the homogenization process that NASA used to make up the global temperature.

Chart 18, Black Body Temperature of planet



The range in temperature just from orbital changes is 4.41^{o} C but including clouds that range is reduced to 2.85^{o} C however in either case it is significantly more than the warming that the IPCC claims has happened looking at only Carbon Dioxide as the main factor. These are hard numbers based on the solar flux which is known and the orbital parameters of the Earth that are also known. The large temperature variances come from the Stefan-Boltzmann Law; which is the energy flux emitted by a blackbody is related to the fourth power of the body's absolute temperature (meaning we must use kelvin). The fourth power in the equation magnifies the small variation in solar flux significantly.

With the understanding that we have now o the importance of Black Body temperature we can add two key factors that will determine the range of possible global temperatures based on a mathematical development of the sensitivity values of H_2O and CO_2. The sensitive of H_2O and CO_2 determines the delay factor of the thermal energy contained in the atmosphere, the oceans, and the land which must leave the planet to put things in balance which is required to happen. Also the warmer the planet gets the faster the heat will leave. These basic principles will allow us to develop a series of curves that represent the various possible temperature ranges of the planet in the last section of this paper.

On the this page, **Figure 8** shows that complexity of the atmospheric energy flows that the global climate models are trying to duplicate in software. Considering that there are no fixed numbers or values

and this is a very dynamic situation in which one of the key determinate of “climate” cloud formation has not been modeled it hard for me to see how there is any chance of the models being anything other but a science/programing toy.

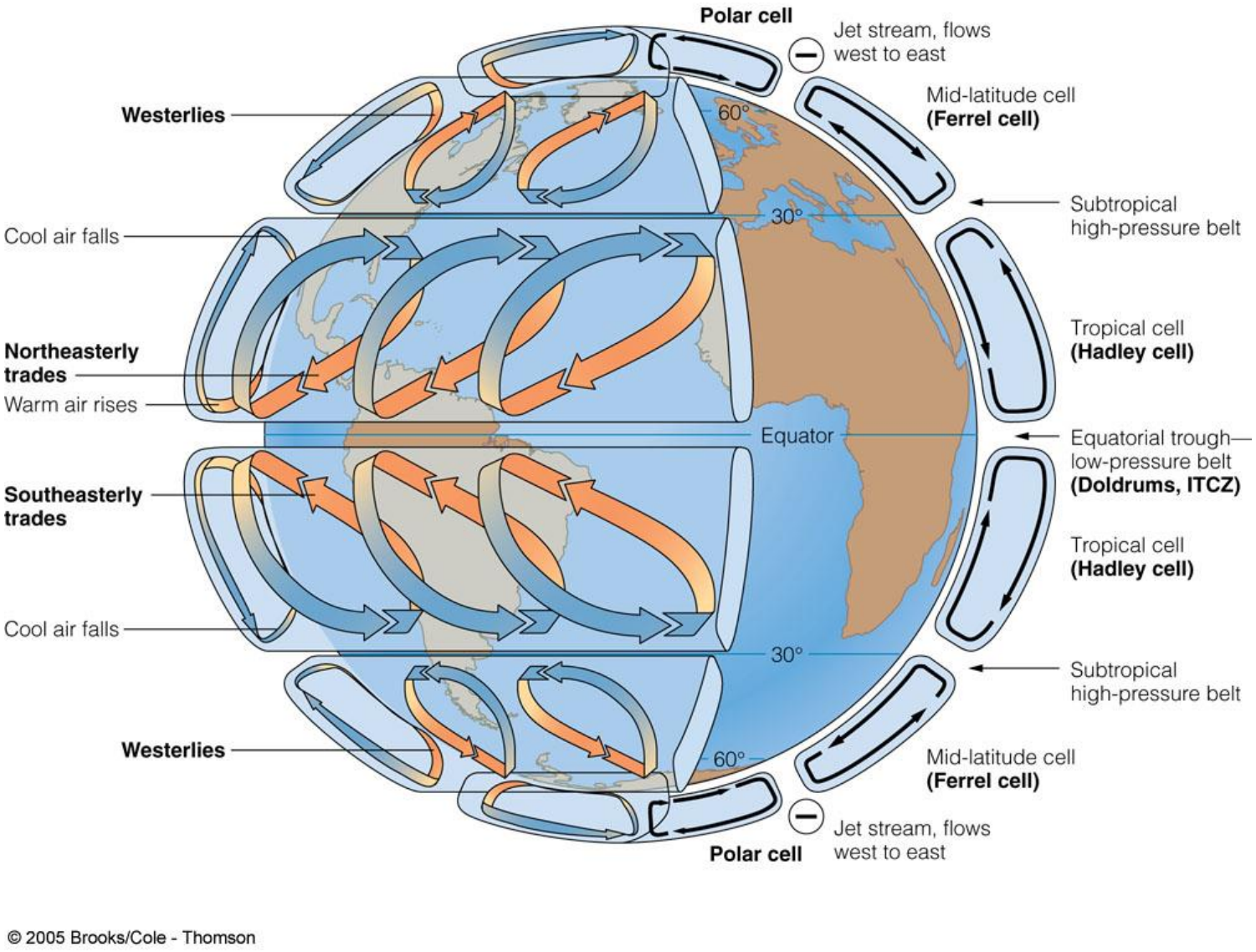


Figure 7 Basic atmospheric flows

Part Two, The Planetary Greenhouse Effect

Now that we have a better understanding of the blackbody temperature of the plant, we can discuss the process that brings us to the global temperature range that we live in. Keep in mind that the temperature of the earth would be the same as that found on the moon if there was not some way to make it warmer. The moon is, after all, the same distance from the sun that are our planet is.

So what is the average temperature of the moon? Using the methods we used to calculate the black body temperature of the earth gives us approximately 236^{O} Kelvin or -37^{O} Celsius which is 18^{O} Celsius colder what we calculated for the earth. So the first thing we learn is that there must be two black body temperatures, so to speak. Considering there is an atmosphere but no life would give us -18.2^{O} Celsius of a stored thermal energy buffer. And then we need another 32.8^{O} Celsius to bring us to the 1950-80 Base NASA temperature 14^{O} Celsius. This makes the earth approximately 51^{O} Celsius warmer than the moon

Therefore, the real thermal buffer is somewhere around 50^{O} Celsius plus or minus a degree or two based on NASA data and that is the amount that needs to be explained by any theories of global climate which is not nor has ever has been a constant. Blaming humans for what is obviously a natural variable is foolish at best and criminal if used for political ends.

From part one, we know that the amount of thermal radiation that reaches the planet has enough variance to it that it needs to be accounted for in any valid theories or calculations. So with that out of the way we'll now look at the so called greenhouse effect which is approximately 33^{o} Celsius. But this brings us to another issue. The process that allows the suns thermal energy to be held in a buffer and warm the planet is modeled as a log function which means that as the variables (H_2O & CO_2) increases the effect of the variable diminishes such that at some point there is no more effect.

Back in July 1979, the US National Academy of Sciences was given the task of determining what that log function looked like and they came up with an Ad Hoc Study Group which issued a report by the end of that year. It was thereafter called the Charney Report as Jule G. Charney was the Chairman of the Ad Hock study group. The key result was that the increasing effects from the doubling of CO_2 were estimated to be from 1.5^{O} C to 4.5^{O} C, or 3.0^{O} C +/- 1.5^{O} C. That ended up being the values that were used to build all the Climate Models used by the IPCC since it did apparently explain the observed changes in global temperatures, at that time.

There were three oversights made at that time.

1) There are no naturally occurring climate changes (not true based on geological evidence)
2) There was only one peer-reviewed paper on the subject (way too few to define the issue)
3) The effect in question could not be a log function (the equation has to be logistic function)

If the first oversight had not been made Issue, two and three would not have occurred because the second oversight produced equations that gave too large a value to the doubling. Years later additional scientific work would indicate that the 3.0^{O} C +/- 1.5^{O} C. was more likely in the range 1.5^{O} C +/- .75 C. That work was ignored as the observed temperature changes could not be reconciled with the lower values and therefor CO_2 would not be a global problem. Since the geological temperatures showed the

Charney report CO_2 sensitivity value was overestimated and the subject was never revisited, as it should have been, **the politicians have reached a solution to a nonexistent problem; but worse their solutions could actually be dangerous to humanity and the planet.**

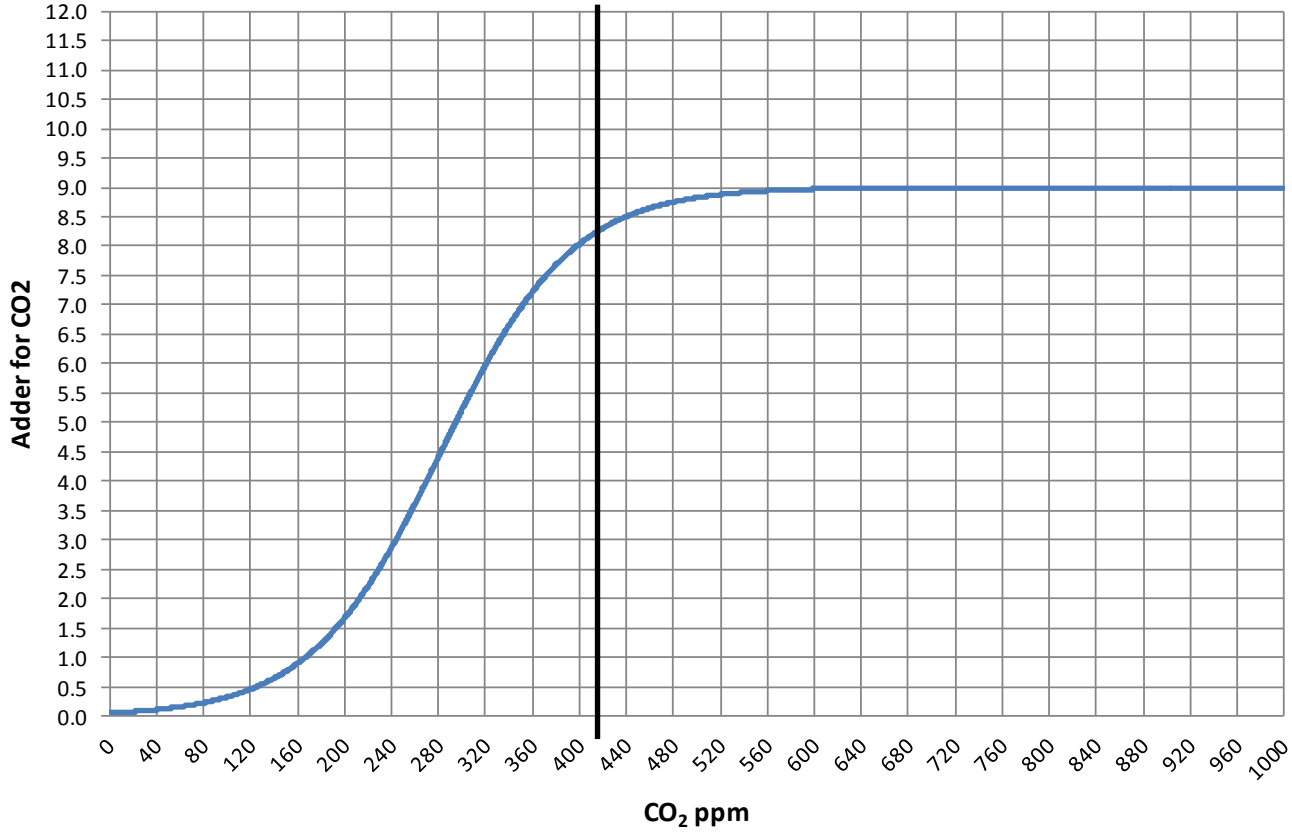
The following logistic equation is commonly found in natural biological process and economic analysis and I believe that it also applies to what we call the Greenhouse effect. My thought is to show that the base is H_2O and then add to that base a series of curves based on the CO_2 level so there would be a high and low range for temperatures for every level of H_2O. The reason I was looking for this kind of function was that if a log function is used for the sensitivity values of CO_2 then it is not asymptotic on both ends above zero. This creates problems at the low end which could not exist in the real world; therefore, it cannot be the right curve. The logistic function solves that issue.

The Following Chart is a rough approximation of my thoughts at this time for CO_2. It is based on the following Logistic function

$$Y = C / (1 + Ae^{-Bx})$$

C	is the upper limit	2.7
A	is the number of “doubles” to reach C	110
B	is a number that controls the slope	.014
X	CO^2 ppm starting value	0

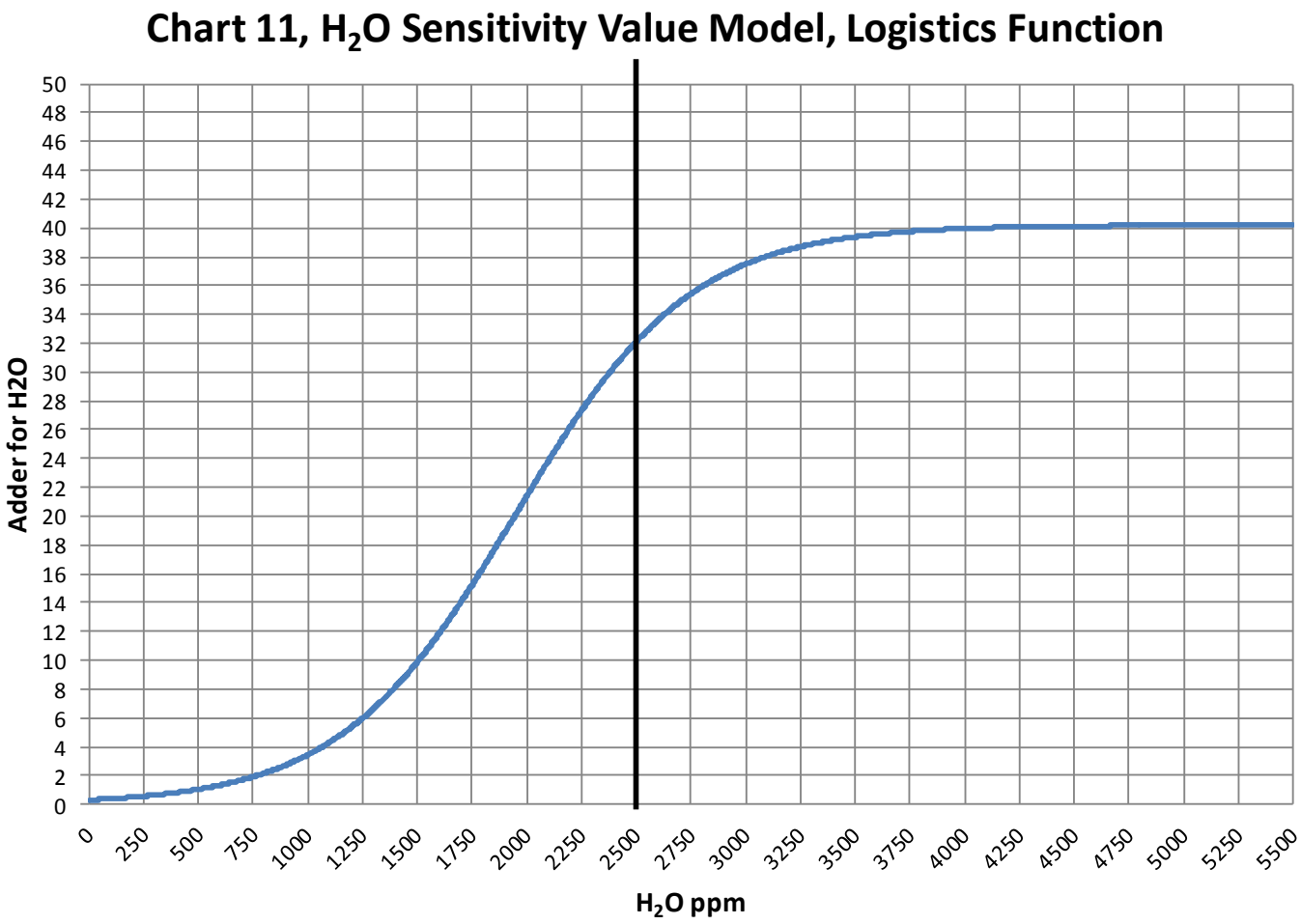
Chart 10, CO_2 Sensitivity Value Model, Logistics Function



The Following Chart is a rough approximation of my thoughts at this time for H_2O. It is based on the following Logistic function. The same logic about using a logistic function verses a log function also applies to water.

$$Y = C / (1 + Ae^{-Bx})$$

C	is the upper limit	42
A	is the number of “doubles” to reach C	80
B	is a number that controls the slope	.0025
X	H_2O ppm starting value	0



The following chart **Figure 8** is from NASA and uses anomalies from the base of 14.0^o Celsius. This method makes it difficult to make comparisons because the14.0^o base value has no meaning and the chart itself is suspect. So we will now have to look at how the temperature is measured so we can understand the methods because the problem, intentional or not, goes back to physics and how we show information. It’s critical that when we talk to nonscientists that information is properly displayed. And nowhere is this more important than when we are discussing global temperature in relationship to anthropogenic climate change.

Figure 8 is also misleading because of the methods used to make this Figure have been modified to make the look, fit their theories. The previously shown **Figure 4** shows a more reasonable chart of

geological temperatures and CO_2 values than the misleading one shown in **Figure 8** especially over the past ten thousand years. The red circle shows a very missing temperature plot; look on page 20 at **Figure 9** and you can see the difference.

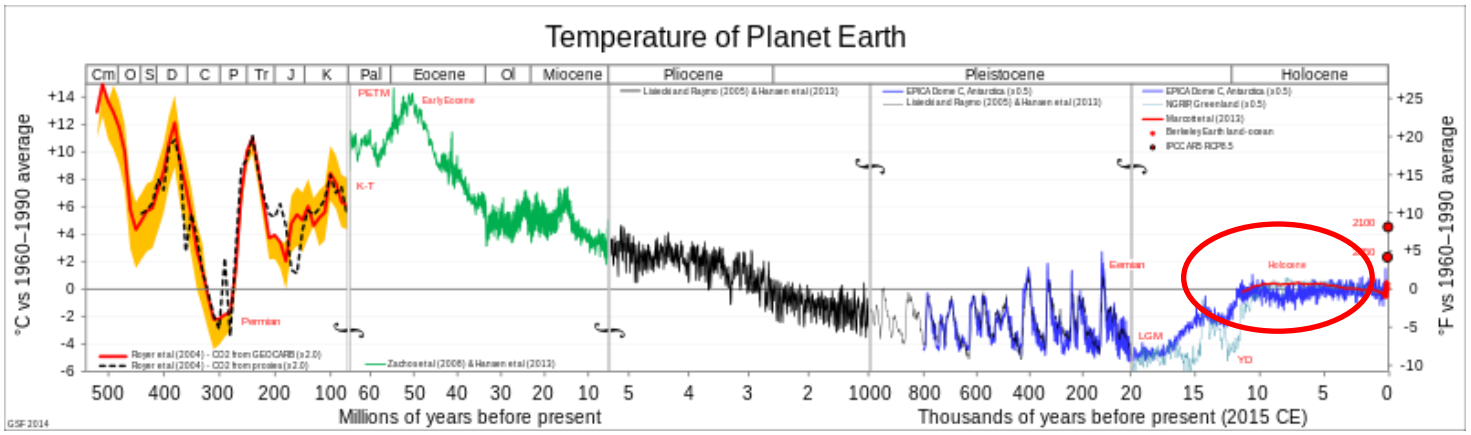


Figure 8, NASA Official Temperatures

When we talk about climate (long term changes; meaning centuries) or weather (short term changes; decades) local temperatures are going be in degrees Celsius (C) in the EU and science, or degrees Fahrenheit (F) in America. The base temperature for the earth that NASA established is 14.0^0 C or 57.2^0 F; but these are both relative measures and **do not tell us how much heat** (thermal energy) is there. To know that we must use Kelvin (K) or Rankin (R) and that would be 287.15^0 K and 516.87^0 R all four of those numbers 14.0^0 C, 287.15^0 K 57.2^0 F and 516.87^0 R, are exactly the same temperature, just using a different base. But if the current temperature went from 14.0^0 C, to 14.86^0 C that is a 6.14% increase in C, an increase of 2.71% in F and an increase of .30% in K and R; so which one is real? The answer is .30% because Kelvin and Rankin are the only ones that measure the total increase in energy! **Table One** shows these relationships that we just discussed.

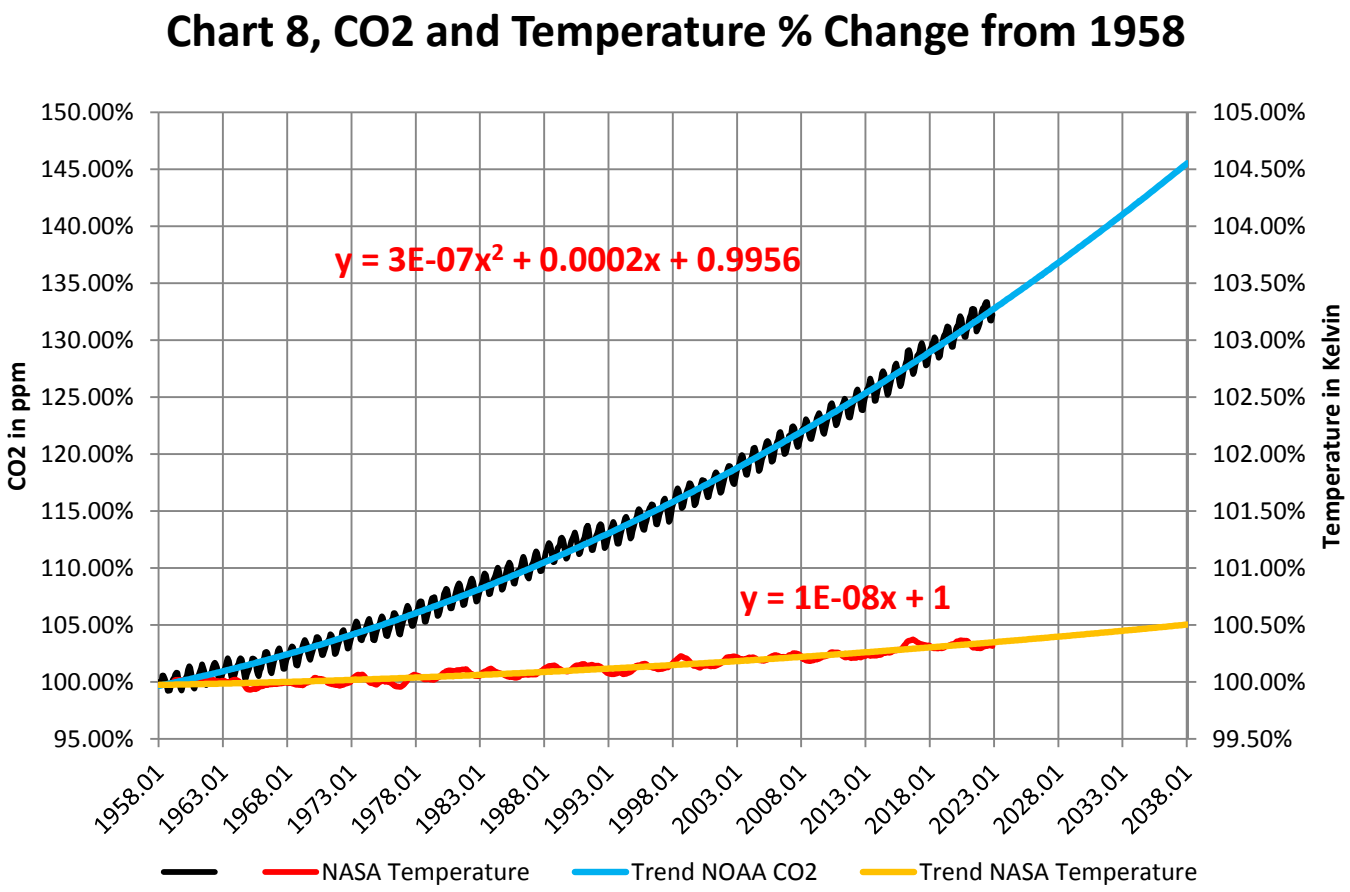
Table One — **Change in Thermal Energy**

	Celsius	Kelvin	Fahrenheit	Rankin
Base, 1950 to 1980	14.00	287.15	57.20	516.87
2017	14.86	288.01	58.75	518.42
Percent Increase	106.14%	100.30%	102.71%	100.30%

The next step is to plot Carbon Diode (CO_2) from NOAA-ESRL and the estimated global temperature as published by NASS-GISS each month. As can be seen in **Table One** on the next page It doesn't really matter whether we would use Kelvin and Rankin since the increase in thermal energy is exactly the

same either way; but we'll use Kelvin as that is the accepted norm in the scientific community for determining the amount thermal energy in any object especially when looking at changes in temperature or measuring the thermal energy in any object. There are other less known temperature scales that have specific purposes, but they don't really apply here in this subject.

The important thing is how much has the global temperature actually gone up since we started to measure CO_2 in the atmosphere? To show this graphically **Chart 8** was constructed by plotting CO_2 as a percent increase from when it was first measured in 1958, the Black plot, with scale on the left shows CO_2 going up about 33.0% from 1958 to October of 2018. That is a very large change as anyone would have to agree. Now how about temperature, well when we look at the percentage change in temperature from 1958, using Kelvin (which does measure the change in heat), we find that the changes in global temperature (heat) are almost un-measurable. The scale on the right side had to be expanded 10 times (the range is 50 % on the left and 5% on the right) to be able to see the plot in the same chart in any detail. The red plot, starting in 1958, shows that the thermal energy in the earth's atmosphere increased by .3%; while CO_2 has increased by 33.0% which is over 100 times that of the increase in temperature. So is there really a meaningful link between them that would give as a major problem? The numbers tell us no, there isn't.



The next chart is Chart 8a which is the same as Chart 8 except for the scales which are the same for both CO2 and Temperature. As you see the increase in energy, heat, is not visually observably in this chart hence the need for the previous chart 8 to show the minuscule increase in thermal energy shown by NASA in relationship to the change in CO_2. Based to these trends, determined by excel not me, in

2028 CO_2 will be 428 ppm and temperatures will be 15.0^o Celsius and in 2038 CO_2 will be 458 ppm and temperatures will be 15.6^O Celsius. This is what the data shows no matter what the reasons are, so I have no idea how the IPCC gets to predict that the world will end in ten or twenty years.

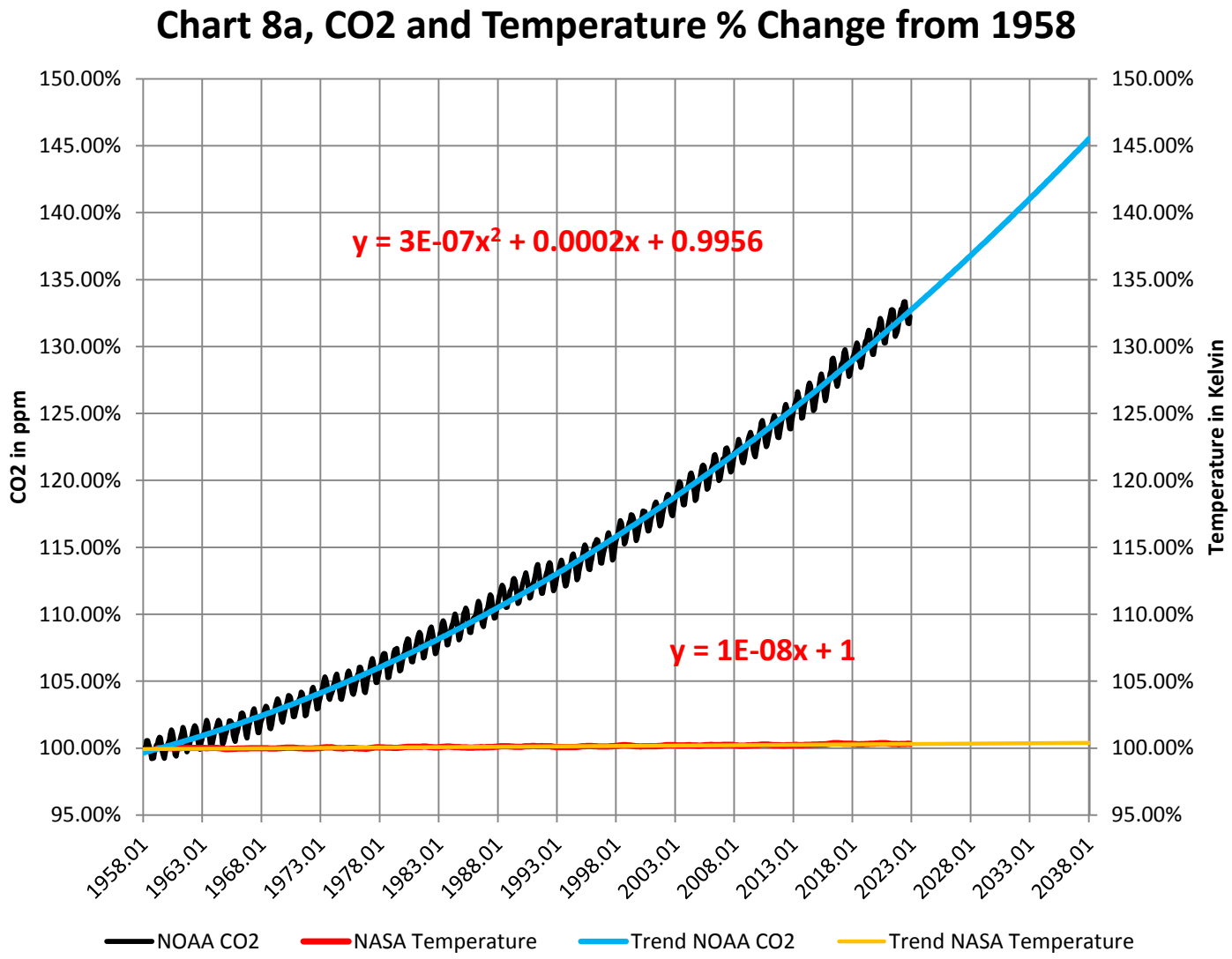
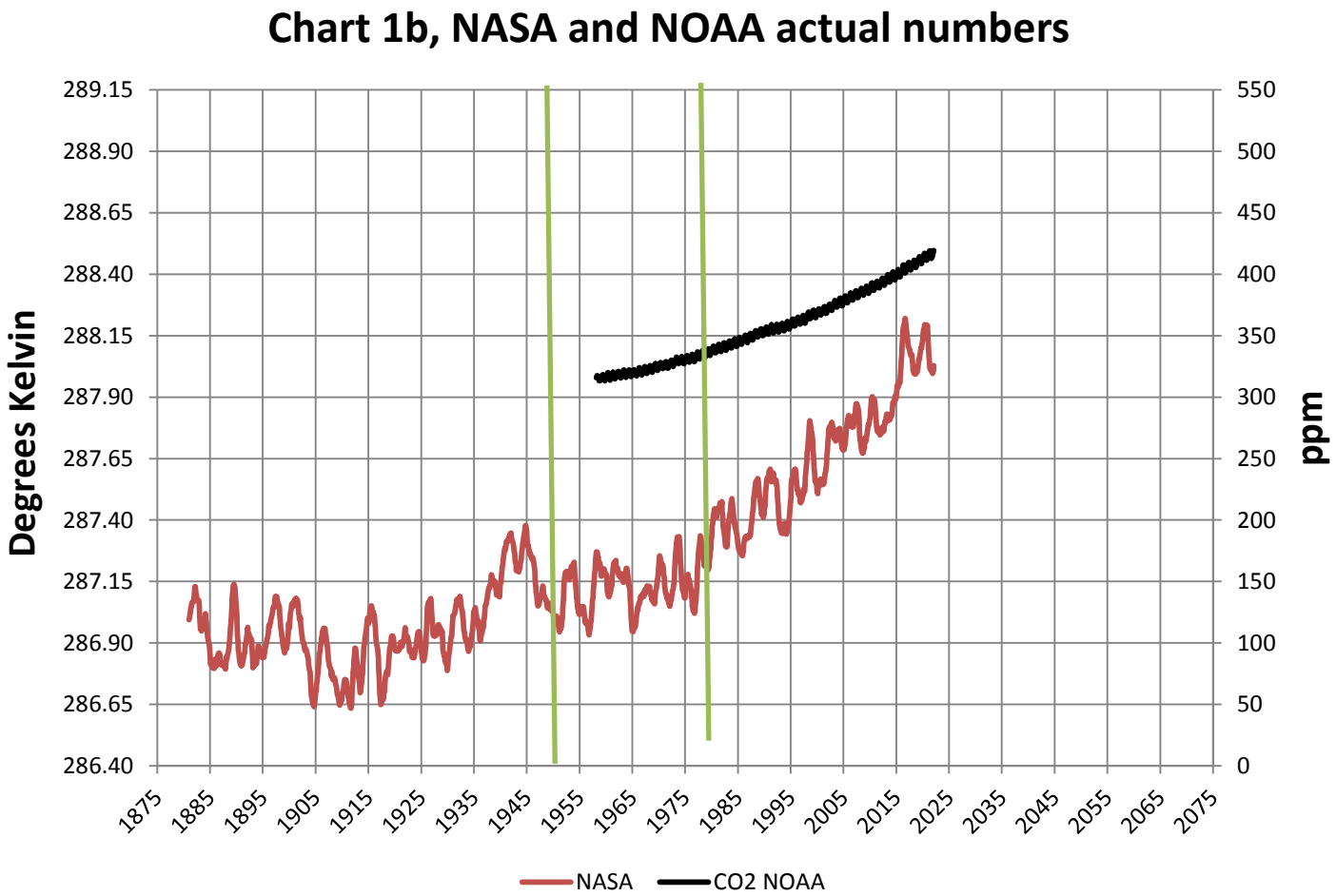


Chart 8 and Chart 8a are both based on the following two data series. First NASA-GISS estimates of a global temperature shown as an anomaly (converted to degrees Celsius) as shown in their table Land Ocean Temperature Index (LOTI) and as shown next in **Chart 1** as the red plot labeled NASA the scale for the temperatures is on the left. The NASA LOTI temperatures are shown as a 12 month moving average because of the very large monthly variations. Second NOAA-ESRL CO_2 values in Parts per Million (PPM) which are shown in **Chart 1** as a black plot labeled NOAA the scale for CO_2 is shown on the right no change is required to the NOAA data set as it is ready to use as is. The NASA data which is a mathematical construct shows there are swings in temperatures which are not believable and on the global bases that implies very large changes in the heat energy on the plant with would appear to be unrealistic. Planetary changes can just not realistically be that great on a month to month basis.

NASA published data is shown as an anomaly, but what is a temperature anomaly? An anomaly is a deviation from some fixed base value. There were two problems with the system that NASA picked

which was there is no “actual” global temperature and climate is a variable so there cannot be a real base to measure from and certainly not 1950 to 1980. NASA known for its science and engineering expertise back in the day thought they could get around these issues and created a system to do so. First, they developed a computer software system they called homogenization which took all the readings from all over the planet, and then made adjustments to them in the software and then came up with the **estimated** global temperature. Second, they picked the period 1950 to 1980 (30 years) and averaged the values found in that period and came up with 14.00 degrees Celsius and made that their base. Lastly, they took the calculated monthly temperature and subtracted the base from it which gave them the anomaly after multiplying the result by 100. In **Chart 1b,** we show the actual temperature not the anomaly by reversing the process. We’ll talk more about this later.

The problem is that both are arbitrary. Why pick 1950 to 1980, the area between the green lines, as the base period? Is there something special about that time frame? And as to a global temperature there is no such thing for many reasons like the earth faces the sun so one side is cool and onside it warm. Higher latitudes are cooler than the equator and higher elevations are cooler than lower. And finally there are many areas where there are no measurements taken. Therefore, there is no one temperature only an artificial artifact solely dependent on the number of data points and soundness of the software used to create that one temperature! **Chart 1b** above accurately show only show NASA and NOAA data as published with no manipulation other than using a 12 month moving average for the NASA data.



As previously discussed in this paper on page 19 the current base of 14.0^{O} Celsius was an ad hock selection of 360 values from 1950 to 1980. Using the base NASA shows global temperatures moving up slightly but the same thing could have been shown going back to any block of time. For example, the little ice age which reached its lowest temperature about between 1600 and 1650 where there are pictures of ice skating on the Thames River, in London. This shows that temperatures have been on the upswing for over 400 years now.

The little ice age is also shown in **Figure 9** which is a chart that was developed from ice core samples taken from Greenland, there have been several significant swings in temperatures over the past 10,000 years. The point being made here is what period or base should we measure the estimated temperature from as the current NASA section of 14.0^{O} Celsius is just a meaningless arbitrary reference point.

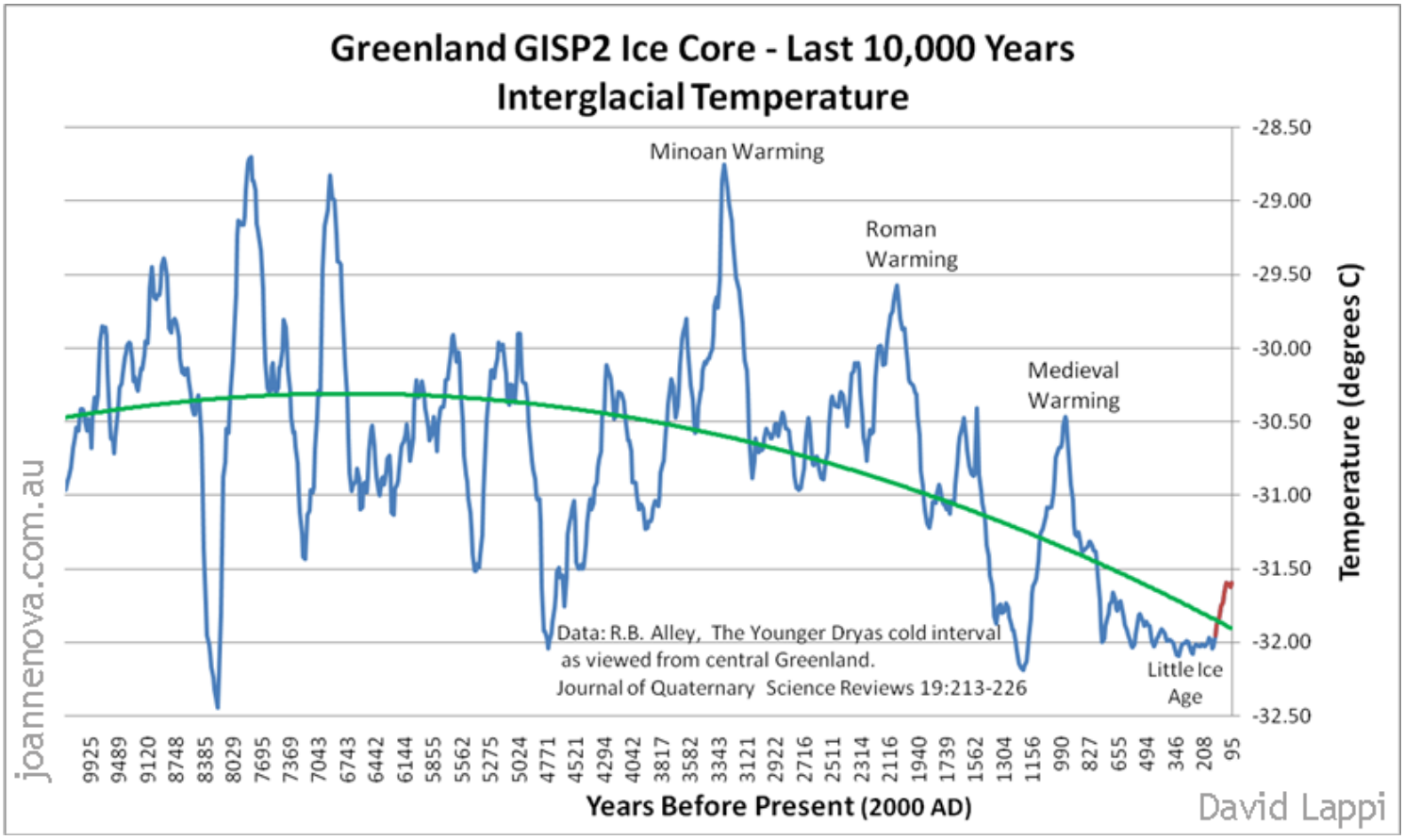
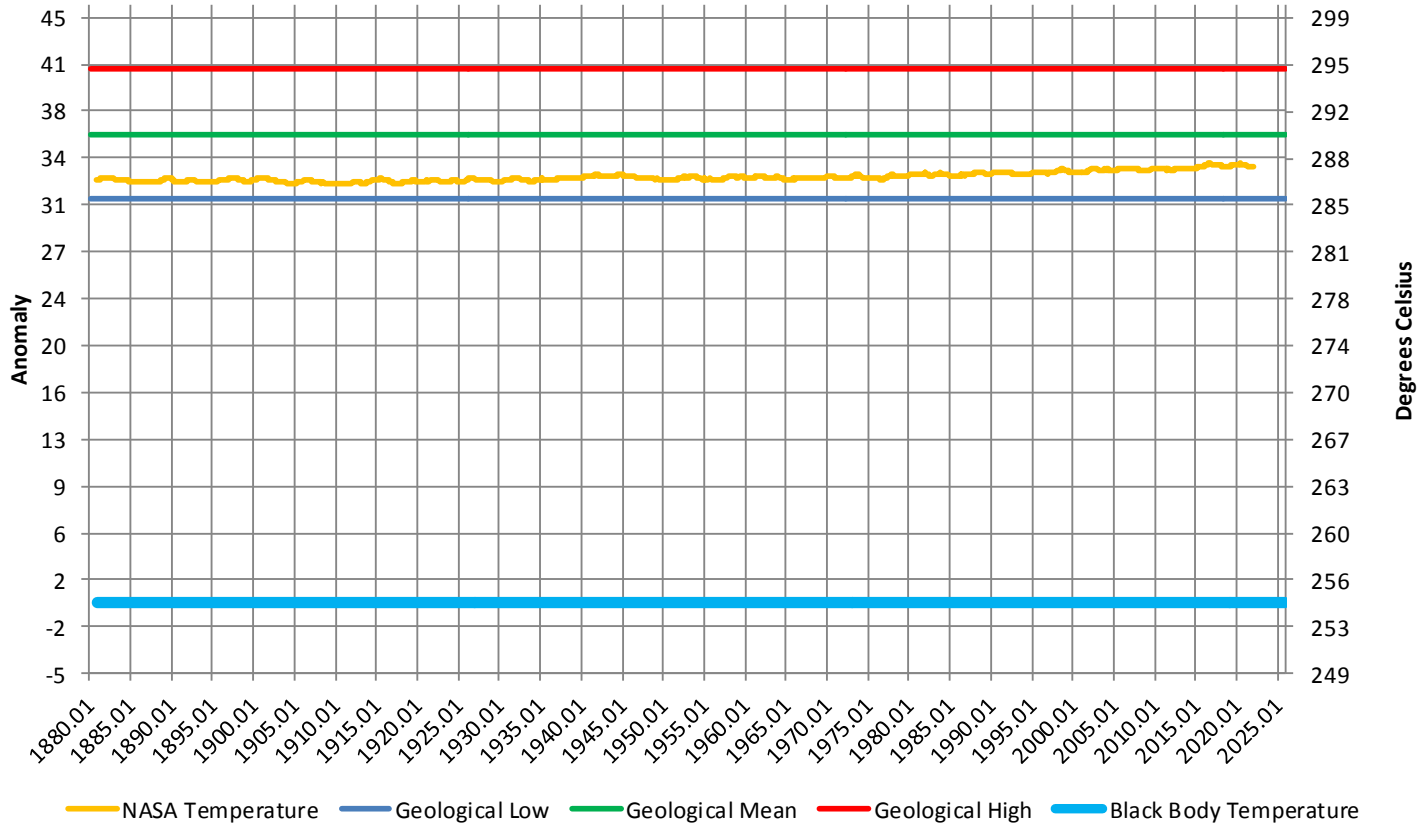


Figure 9, Temperatures from Greenland ice cores

What is shown next are two charts **Charts15** and **Chart 16** that were developed to show two recommended new bases for showing the global temperature estimate as published by NASA. The first Chart, **Chart 15** uses the conventional black body temperature of the planet as the base because it is a real number that is fixed on the orbital parameters and the suns output at -18.75^{o} Celsius (254.39^{O} Kelvin) instead of the arbitrary 14.0^{o} Celsius that NASA concocted. Using this number drastically simplifies the homogenization process. We don't need to discuss the details of why in this paper. The solid blue line at the bottom is the zero point on the scale on the left side. I've also added the geological high (red), mean (green) and low (blue) for reference. This chart shows tow things number one the magnitude of the real greenhouse effect approximately 33^{O} Celsius. And using that reference puts the

current temperature value in prospective, which are that we are way to the low side of geological temperature not high side as we are led to believe.

Chart 15, NASA Anomalies using the Planets Black Body Temperature of 254.36 degrees Kelvin as the base.



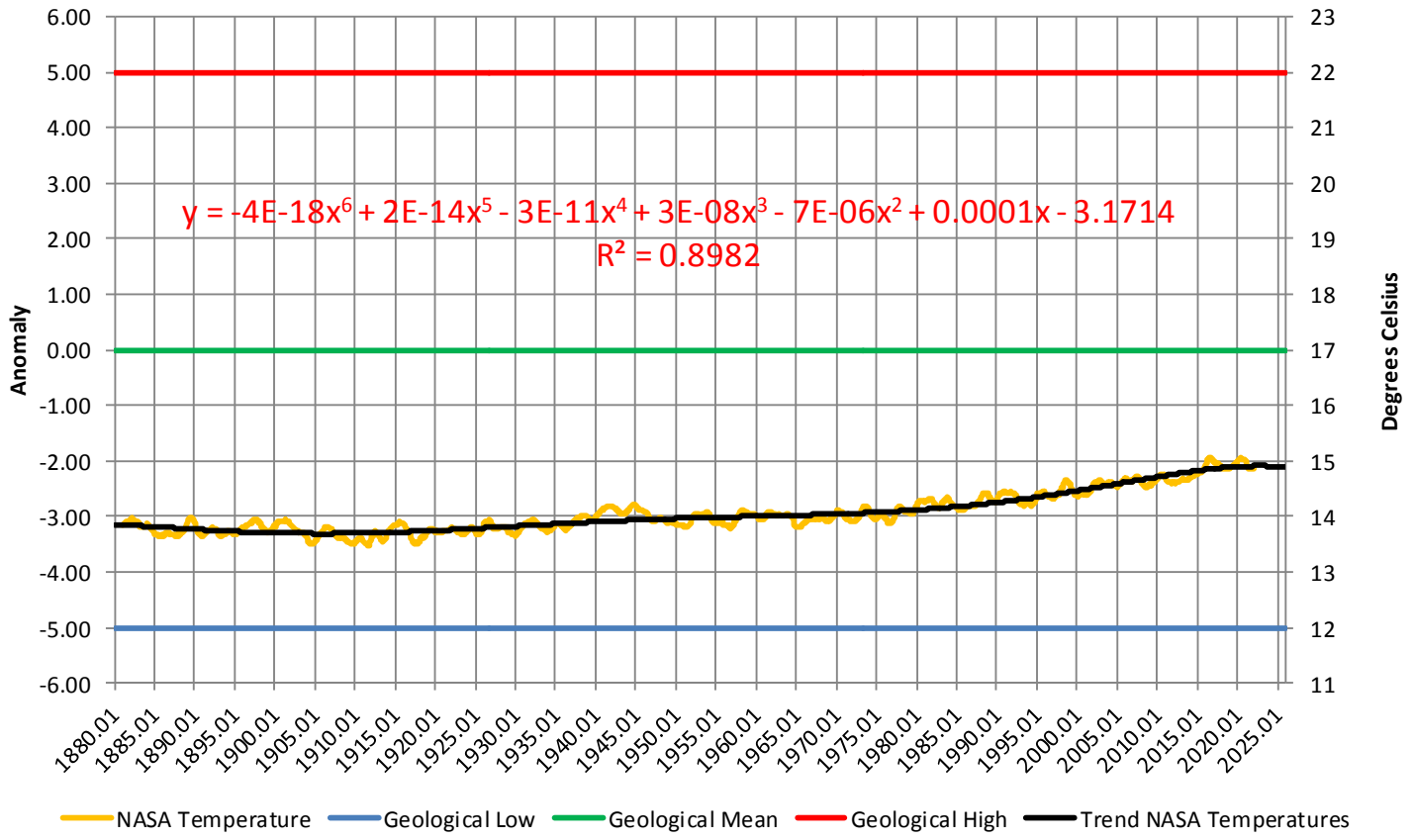
The following **Chart 16** shows the same exact temperatures as **Chart 15 or for that matter Chart 1** from the new prosed base of 17.0^{o} Celsius which is the estimated mean temperature of the planet geologically as shown in **Figure 4**. Although I would prefer the black body temperature to be used as the base, that's probably too technical so the next best would be 17.0^{O} Celsius the mean global temperature. And if that 17.0^{O} isn't a good number then the science community should study it and find out what it is, without political interference.

The advantage with this kind of chart is that it shows that the current world temperatures are historically very low as they basically run from -3.0^{O} C to -2.0^{O} C from the global mean. Keep in mind that there is now a panic that if the published global temperatures went up 2.0^{O} Celsius from the base of 14.0^{O} Celsius that the planet would melt and all life would be gone. Well I'm not using new math here so 14.0^{O} C plus 2.0^{O} C only adds up to 16.0^{O} C which is not even to the green line on the chart, the mean average of the planet historic temperature.

What is shown on the next page in **Chart 16** is the best base to use to measure from whether we use temperature of anomalies as used by NASA in their homogenization process and therefore the IPCC. The scientific and engineering reason is that by using the period from 1950 to 1980 the base falls into

the period under evaluation and as adjustments are made every month from 1880 to the current month the base period cannot be allowed to change. So how can the base fall inside the range being measured when the entire range is recalculated every month that is using circular logic. I know I would not want to try and program that into the homogenization process.

Chart 16, NASA Anomalies using the Geological Mean temperature of the Planet 17.0 degrees Celsius as the base.



What follows next is a page from a scientific paper written by W. A. van Wijngaarden and W. Happer published on June 8, 2020 titled *Dependence of Earth's Thermal Radiation on Five Most Abundant Greenhouse Gases*. It's a 38 page work with significant ramifications to the validity of the IPCC climate change narrative. The bottom line to this scientific study is that there is NO DANGER to additional CO_2 in the earth's atmosphere. Any warming that might be caused by CO_2 has for the most case already been accounted for.

Page 13 from that report, on the next page, clearly shows that the sun's radiation absorption bands for CO_2 are now saturated and there will be no additional effect. The green line is no CO_2 the back line is the current level of CO_2 and the red line is double the current level of CO_2. As can be clearly seen the black and red lines are virtually identical.

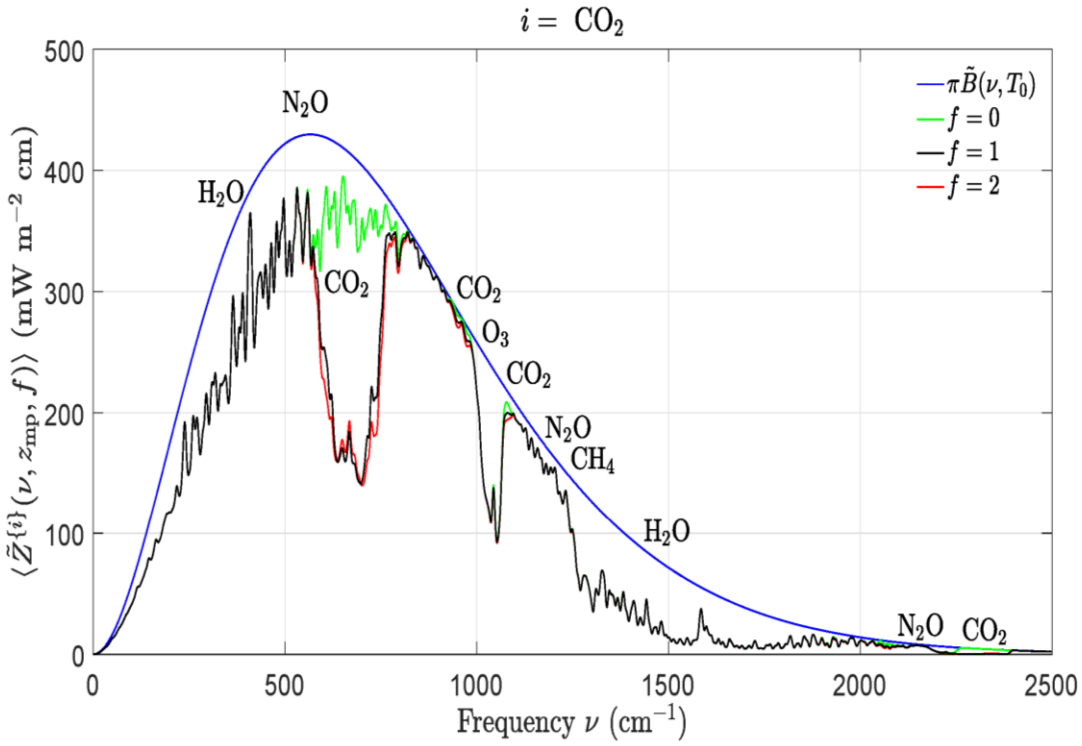


Figure 4: Effects of changing concentrations of carbon dioxide, CO_2 on the filtered spectral flux $\langle \tilde{Z}^{\{i\}}(\nu, z_{\rm mp}, f) \rangle$ of (44) at the mesopause altitude, $z_{\rm mp} = 86$ km. The width of the filter (43) was $\Delta\nu = 3$ cm^{-1}. The smooth blue line is the spectral flux, $\tilde{Z} = \pi\tilde{B}(\nu, T_0)$ from a surface at the temperature $T_0 = 288.7$ K for a transparent atmosphere with no greenhouse gases. The green line is $\langle \tilde{Z}^{\{i\}}(\nu, z_{\rm mp}, 0) \rangle$ with the CO_2 removed but with all the other greenhouse gases at their standard concentrations. The black line is $\langle \tilde{Z}^{\{i\}}(\nu, z_{\rm mp}, 1) \rangle$ with all greenhouse gases at their standard concentrations. The red line is $\langle \tilde{Z}^{\{i\}}(\nu, z_{\rm mp}, 2) \rangle$ for twice the standard concentration of CO_2 but with all the other greenhouse gases at their standard concentrations. Doubling the standard concentration of CO_2 (from 400 to 800 ppm) would cause a forcing increase (the area between the black and red lines) of $\Delta F^{\{i\}} = 3.0$ W m^{-2}, as shown in Table 2.

The effects on radiative transfer of changing the column density of the ith greenhouse gas to some multiple f of the standard value, $\hat{N}_{\rm sd}^{\{i\}}$, can be displayed with filtered spectral fluxes

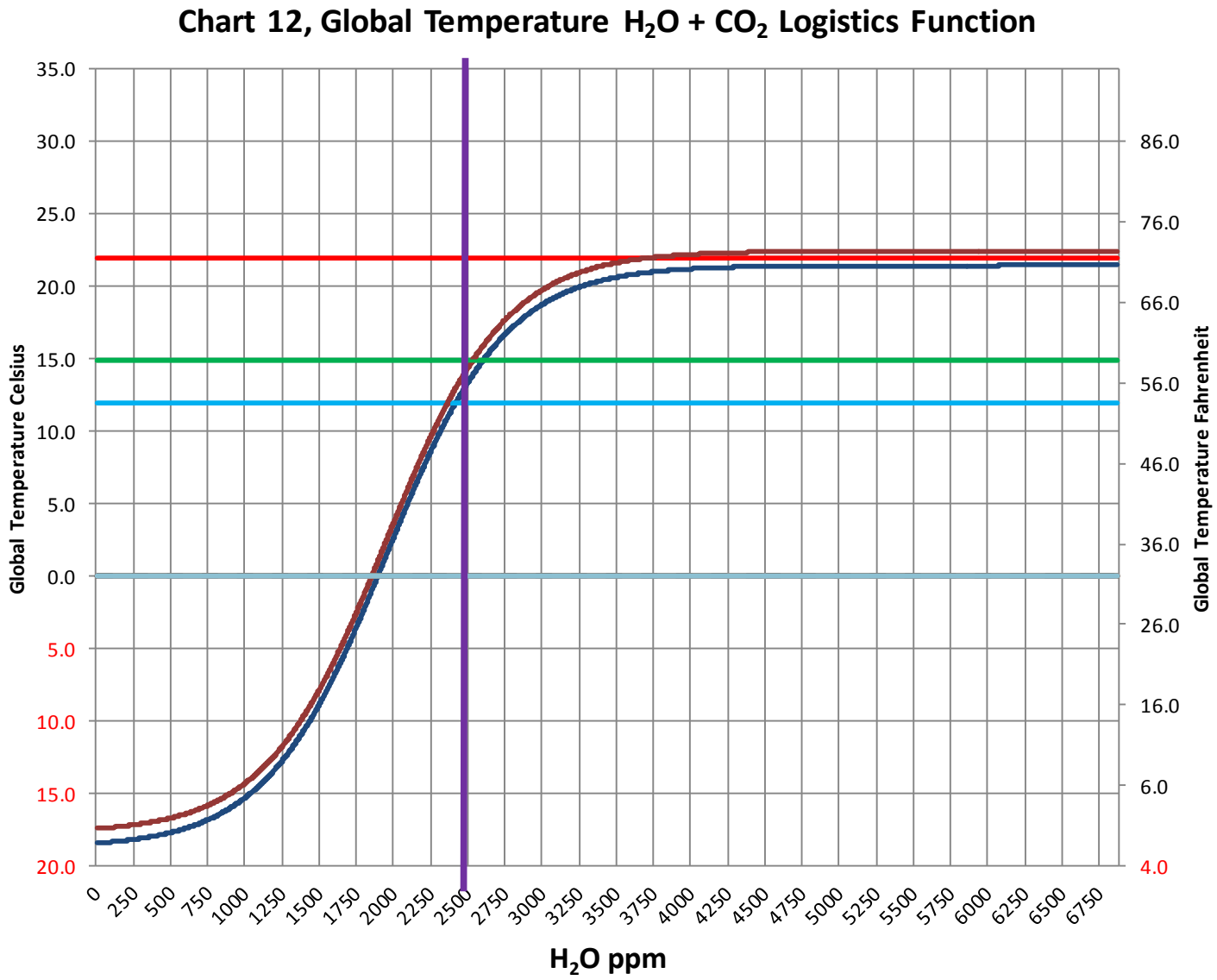
$$\langle \tilde{Z}^{\{i\}}(\nu, z, f) \rangle = \langle \tilde{Z}(\nu, z, \hat{N}_{\rm sd}^{\{1\}}, \ldots, \hat{N}_{\rm sd}^{\{i-1\}}, f\hat{N}_{\rm sd}^{\{i\}}, \hat{N}_{\rm sd}^{\{i+1\}}, \ldots, \hat{N}_{\rm sd}^{\{n\}}) \rangle. \tag{44}$$

Figs. 4 and 5 show how varying the concentrations of CO_2 and CH_4 affect the filtered spectral fluxes at the mesopause altitude, $z_{\rm mp} = 86$ km. Expanded views of the differences between the flux for standard and doubled concentrations of greenhouse gases are shown in Fig. 6, where we display

$$\langle \Delta\tilde{F}^{\{i\}}(z_{\rm mp}, 2) \rangle = \langle \tilde{Z}^{\{i\}}(\nu, z_{\rm mp}, 1) \rangle - \langle \tilde{Z}^{\{i\}}(\nu, z_{\rm mp}, 2) \rangle. \tag{45}$$

Part Three, the Probable Range of Temperatures on the Planet

The next Chart, **Chart 12** is derived from **Chart 10** and **Chart 11** and is created using the following logic. The first curve is the dark blue line at the bottom of the S shaped curves which run across **Chart 12** from left to right represents the equation for H_20 previously shown except we start at -18.89 C which is the accepted blackbody value of the Earth. The curve shown here is therefore the greenhouse effect of H_20 with no CO_2 present; we are ignoring other gases as their contribution is minimal at present concentrations. H_20 is on average 2,500 ppm and that is where the purple vertical line is placed; and that vertical line intersects the dark blue line at about 12 degrees C which just happens to be very close to the lowest estimate for the planets geological temperature as shown by the graphic on page 5 and shown here as a Cyan line. The Red line is the Global max temperature 22^O C, and the Green line is the current global temperature of about 14.9^O C.



Next, we add to the base H_2O line, lines for CO_2 at various levels in the atmosphere. The core assumption is that as CO_2 level go up the global temperature will follow by transferring energy to the

water the additional heat may increase the level of H_2O in the atmosphere but there is no evidence that this varies much at a global level; probably less that a 100 ppm. But both H_2O and CO_2 have saturation limits based on the parameters set in the individual curves and so no runaway effect is possible. This conclusion is supported by geological records that indicate the global temperature has ranged about 10 or 12 degrees Celsius and CO_2 has ranged about 200 to 6,000 ppm.

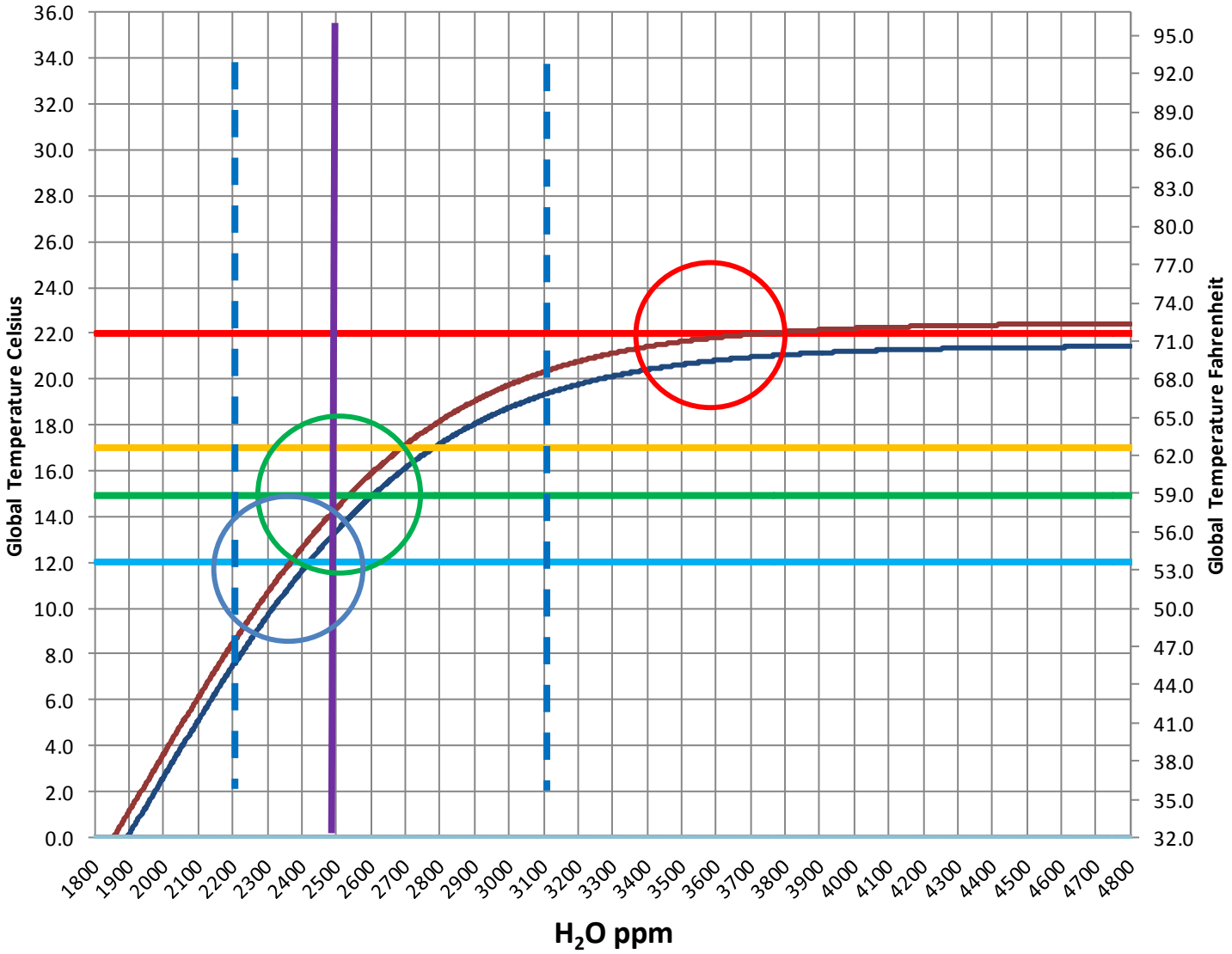
In the original version of this paper there were other plots shown here for different levels o co2. There was a blue line is for 300 ppm CO_2 a brown line for 400 ppm CO_2 a dashed gray line for 500 ppm CO_2 and a solid black line for 1,000 ppm of CO_2 which was the saturation point above which there is no longer any meaningful greenhouse effect. The only plot shown in Chart 12 is he brown line for 420 ppm CO_2 which intersects the horizontal green line at 15 degrees C and which is the approximate current global temperature. The reason for eliminating all the other plots was the very important paper published by Wijngaarden and Happer in 2020 (one chart is shown on page 23) which proved there was no meaningful additional captured heat past 400 ppm.

Now for a summary we have an exploded view of **Chart 12** labeled as **Chart 13** where we zoom in to get more detail of the temperature ranges of the planet based on realistic numbers and equations. The chart is based on the black body temperature of the planet, realistic logistics equations for H_2O and CO_2 and lastly geologic temperature estimates for lows, highs and a mean. None of these can be shown to be false, although I would be the first to agree that these numbers could be adjusted some by serious scientific work.

- We know that the Black Body temperature of the Earth is 254.39^O Kelvin on average but there is a variance of about 2.15^O Celsius plus or minus.
- We know that the amount of H_2O (water) in the earth's atmosphere is by far the most significant greenhouse agent and is the primary determinant of the temperature of the planet at about 85.0% of the total greenhouse effect.
- We know that the amount of CO_2 (Carbon Dioxide) in the earth's atmosphere is also a greenhouse agent but it is only a secondary determinant of the temperature of the planet at maybe 16.0% of the total greenhouse effect.
- We have developed an equation for the sensitivity values of H_2O and CO^2 using a logistics function rather than a log function since a logistic function more accurately represents the actual process of this kind of item as there are limits to the values both negative and positive on the planet temperature.
- We also know the probable high, low and mean geological temperatures of the planet for the past 600 million years.
- We know that the actual temperature of the planet is very stable despite all the major events that have impacted the planet which indicates that the positive and negative feedbacks are in balance.

Based on those above facts and acquired knowledge we can create a representation of all the possible stable temperatures for different amounts of H_2O and CO_2 in the planet's atmosphere and that is now shown graphically in **Chart 13**. The box represented between the vertical yellow lines and the red and blue horizontal lines contain all reasonable possible temperatures for the planet based on what we have developed in the analysis.

Chart 13, Global Temperature $H_2O + CO_2$ Logistics Function



The amount of water in the earth's atmosphere probably falls between 2,250 ppm (.225%), 3,100 ppm (.31%) which are represented by the two Blue dashed vertical lines, and these values are probably directly related to the planets temperature. The estimated minimum and maximum global temperatures appear to fall between 12^O and 22^O Celsius which falls between the Cyan and Red horizontal lines. The last thing we know is that the current temperature is about 14.9^O Celsius (green horizontal line) and the water in the atmosphere is .25% which is shown as purple vertical line. The yellow line is 17^0 Celsius representing the mean temperature of the planet. Lastly using the logistics functions that were developed we have these curves.

- First the dark blue curve starting at the bottom left and running to the upper right which represents the planet's atmospheric temperature with no CO_2 in it.
- Second, we have the brown curve starting at the bottom left and running to the upper right which represents the planet's atmospheric temperature with CO_2 at the 420 ppm level, which is where it is today.

- In summary, the vertical purple line and the green horizontal line intersect the brown curve such that the current planet's climate/weather conditions are satisfied. The H_2O is at .25%, the CO_2 is at 418.9 ppm and the current temperature is 14.9^O Celsius. The green circle.
- The 14.9^O Celsius Temperature is suspect because of the homogenization process that NASA uses but that is a separate subject only briefly discussed here on Pages 9 and 10. But with no solution to the problem presented here, we really don't know what the planets temperature is with any specificity.

Now it is given that these numbers are estimates and so may very some, but we also know that the earth's temperature is inherently very stable so they cannot very much from what is shown here in **Chart 13**. The key factor is that the planets temperature is a function of the amount of water in the atmosphere and that the CO_2 levels contribute to that temperature. However since there is a saturation point to the Caron Dioxide / Water dynamic governed by the method that energy is transfer between the two it requires a higher percentage of water in the atmosphere to be able to absorb the additional carbon captured energy so the two cannot be looked at independently.

Therefore, it is my suspicion that NASA is either measuring weather or they do not understand that there are cycles to climate. This fundamental error results in an improper set of assumptions such as ignoring the variability of the Black Body temperature of the planet and assuming that CO_2 either is the primary driver of global temperatures or that it has a greater influence then it does since it is the water that actually holds the heat not the Carbon Dioxide. The core problem is the sensitivity value that the IPCC assigned to CO_2 in 1979. That value is the subject for a different paper but in general peer-reviewed papers since then have significantly reduced that value ever since. That alone destroys every IPCC global climate model.

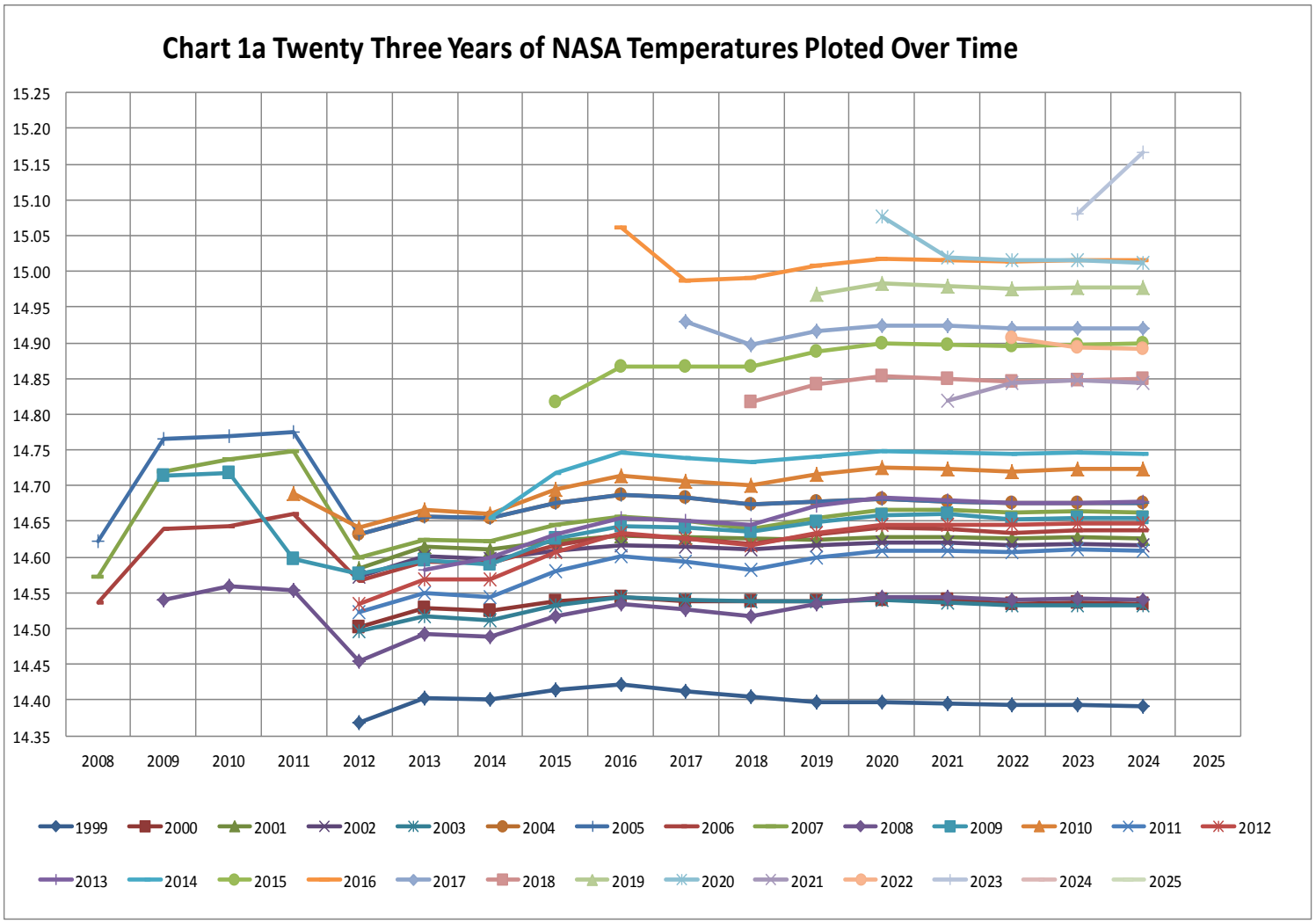
But now that politics has gotten involved there is no hope of changing the direction as government propaganda and misinformation now drives the narrative in the elementary schools, the high schools the and colleges. It will take multiple generations to undo the damage that was done which takes it into the next century.

Starting on page 30 there are two 4 page printouts of NASA table LOTI. The first is from April 2008 which is the oldest one I saved and the second is Current date of the paper. So let's look at the numbers that NASA publishes. First on the April 2008 printout look at the anomalies for the entire year 2007 which average .539 degrees Celsius higher than the base. Then look at the same values on the August 2022 printout and we find the average for 2007 is .675 degrees Celsius.136 degrees Celsius higher than 2007 so in 12 years and 1 month the past got 25.2% warmer --- now how did that happen? The answer is simple the process that NASA uses to calculate anomalies are not stable and therefore all the numbers are a **variable**. If the past, can be 25.2% warmer after 15 years that makes the present 25.2% colder so how do we even know what the global temperature is? The answer lies in the way that NASA calculates global temperatures which they call homogenization. The bottom line is that every time they run the program they get different results. Some of these "adjustments" seem to give the impression that there is a desired result that isn't there in the raw data but by tweaking the program the raw data can be made to look like what someone wants it's to look.

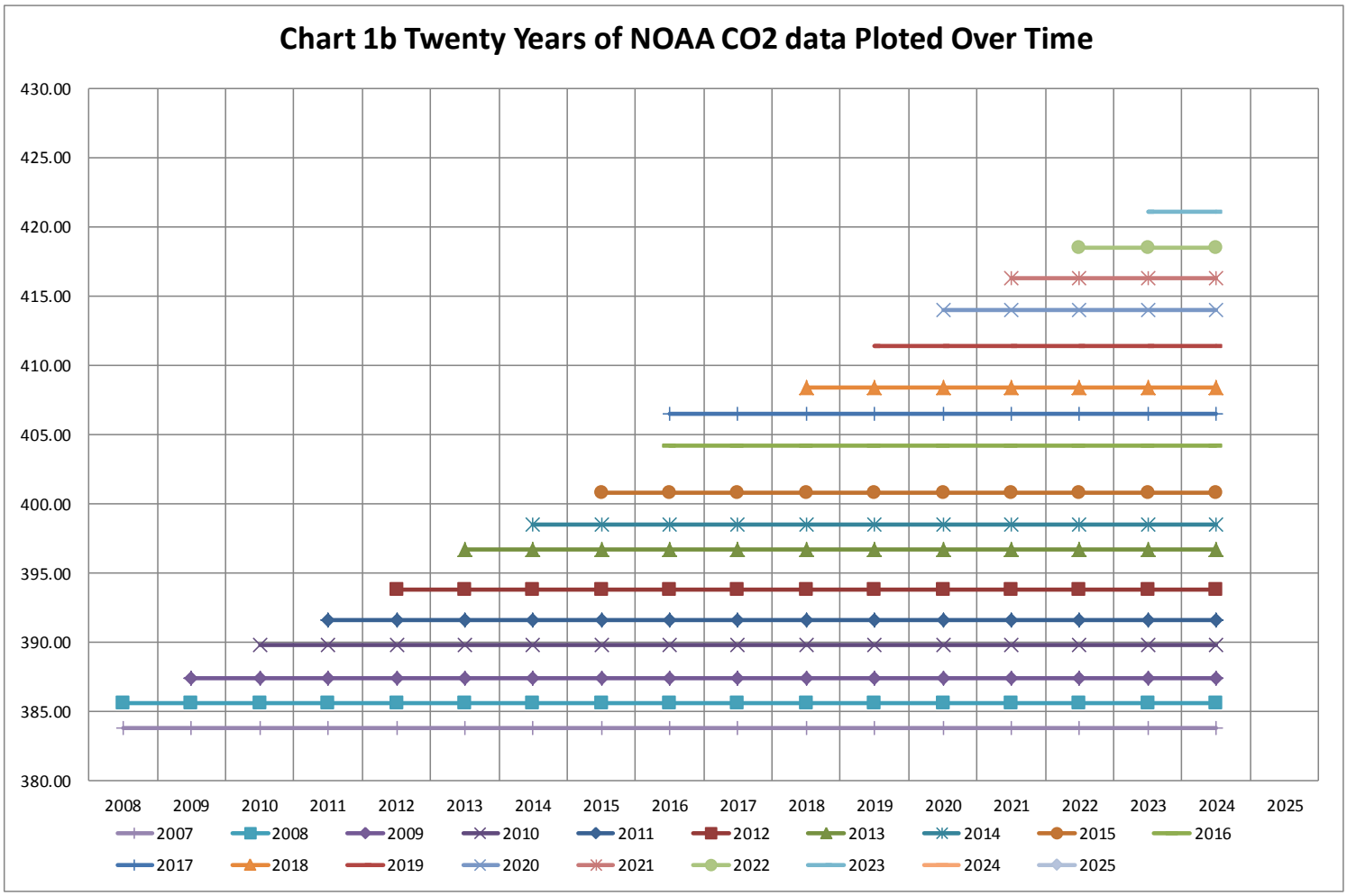
So, now let's look at two more charts the first, Chart 1a, will be a plot of 16 years of temperatures (from LOTI Table) out of the past 20 years (to simplify the chart). The plot shows that, for example, for the

anomalies of 1999 from the year 2012 to the current full year 2021 (Red plot with a star). In general, all the years in the NASA process almost never gives the same value in succeeding years that plot should just be a straight line. Some of these changes are large and others aren't. Some move up and some move down. Why the large jump in temperature in 2015/2016, maybe the Paris Climate change Meeting?

Now look at the plots for 2015, 2016, 2017, 2018, 2019, 2020 and 2021, the top seven plots. That doesn't seem to make sense since there was not a corresponding large jump in CO_2 so why the dramatic change? There is just not any correlation between CO2 and the NASA "calculated temperature of the planet.



Now let's look at another chart, Chart 1b, this one is from NOAA showing CO_2 levels in PPM. This chart was developed the same way that the previous one was and we see that the values for CO_2 do not change after they are calculated. This is the way a chart of this type should look and so there is no reason to ever show this chart, Chart 1b, of CO_2 the one on page 19 is sufficient.



So looking back to the weeks after the November 2018 election we have Alexandria Ocasio-Cortez (AOC) telling us that we only have 12 more years to live if we didn't give up all carbon based fuels that we use "immediately" so; we now have a hard date to measure from and we also know that the point of no return is an increase of 2.0^{o} Celsius from the base of 14.0^{o} Celsius or 16.0^{o} Celsius. Now 12 Years from November 2018 would be November 2030 but we'll be generous and say we have until January 2031. The present global temperature is .93^{o} Celsius above the base of 14.0^{o} Celsius or 14.93^{o} Celsius. This only gives us 1.07^{o} Celsius of increase left as we have already used up 46.5% of the available buffer before we die.

Do we really believe any of this, I don't! And apparently, neither do the insurance companies or any of the communities on the shorelines around the entire planet believe this. And also I believe that the NASA numbers are manipulated to give results that the politicians want --- this entire climate change scare is all made up!

The following from Sir Karl Pooper should be understood by everyone in science as gospel.

Sir Karl Raimund Popper (28 July 1902 – 17 September 1994) was an Austrian and British philosopher and a professor at the London School of Economics. He is considered one of the most influential philosophers for science of the 20th century, and he wrote extensively on social and political philosophy. The following quotes of his apply to this subject.

If we are uncritical, we shall always find what we want: we shall look for, and find, confirmations, and we shall look away from, and not see, whatever might be dangerous to our pet theories.

Whenever a theory appears to you as the only possible one, take this as a sign that you have neither understood the theory nor the problem which it was intended to solve.

… (S)cience is one of the very few human activities — perhaps the only one — in which errors are systematically criticized and fairly often, in time, corrected.

David J. Pristash, Independent Researcher
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Face Book www.facebook.com/david.pristash
Blog www.centinel2012.com
Cell 216 272 4583

GLOBAL Land-Ocean Temperature Index in 0.01 degrees Celsius
base period: 1951-1980

sources: GHCN-v3 1880-11/2012 + SST: 1880-11/1981 HadISST1
12/1981-11/2012 Reynolds v2 using elimination of outliers and homogeneity adjustment

Notes: 1950 DJF = Dec 1949 - Feb 1950 ; ***** = missing

April 2008

GLOBAL Land-Ocean Temperature Index in 0.01 degrees Celsius base period: 1951-1980

sources: GHCN-v4 1880-12/2023 + SST: ERSST v5 1880-12/2023
using elimination of outliers and homogeneity adjustment
Notes: 1950 DJF = Dec 1949 - Feb 1950 ; ***** = missing

CO_2 421.86

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AnnMean J-D	AnnMean D-N	DJF	MAM	JJA	SON	Year
1880	-19	-24	-9	-16	-10	-21	-18	-10	-14	-23	-21	-18	-17	***	****	-12	-16	-19	1880
1881	-20	-14	3	5	6	-19	0	-4	-15	-22	-19	-7	-9	-10	-17	5	-8	-19	1881
1882	16	14	5	-17	-14	-23	-16	-7	-14	-23	-16	-35	-11	-9	8	-9	-15	-18	1882
1883	-29	-37	-12	-18	-17	-8	-6	-14	-21	-11	-23	-11	-17	-19	-34	-16	-9	-18	1883
1884	-13	-7	-36	-40	-34	-36	-30	-27	-27	-25	-33	-30	-28	-27	-10	-37	-31	-28	1884
1885	-58	-34	-27	-42	-45	-44	-34	-31	-28	-23	-24	-11	-33	-35	-41	-38	-36	-25	1885
1886	-44	-51	-43	-28	-24	-35	-18	-31	-24	-28	-28	-25	-31	-30	-35	-32	-28	-26	1886
1887	-72	-57	-36	-35	-31	-25	-26	-36	-26	-36	-26	-33	-36	-36	-51	-34	-29	-29	1887
1888	-34	-36	-41	-20	-22	-17	-10	-16	-12	1	3	-4	-17	-20	-34	-28	-14	-2	1888
1889	-9	17	6	10	-1	-10	-7	-20	-23	-25	-33	-29	-10	-8	1	5	-13	-27	1889
1890	-42	-45	-40	-30	-39	-25	-28	-39	-36	-25	-43	-32	-35	-35	-38	-36	-30	-35	1890
1891	-33	-46	-18	-27	-16	-21	-17	-17	-15	-21	-31	-4	-22	-24	-37	-20	-18	-22	1891
1892	-28	-11	-40	-33	-23	-22	-31	-27	-16	-14	-42	-38	-27	-24	-14	-32	-27	-24	1892
1893	-80	-56	-22	-27	-33	-25	-13	-25	-22	-19	-19	-34	-31	-32	-58	-27	-21	-20	1893
1894	-53	-31	-23	-45	-32	-41	-25	-25	-29	-24	-27	-22	-31	-32	-39	-33	-30	-26	1894
1895	-42	-43	-34	-22	-28	-21	-18	-18	-12	-10	-17	-14	-23	-24	-36	-28	-19	-13	1895
1896	-22	-12	-26	-30	-15	-11	-2	-5	-6	7	-4	-4	-11	-12	-16	-24	-6	-1	1896
1897	-15	-16	-13	-1	-1	-11	-2	-9	-8	-12	-18	-20	-11	-9	-12	-5	-7	-13	1897
1898	-2	-30	-51	-31	-30	-19	-22	-26	-21	-34	-38	-23	-27	-27	-17	-37	-22	-31	1898
1899	-16	-38	-36	-20	-23	-31	-16	-8	-4	-3	13	-26	-17	-17	-25	-26	-18	2	1899
1900	-35	-5	1	-8	-8	-9	-12	-8	-5	10	-6	-6	-8	-9	-22	-5	-10	0	1900

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1901	-22	-11	6	-3	-15	-12	-14	-20	-22	-29	-16	-27	-15	-14	-13	-4	-15	-23	1901
1902	-15	-9	-27	-27	-33	-32	-27	-30	-28	-29	-36	-41	-28	-27	-17	-29	-30	-31	1902
1903	-24	-5	-23	-41	-39	-42	-34	-45	-49	-46	-41	-50	-37	-36	-23	-34	-41	-45	1903
1904	-62	-58	-50	-50	-52	-48	-51	-49	-56	-39	-17	-33	-47	-49	-57	-51	-49	-37	1904
1905	-35	-59	-21	-33	-29	-28	-26	-20	-19	-25	-7	-13	-26	-28	-42	-28	-25	-17	1905
1906	-28	-29	-18	-5	-26	-19	-23	-20	-28	-20	-37	-14	-22	-22	-23	-16	-20	-28	1906
1907	-43	-51	-27	-37	-46	-42	-35	-34	-34	-23	-46	-47	-39	-36	-36	-37	-37	-34	1907
1908	-44	-32	-55	-44	-37	-38	-35	-46	-35	-44	-52	-49	-43	-42	-41	-45	-39	-44	1908
1909	-72	-46	-54	-59	-54	-52	-45	-34	-38	-40	-32	-56	-48	-48	-56	-56	-44	-37	1909
1910	-42	-41	-50	-42	-34	-38	-34	-37	-39	-41	-57	-67	-44	-43	-46	-42	-36	-46	1910
1911	-62	-58	-61	-54	-52	-50	-42	-44	-41	-26	-22	-22	-44	-48	-62	-55	-45	-30	1911
1912	-26	-16	-39	-18	-21	-24	-42	-55	-57	-58	-40	-43	-37	-35	-21	-26	-41	-52	1912
1913	-40	-45	-42	-39	-44	-45	-36	-33	-34	-32	-20	-2	-34	-38	-43	-42	-38	-29	1913

1914	5	-10	-24	-29	-21	-25	-23	-16	-16	-3	-15	-4	-15	-15	-2	-25	-22	-12	1914
1915	-20	-3	-10	7	-6	-22	-12	-22	-20	-24	-13	-21	-14	-12	-9	-3	-19	-19	1915
1916	-12	-14	-28	-30	-35	-49	-37	-28	-36	-33	-46	-81	-36	-31	-16	-31	-38	-38	1916
1917	-56	-63	-63	-54	-55	-43	-25	-22	-22	-44	-34	-67	-46	-47	-67	-57	-30	-33	1917
1918	-47	-34	-24	-44	-43	-36	-31	-31	-17	-6	-11	-29	-29	-33	-49	-37	-33	-11	1918
1919	-20	-23	-21	-12	-28	-36	-29	-33	-25	-20	-41	-42	-27	-26	-24	-20	-33	-29	1919
1920	-24	-26	-12	-24	-27	-36	-30	-26	-22	-26	-27	-46	-27	-27	-31	-21	-31	-25	1920

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1921	-4	-17	-22	-29	-30	-26	-14	-26	-19	-3	-14	-17	-19	-21	-23	-27	-22	-12	1921
1922	-33	-44	-15	-23	-33	-30	-27	-32	-35	-31	-14	-19	-28	-28	-32	-23	-30	-27	1922
1923	-27	-39	-34	-40	-33	-29	-31	-33	-31	-13	-3	-3	-26	-28	-28	-36	-31	-16	1923
1924	-22	-23	-8	-30	-18	-26	-29	-36	-32	-35	-20	-43	-27	-24	-16	-19	-30	-29	1924
1925	-37	-39	-27	-26	-29	-33	-27	-21	-19	-17	6	6	-22	-26	-40	-27	-27	-10	1925
1926	21	3	12	-12	-23	-26	-27	-13	-14	-11	-6	-29	-11	-8	10	-8	-22	-11	1926
1927	-27	-17	-38	-30	-26	-27	-19	-24	-13	-1	-6	-33	-22	-21	-24	-31	-23	-6	1927
1928	-3	-9	-25	-28	-30	-39	-19	-23	-21	-19	-10	-16	-20	-22	-15	-28	-27	-17	1928
1929	-45	-58	-33	-41	-38	-43	-36	-33	-25	-14	-11	-54	-36	-33	-40	-37	-38	-17	1929
1930	-30	-27	-11	-25	-24	-22	-21	-15	-15	-12	18	-6	-16	-20	-37	-20	-19	-3	1930
1931	-10	-20	-10	-23	-20	-8	-3	-4	-7	6	-6	-5	-9	-9	-12	-17	-5	-2	1931
1932	15	-17	-18	-6	-18	-29	-24	-22	-10	-9	-27	-26	-16	-14	-2	-14	-25	-15	1932
1933	-23	-29	-29	-24	-29	-34	-21	-24	-29	-25	-30	-44	-29	-27	-26	-28	-26	-28	1933
1934	-21	-2	-29	-30	-9	-15	-10	-12	-15	-6	3	-2	-12	-16	-22	-23	-12	-6	1934
1935	-34	14	-14	-37	-29	-27	-21	-22	-21	-6	-26	-17	-20	-19	-7	-26	-23	-17	1935
1936	-27	-38	-20	-20	-16	-22	-9	-13	-9	-2	2	-1	-15	-16	-27	-19	-15	-3	1936
1937	-7	3	-20	-15	-5	-5	-3	1	9	9	8	-7	-3	-2	-1	-14	-2	9	1937
1938	9	4	10	7	-9	-17	-9	-6	1	15	8	-12	0	0	2	2	-11	8	1938
1939	-5	-6	-17	-10	-4	-7	-5	-6	-7	-4	7	43	-2	-6	-8	-10	-6	-1	1939
1940	0	8	9	17	11	12	12	6	15	11	16	31	12	13	17	12	10	14	1940

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1941	18	31	10	16	17	13	22	14	2	35	22	21	18	19	27	14	16	20	1941
1942	29	2	5	9	11	5	0	-4	-3	1	9	12	6	7	18	9	0	3	1942
1943	-1	17	-4	11	6	-5	8	0	5	23	19	23	9	8	10	5	1	16	1943
1944	36	24	26	19	19	15	18	18	28	26	11	4	20	22	28	22	17	22	1944
1945	10	1	6	19	5	0	4	26	20	18	7	-7	9	10	5	10	10	15	1945
1946	15	3	1	6	-7	-21	-12	-20	-8	-8	-5	-31	-7	-5	3	0	-18	-7	1946
1947	-6	-8	7	6	-2	-2	-4	-7	-12	7	2	-13	-3	-4	-15	4	-4	-1	1947
1948	6	-15	-24	-12	-1	-5	-11	-12	-14	-5	-12	-24	-11	-10	-7	-12	-9	-11	1948
1949	7	-14	-2	-11	-10	-27	-13	-13	-14	-6	-10	-18	-11	-11	-10	-8	-18	-10	1949
1950	-26	-27	-8	-21	-11	-5	-8	-16	-11	-20	-34	-22	-17	-17	-24	-13	-10	-22	1950
1951	-34	-42	-20	-14	0	-7	-1	6	5	8	-1	16	-7	-10	-32	-12	-1	4	1951
1952	11	11	-8	3	-3	-3	4	5	7	0	-13	-2	1	3	13	-2	2	-2	1952
1953	7	15	11	19	11	12	1	5	4	8	-3	5	8	7	7	14	6	3	1953

1954	-25	-10	-15	-14	-20	-19	-19	-18	-10	-2	8	-18	-13	-11	-10	-16	-18	-1	1954
1955	13	-16	-32	-22	-20	-14	-11	2	-11	-5	-25	-28	-14	-13	-7	-25	-8	-14	1955
1956	-13	-24	-21	-28	-29	-15	-9	-26	-19	-23	-15	-6	-19	-21	-22	-26	-17	-19	1956
1957	-9	-3	-5	0	9	16	2	15	8	1	8	15	5	3	-6	1	11	6	1957
1958	39	22	8	1	6	-8	5	-5	-3	4	2	1	6	7	25	5	-3	1	1958
1959	8	7	18	16	4	3	3	-1	-6	-7	-8	0	3	3	5	13	2	-7	1959
1960	0	13	-35	-15	-8	-4	-4	2	7	6	-11	19	-3	-4	4	-19	-2	0	1960

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1961	7	19	9	13	12	11	1	1	8	0	3	-16	6	9	15	11	4	4	1961
1962	5	15	10	5	-6	3	2	-1	0	1	6	-3	3	2	1	3	1	2	1962
1963	-3	18	-14	-7	-6	5	6	23	18	14	15	-3	5	5	4	-9	11	16	1963
1964	-9	-10	-21	-32	-25	-4	-4	-22	-29	-32	-21	-30	-20	-18	-7	-26	-10	-27	1964
1965	-8	-17	-13	-19	-12	-8	-13	-4	-15	-5	-6	-8	-11	-12	-18	-15	-8	-9	1965
1966	-19	-4	3	-13	-12	1	8	-9	-3	-17	-1	-3	-6	-6	-11	-7	0	-7	1966
1967	-7	-21	5	-5	13	-8	2	1	-6	9	-5	-5	-2	-2	-10	4	-2	-1	1967
1968	-26	-14	20	-6	-14	-9	-13	-9	-19	9	-5	-14	-8	-7	-15	0	-10	-5	1968
1969	-11	-18	1	17	19	3	-4	4	8	10	12	25	5	2	-14	12	1	10	1969
1970	8	22	6	5	-3	-3	1	-10	12	3	2	-12	3	6	18	3	-4	6	1970
1971	-2	-15	-18	-7	-5	-17	-8	-1	-6	-4	-7	-8	-8	-9	-10	-10	-8	-6	1971
1972	-22	-18	2	0	-3	4	1	16	2	8	2	18	1	-1	-16	0	7	4	1972
1973	29	32	29	27	23	19	12	5	9	10	4	-7	16	18	26	26	12	8	1973
1974	-10	-26	-5	-11	-4	-5	-3	10	-8	-6	-8	-8	-7	-7	-14	-7	1	-7	1974
1975	10	8	12	4	16	-1	-1	-17	-2	-11	-17	-17	-1	-1	3	11	-6	-10	1975
1976	-3	-6	-22	-7	-21	-12	-10	-12	-6	-24	-6	11	-10	-12	-9	-16	-11	-12	1976
1977	19	22	25	27	33	27	20	18	2	4	16	3	18	19	17	28	22	7	1977
1978	6	10	19	17	9	-1	4	-13	6	3	14	8	7	6	6	15	-4	8	1978
1979	9	-10	19	15	4	14	4	17	25	26	28	48	16	13	2	13	11	26	1979
1980	30	39	30	30	35	20	22	19	21	13	30	22	26	28	39	32	20	21	1980

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1981	53	42	48	32	25	29	32	35	15	12	23	41	32	31	39	35	32	17	1981
1982	5	15	3	15	18	6	15	4	14	13	18	42	14	14	20	12	8	15	1982
1983	53	43	42	27	34	22	18	35	37	17	30	17	31	33	46	34	25	28	1983
1984	31	14	26	6	33	2	19	19	21	14	7	-4	16	17	21	22	13	14	1984
1985	22	-4	17	12	14	15	4	17	13	12	5	14	12	10	5	15	12	10	1985
1986	26	37	30	22	21	12	11	16	3	15	10	13	18	18	26	25	13	9	1986
1987	32	43	18	24	25	35	40	25	35	33	29	46	32	29	29	23	33	32	1987
1988	57	44	51	43	44	40	33	39	37	38	12	29	39	40	49	46	37	29	1988
1989	13	30	36	29	17	15	34	33	34	29	20	37	27	27	24	28	27	28	1989
1990	41	44	80	56	45	38	45	34	23	45	46	40	45	45	41	61	39	38	1990
1991	42	50	35	51	34	53	47	39	44	29	30	32	41	41	44	40	46	34	1991
1992	48	40	48	27	31	26	9	8	-1	6	3	22	22	23	40	36	14	3	1992
1993	35	37	36	28	28	23	25	11	11	23	3	18	23	23	31	31	20	13	1993

1994	26	3	29	41	28	44	30	21	31	42	44	39	31	30	16	33	32	39	1994
1995	52	79	47	46	27	43	45	45	33	47	44	26	45	46	57	40	45	41	1995
1996	24	46	33	33	27	29	37	48	25	24	38	37	33	32	32	31	38	29	1996
1997	31	40	52	33	34	54	34	41	52	61	64	59	46	44	36	40	43	59	1997
1998	58	88	63	63	68	77	66	65	42	41	43	55	61	61	68	65	69	42	1998
1999	48	64	32	32	26	36	38	31	38	34	37	41	38	39	56	30	35	36	1999
2000	25	56	55	57	36	40	39	42	39	26	30	28	39	40	41	49	41	32	2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
2001	46	44	56	50	58	52	59	49	52	50	72	56	54	51	39	55	53	58	2001
2002	77	78	88	58	64	53	62	53	63	54	59	44	63	64	71	70	56	59	2002
2003	75	58	60	55	61	48	58	65	62	72	53	75	62	59	59	58	57	63	2003
2004	58	73	63	61	37	44	26	46	49	61	72	51	53	55	69	54	38	61	2004
2005	74	60	74	67	63	64	61	60	71	75	73	68	68	66	62	68	62	73	2005
2006	56	73	63	47	48	66	54	70	65	70	74	79	64	63	65	52	63	70	2006
2007	102	70	73	76	69	61	59	60	60	58	59	50	66	69	83	73	60	59	2007
2008	30	38	74	53	49	49	60	46	61	67	68	54	54	54	39	59	51	65	2008
2009	64	53	54	61	65	64	73	69	71	66	79	67	66	64	57	60	69	72	2009
2010	75	83	92	84	75	68	63	67	64	71	81	45	72	74	75	84	66	72	2010
2011	52	48	65	65	53	62	70	75	56	66	59	60	61	60	48	61	69	60	2011
2012	49	49	58	73	78	64	58	66	72	80	78	52	65	65	53	70	63	77	2012
2013	71	62	67	54	61	69	60	70	76	69	83	70	68	66	62	60	66	76	2013
2014	76	55	78	79	86	67	58	83	87	80	66	77	74	74	67	81	69	78	2014
2015	86	90	96	76	80	81	73	79	85	109	106	116	90	87	84	84	78	100	2015
2016	117	137	136	110	95	80	85	102	90	88	92	86	101	104	123	114	89	90	2016
2017	102	114	116	94	91	72	82	87	77	90	88	93	92	92	101	101	80	85	2017
2018	82	85	88	89	82	77	82	77	80	101	82	91	85	85	86	86	79	88	2018
2019	93	95	117	101	85	90	94	95	92	100	99	109	98	96	93	101	93	97	2019
2020	117	124	117	113	101	92	90	87	98	88	110	80	101	104	117	110	89	99	2020

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
2021	81	64	89	75	78	84	92	82	92	100	94	86	85	84	75	81	86	95	2021
2022	91	89	105	84	84	92	94	95	89	96	72	80	89	90	89	91	94	86	2022
2023	87	98	120	100	94	108	119	119	148	134	143	137	117	112	88	105	115	141	2023
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year

Divide by 100 to get changes in degrees Celsius (deg-C).
Multiply that result by 1.8(=9/5) to get changes in degrees Fahrenheit (deg-F).

Example -- Table Value : 40
change : 0.40 deg-C or 0.72 deg-F

GLOBAL Land-Ocean Temperature Index in 0.01 degrees Celsius base period: 1951-1980

sources: GHCN-v3 1880-11/2012 + SST: 1880-11/1981 HadISST1
12/1981-11/2012 Reynolds v2 using elimination of outliers and homogeneity adjustment

Notes: 1950 DJF = Dec 1949 - Feb 1950 ; ***** = missing

Date of this paper

GLOBAL Land-Ocean Temperature Index in 0.01 degrees Celsius base period: 1951-1980

sources: GHCN-v4 1880-02/2024 + SST: ERSST v5 1880-02/2024
using elimination of outliers and homogeneity adjustment
Notes: 1950 DJF = Dec 1949 - Feb 1950 ; ***** = missing

CO_2 424.55

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	AnnMean J-D	AnnMean D-N	DJF	MAM	JJA	SON	Year
1880	-17	-24	-8	-16	-9	-20	-17	-10	-13	-23	-21	-17	-16	***	****	-11	-16	-19	1880
1881	-19	-13	4	6	6	-18	1	-3	-15	-21	-18	-7	-8	-9	-16	5	-7	-18	1881
1882	17	14	4	-16	-14	-23	-16	-7	-14	-23	-16	-35	-11	-8	8	-9	-15	-18	1882
1883	-29	-36	-12	-18	-17	-8	-6	-13	-21	-10	-22	-10	-17	-19	-33	-15	-9	-18	1883
1884	-12	-7	-35	-39	-33	-35	-29	-27	-26	-24	-33	-30	-28	-26	-10	-36	-30	-28	1884
1885	-58	-33	-26	-41	-45	-43	-33	-31	-28	-23	-23	-10	-33	-35	-40	-37	-36	-25	1885
1886	-43	-50	-42	-27	-23	-34	-17	-30	-23	-27	-27	-24	-31	-30	-34	-31	-27	-26	1886
1887	-71	-56	-35	-34	-30	-24	-25	-35	-25	-35	-26	-32	-36	-35	-51	-33	-28	-29	1887
1888	-34	-36	-41	-20	-21	-17	-10	-15	-11	2	3	-4	-17	-19	-34	-27	-14	-2	1888
1889	-9	17	7	10	0	-10	-7	-20	-23	-25	-33	-28	-10	-8	2	5	-12	-27	1889
1890	-41	-44	-40	-29	-39	-24	-27	-39	-36	-24	-43	-31	-35	-35	-38	-36	-30	-34	1890
1891	-33	-46	-18	-27	-16	-20	-17	-17	-15	-21	-31	-4	-22	-24	-37	-20	-18	-22	1891
1892	-29	-11	-40	-33	-23	-22	-31	-27	-16	-14	-42	-38	-27	-24	-15	-32	-27	-24	1892
1893	-80	-56	-21	-26	-33	-24	-13	-25	-21	-17	-18	-31	-31	-31	-58	-27	-21	-19	1893
1894	-52	-28	-22	-44	-30	-40	-23	-23	-27	-22	-25	-20	-30	-31	-37	-32	-29	-25	1894
1895	-40	-42	-32	-21	-27	-21	-16	-17	-12	-10	-16	-13	-22	-23	-34	-27	-18	-13	1895
1896	-22	-12	-26	-30	-15	-11	-2	-5	-7	7	-4	-4	-11	-12	-16	-24	-6	-1	1896
1897	-14	-16	-13	-2	-1	-11	-2	-9	-8	-13	-18	-21	-11	-9	-11	-5	-7	-13	1897
1898	-2	-30	-50	-30	-30	-19	-22	-27	-21	-34	-37	-23	-27	-27	-17	-37	-22	-31	1898
1899	-16	-37	-36	-20	-23	-31	-15	-8	-4	-3	12	-26	-17	-17	-25	-26	-18	2	1899
1900	-36	-5	1	-8	-8	-10	-12	-8	-5	10	-6	-7	-8	-9	-22	-5	-10	0	1900

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1901	-22	-10	6	-2	-15	-12	-14	-20	-22	-29	-16	-27	-15	-13	-13	-4	-15	-22	1901
1902	-16	-8	-27	-26	-31	-32	-27	-29	-28	-30	-36	-41	-28	-26	-17	-28	-30	-31	1902
1903	-23	-5	-23	-40	-39	-42	-34	-45	-49	-46	-41	-50	-36	-36	-23	-34	-40	-45	1903
1904	-62	-58	-50	-50	-51	-48	-50	-48	-54	-38	-16	-32	-46	-48	-57	-50	-49	-36	1904
1905	-33	-58	-20	-32	-28	-27	-25	-20	-18	-23	-5	-12	-25	-27	-41	-27	-24	-15	1905
1906	-27	-29	-17	-4	-25	-18	-22	-19	-27	-19	-36	-14	-22	-21	-23	-15	-20	-27	1906
1907	-42	-50	-27	-36	-45	-41	-34	-33	-33	-22	-46	-46	-38	-35	-35	-36	-36	-34	1907
1908	-43	-32	-55	-43	-36	-37	-34	-45	-34	-43	-51	-48	-42	-42	-40	-45	-39	-43	1908
1909	-72	-45	-53	-58	-54	-51	-44	-33	-37	-38	-31	-55	-48	-47	-55	-55	-43	-35	1909
1910	-42	-41	-49	-42	-33	-37	-33	-35	-38	-40	-56	-66	-43	-42	-46	-41	-35	-45	1910
1911	-61	-57	-60	-53	-51	-50	-41	-43	-40	-26	-21	-21	-44	-47	-61	-55	-45	-29	1911
1912	-26	-15	-38	-17	-21	-24	-42	-54	-57	-57	-39	-42	-36	-34	-20	-25	-40	-51	1912
1913	-39	-44	-41	-38	-43	-44	-35	-32	-33	-31	-19	-1	-33	-37	-42	-41	-37	-28	1913

1914	5	-9	-23	-29	-20	-24	-22	-15	-16	-2	-15	-3	-14	-14	-2	-24	-21	-11	1914
1915	-20	-3	-8	7	-5	-21	-12	-21	-19	-23	-12	-20	-13	-12	-9	-2	-18	-18	1915
1916	-12	-14	-27	-30	-35	-49	-36	-27	-35	-33	-45	-80	-35	-30	-15	-30	-37	-38	1916
1917	-56	-62	-63	-54	-54	-43	-24	-22	-22	-43	-33	-67	-45	-46	-66	-57	-30	-33	1917
1918	-47	-34	-24	-44	-43	-36	-31	-31	-16	-5	-11	-29	-29	-32	-49	-37	-33	-11	1918
1919	-20	-22	-21	-12	-27	-36	-29	-33	-25	-19	-41	-42	-27	-26	-24	-20	-32	-28	1919
1920	-24	-26	-12	-24	-26	-35	-30	-26	-21	-26	-26	-46	-27	-26	-30	-21	-30	-24	1920

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1921	-4	-17	-22	-29	-29	-26	-14	-26	-18	-2	-14	-17	-18	-21	-22	-27	-22	-11	1921
1922	-33	-44	-14	-23	-33	-30	-27	-32	-34	-31	-14	-19	-28	-28	-31	-23	-30	-26	1922
1923	-27	-39	-33	-41	-33	-29	-30	-33	-30	-13	-2	-3	-26	-27	-28	-36	-31	-15	1923
1924	-22	-23	-8	-30	-18	-26	-29	-36	-32	-35	-20	-43	-27	-23	-16	-19	-30	-29	1924
1925	-37	-39	-27	-25	-29	-33	-26	-20	-19	-17	6	7	-22	-26	-39	-27	-26	-10	1925
1926	21	3	12	-12	-23	-26	-27	-14	-15	-12	-7	-29	-11	-8	11	-8	-22	-11	1926
1927	-27	-17	-38	-30	-26	-27	-19	-24	-13	-1	-5	-33	-22	-21	-24	-31	-23	-6	1927
1928	-3	-9	-25	-28	-30	-39	-19	-22	-21	-19	-9	-16	-20	-21	-15	-27	-27	-16	1928
1929	-45	-58	-33	-41	-38	-43	-36	-32	-25	-14	-12	-54	-36	-33	-40	-37	-37	-17	1929
1930	-30	-26	-10	-24	-24	-22	-21	-15	-15	-11	18	-5	-15	-20	-37	-19	-19	-3	1930
1931	-10	-20	-10	-22	-19	-8	-3	-3	-6	6	-6	-5	-9	-9	-12	-17	-5	-2	1931
1932	16	-16	-18	-5	-17	-29	-24	-22	-10	-9	-27	-26	-16	-14	-2	-13	-25	-15	1932
1933	-23	-29	-29	-24	-29	-34	-21	-23	-29	-25	-30	-44	-28	-27	-26	-27	-26	-28	1933
1934	-20	-2	-29	-30	-9	-15	-10	-12	-15	-6	4	-2	-12	-16	-22	-23	-12	-6	1934
1935	-33	15	-14	-37	-28	-26	-21	-22	-21	-6	-26	-16	-20	-18	-7	-26	-23	-17	1935
1936	-27	-37	-20	-20	-16	-21	-9	-13	-9	-2	2	0	-14	-16	-27	-19	-15	-3	1936
1937	-7	3	-20	-15	-5	-5	-3	1	9	9	8	-7	-3	-2	-1	-14	-2	9	1937
1938	9	4	10	7	-9	-17	-9	-6	1	15	8	-12	0	0	2	3	-10	8	1938
1939	-5	-6	-17	-10	-4	-7	-5	-6	-7	-3	8	43	-2	-6	-8	-10	-6	-1	1939
1940	0	8	9	18	11	12	13	7	15	11	16	32	13	14	17	13	11	14	1940

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1941	18	31	10	17	17	13	22	15	2	35	23	22	19	20	27	14	17	20	1941
1942	29	2	6	10	11	5	1	-4	-3	2	10	12	7	8	18	9	1	3	1942
1943	0	18	-3	11	7	-5	9	1	6	23	20	24	9	8	10	5	2	16	1943
1944	36	24	26	20	20	16	18	18	28	27	11	4	21	22	28	22	17	22	1944
1945	10	1	6	20	6	1	4	26	21	19	7	-7	10	10	5	11	10	16	1945
1946	15	3	1	6	-7	-21	-12	-20	-7	-7	-5	-31	-7	-5	4	0	-18	-7	1946
1947	-6	-7	7	6	-1	-1	-4	-7	-12	7	3	-13	-2	-4	-15	4	-4	-1	1947
1948	7	-14	-24	-12	-1	-5	-11	-12	-14	-5	-12	-23	-10	-10	-7	-12	-9	-10	1948
1949	7	-14	-2	-11	-10	-27	-13	-13	-14	-6	-10	-18	-11	-11	-10	-8	-18	-10	1949
1950	-26	-27	-8	-21	-11	-5	-8	-16	-11	-20	-34	-22	-17	-17	-24	-13	-10	-22	1950
1951	-34	-41	-20	-14	0	-7	-1	6	5	8	-1	16	-7	-10	-32	-12	-1	4	1951
1952	11	11	-8	4	-3	-3	4	5	7	0	-13	-2	1	3	13	-2	2	-2	1952
1953	7	15	11	20	11	12	1	5	4	8	-3	5	8	8	7	14	6	3	1953

1954	-24	-10	-15	-14	-20	-19	-19	-18	-10	-2	8	-18	-13	-11	-10	-16	-18	-1	1954
1955	13	-16	-32	-22	-20	-14	-11	2	-11	-5	-25	-28	-14	-13	-7	-25	-8	-14	1955
1956	-13	-24	-21	-28	-29	-16	-9	-26	-19	-23	-15	-6	-19	-21	-22	-26	-17	-19	1956
1957	-9	-3	-5	0	9	16	2	15	8	1	8	15	5	3	-6	1	11	6	1957
1958	39	22	9	1	6	-9	5	-5	-3	4	2	1	6	7	25	5	-3	1	1958
1959	7	7	18	15	4	3	3	-1	-6	-7	-8	0	3	3	5	12	2	-7	1959
1960	0	13	-35	-15	-8	-4	-4	2	7	6	-11	19	-3	-4	4	-19	-2	0	1960

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1961	7	19	9	13	12	11	1	1	8	0	3	-16	6	9	15	11	4	4	1961
1962	5	15	10	5	-6	3	2	-1	0	1	6	-3	3	2	1	3	1	2	1962
1963	-3	18	-14	-7	-6	5	6	23	18	14	15	-3	5	5	4	-9	11	16	1963
1964	-9	-10	-21	-32	-25	-4	-4	-22	-29	-31	-21	-30	-20	-18	-7	-26	-10	-27	1964
1965	-8	-17	-13	-19	-12	-8	-13	-4	-15	-5	-6	-8	-11	-12	-18	-14	-8	-9	1965
1966	-19	-4	3	-13	-12	1	8	-9	-3	-17	-1	-2	-6	-6	-10	-7	0	-7	1966
1967	-7	-21	5	-5	12	-8	2	1	-6	9	-5	-5	-2	-2	-10	4	-2	-1	1967
1968	-26	-14	20	-6	-14	-9	-13	-8	-19	9	-5	-14	-8	-7	-15	0	-10	-5	1968
1969	-11	-18	1	17	18	3	-4	4	8	9	12	25	5	2	-14	12	1	10	1969
1970	8	22	6	5	-3	-2	2	-10	12	3	2	-12	3	6	18	3	-4	6	1970
1971	-2	-15	-18	-7	-5	-16	-7	-1	-6	-4	-7	-8	-8	-8	-10	-10	-8	-6	1971
1972	-22	-18	2	0	-3	4	1	16	2	8	2	18	1	-1	-16	0	7	4	1972
1973	29	32	29	27	23	19	12	5	9	10	4	-7	16	18	26	26	12	8	1973
1974	-10	-27	-5	-11	-4	-5	-3	10	-8	-5	-8	-8	-7	-7	-14	-7	1	-7	1974
1975	10	8	12	4	16	-1	0	-17	-2	-11	-17	-17	-1	-1	3	11	-6	-10	1975
1976	-3	-6	-21	-7	-21	-12	-10	-12	-6	-24	-6	11	-10	-12	-9	-16	-11	-12	1976
1977	19	23	24	26	33	27	20	18	2	3	16	3	18	19	17	28	22	7	1977
1978	7	10	19	17	9	-1	4	-13	6	3	14	8	7	6	7	15	-4	8	1978
1979	9	-10	19	15	4	14	4	17	25	26	28	48	16	13	2	13	11	26	1979
1980	30	39	30	30	35	20	22	18	20	13	30	21	26	28	39	32	20	21	1980

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
1981	53	42	48	32	25	29	32	35	15	12	23	41	32	31	39	35	32	17	1981
1982	5	15	3	15	18	6	15	4	14	13	18	42	14	14	20	12	8	15	1982
1983	53	43	42	27	34	22	18	35	37	17	30	17	31	33	46	34	25	28	1983
1984	31	14	26	6	33	2	19	19	21	13	7	-4	16	17	21	22	13	14	1984
1985	22	-4	17	12	14	15	4	16	13	11	5	14	12	10	5	14	12	10	1985
1986	26	37	30	22	21	12	11	16	3	15	10	13	18	18	26	25	13	9	1986
1987	32	43	18	24	25	35	40	25	35	33	29	46	32	29	29	23	33	32	1987
1988	57	44	51	43	44	40	33	39	37	38	12	29	39	40	49	46	37	29	1988
1989	12	30	36	29	17	15	34	33	34	29	20	37	27	27	24	28	27	28	1989
1990	41	44	80	56	45	37	45	34	23	44	46	40	45	45	41	61	39	38	1990
1991	42	50	35	51	34	53	47	39	44	29	30	32	40	41	44	40	46	34	1991
1992	47	40	48	27	31	26	9	8	-1	6	3	22	22	23	40	36	14	3	1992
1993	34	37	36	28	28	23	25	11	11	23	3	18	23	23	31	31	20	12	1993

1994	26	2	29	41	28	44	30	21	31	42	44	39	31	30	15	33	32	39	1994
1995	52	79	47	47	27	43	45	45	33	47	44	26	45	46	57	40	44	41	1995
1996	24	46	32	33	27	29	37	48	25	24	38	37	33	32	32	31	38	29	1996
1997	33	41	52	33	34	54	34	41	52	61	64	59	46	45	37	40	43	59	1997
1998	58	88	63	64	68	77	66	65	42	41	43	55	61	61	68	65	69	42	1998
1999	48	64	32	32	26	36	38	31	38	34	37	40	38	39	55	30	35	36	1999
2000	25	56	55	57	36	40	39	42	38	26	30	28	39	40	40	49	40	32	2000

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
2001	45	44	55	50	58	52	59	49	52	50	72	55	53	51	39	55	53	58	2001
2002	77	78	88	58	64	53	62	53	63	54	59	44	63	64	70	70	56	58	2002
2003	75	58	60	55	61	48	58	65	62	72	53	75	62	59	59	58	57	63	2003
2004	58	73	63	61	37	44	26	46	49	61	72	51	53	55	68	54	39	61	2004
2005	75	60	74	67	63	65	61	60	71	75	73	68	68	66	62	68	62	73	2005
2006	56	73	63	47	48	66	54	70	65	70	74	79	64	63	66	52	63	70	2006
2007	101	70	73	76	69	61	59	60	60	58	59	50	66	69	83	73	60	59	2007
2008	30	38	74	53	49	49	60	46	61	67	68	54	54	54	39	59	51	65	2008
2009	65	52	53	61	65	64	73	69	71	66	79	67	66	64	57	60	69	72	2009
2010	75	83	92	85	75	68	63	67	64	71	81	45	72	74	75	84	66	72	2010
2011	53	48	65	65	53	62	70	75	56	65	58	60	61	60	49	61	69	60	2011
2012	47	49	58	73	78	64	58	66	72	80	78	53	65	65	52	70	63	77	2012
2013	71	62	67	54	61	69	60	70	76	69	83	70	68	66	62	60	66	76	2013
2014	76	55	78	80	86	67	58	83	87	80	66	78	74	74	67	81	69	78	2014
2015	87	90	96	76	80	81	73	79	85	109	106	117	90	87	85	84	78	100	2015
2016	118	137	135	110	95	80	85	102	90	88	92	87	102	104	124	114	89	90	2016
2017	103	114	116	94	91	71	82	87	77	90	88	93	92	92	101	100	80	85	2017
2018	83	85	89	89	82	77	83	77	80	101	82	92	85	85	87	86	79	88	2018
2019	94	95	117	101	85	90	94	95	92	100	99	110	98	96	93	101	93	97	2019
2020	117	124	117	113	101	91	89	87	98	87	110	80	101	104	117	110	89	98	2020

Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year
2021	81	64	88	75	78	84	92	82	92	99	94	86	85	84	75	81	86	95	2021
2022	91	89	105	83	84	92	94	95	89	96	73	80	89	90	89	91	94	86	2022
2023	87	97	120	100	93	108	119	119	148	134	142	135	117	112	88	104	115	141	2023
2024	122	144	****	****	****	****	****	****	****	****	****	****	****	***	134	****	****	****	2024
Year	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec	J-D	D-N	DJF	MAM	JJA	SON	Year

Divide by 100 to get changes in degrees Celsius (deg-C).
Multiply that result by 1.8(=9/5) to get changes in degrees Fahrenheit (deg-F).

Example -- Table Value : 40
change : 0.40 deg-C or 0.72 deg-F