AN OPEN LETTER TO THE WORLD ON CLIMATE CHANGE

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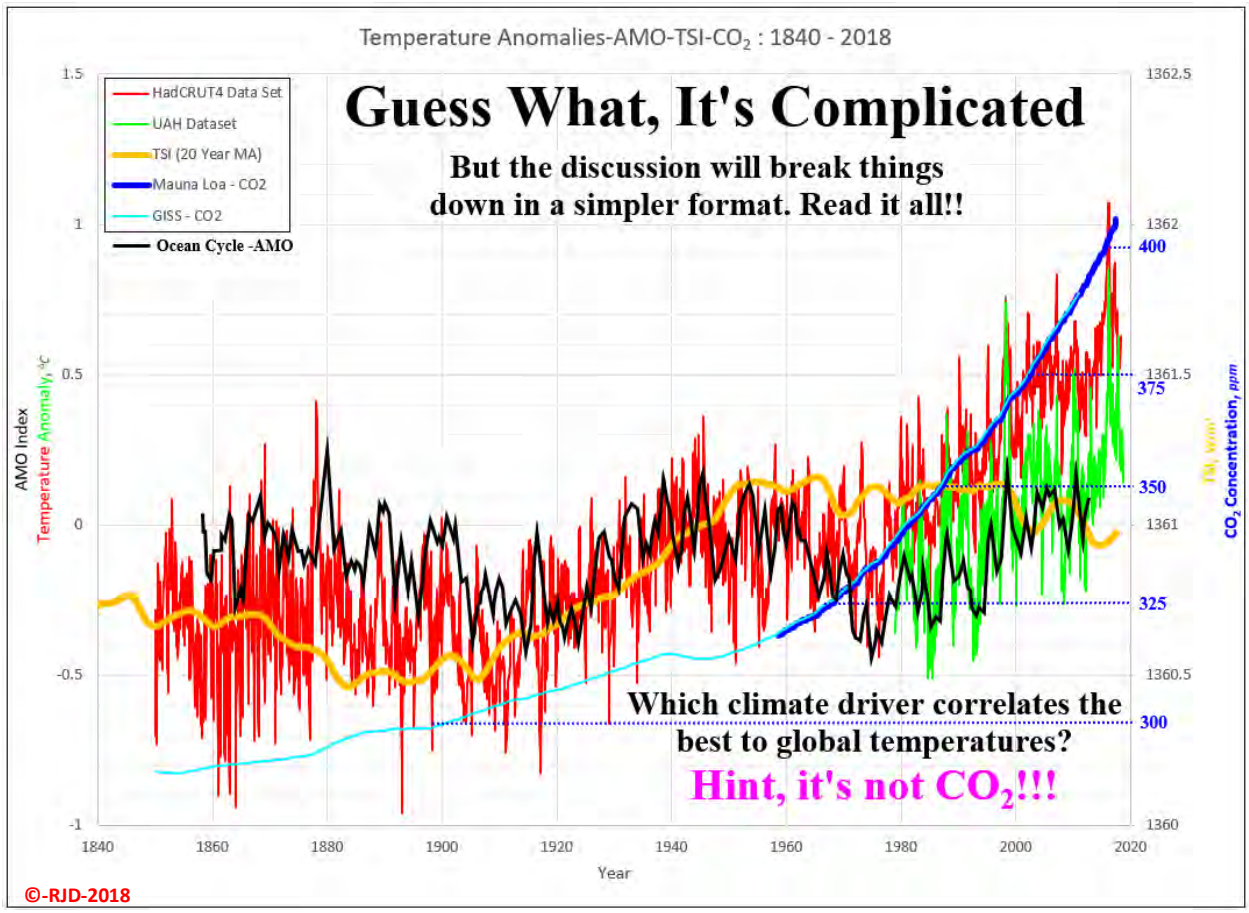
Very few people who read this will know who I am or what type of person I am. I've had a successful engineering career, I believe I'm well liked and I've conducted my life honestly. I am not normally outspoken but I've had a long time to look at "Global Warming" and I just felt that I need to add my voice to the skeptic side of the discussion for the sake of my children and grandchildren (and yours).



As a Professional Engineer, I am charged with an ethical responsibility to fairly design and report on the infrastructure work we do, so as to ensure the public are kept safe and projects are reasonably designed within the project budget and performance objectives. I bring this thinking to the "Global Warming" issue. I am concerned that there are significant data discrepancies in many aspects of human-made "Global Warming" claims, and that the proposed solutions will result in a tremendous cost burden for our children, with little benefit to society, the environment or a beneficial effect on climate change. I am also concerned that the public debate is being silenced through name calling and intimidation. For our children, we must encourage free inquiry in science. Otherwise we are doomed to return to the days of believing in magic and medieval witch burning.

The purpose of this document is to lay out actual data **(NOT computer models and unverified theories)** and let the reader make their own decision. A quick summary of the facts (based on July/August 2018 data) is laid out below.

1. There is no empirical data showing that CO_2 has been or ever will be one of the main drivers of climate change.
2. Early August Arctic sea ice extent is only 8.6% below the 1981-2010 lower interdecile range, but Arctic sea ice volume (which is more representative than the areal extent) is actually well above average at the upper end of the normal range.
3. Antarctic sea ice extent is within the 1981-2010 normal range.
4. Both Antarctica (for several decades) and Greenland (more recently) are adding significant ice volumes to their ice caps (details in the discussion).
5. Sea levels have been rising steadily (with small fluctuations) since the mid 18th century with no correlation to CO_2 concentrations.
6. Northern Hemisphere snow extent (2017-18) had risen above one standard deviation based on the 1998-2011 period (not a big deal) but the Snow Water Equivalent (SWE) in early April was actually more than 30% higher than the typical range with significantly more snowfall over the remaining spring snowfall season.
7. The average global temperature anomaly for August 2018 was +0.19 °C (based on the University of Alabama Huntsville (UAH) satellite data). Apart from el Nino temperature spikes, the temperature is currently at the same levels we experienced from 2002 – 2007. Other temperature data sets are discussed later.
8. If we assume that every country adheres to their 2030 commitments from the 2015 Paris Accord the temperature reduction by 2100 will only be 0.048 °C using the UN's Intergovernmental Panel on Climate Change's (IPCC's) computer models. Canada's contribution to the temperature reduction (based on our 1.5 – 2.0 % CO_2 global emission contribution) will only be 0.00072 – 0.00096 °C. Definitely not worth the tens of billions of Canadian dollars per year of wasted capital and lost GDP. Or the trillions of dollars globally.

Foreword Discussion

Based on my look at the data (and I've looked at a lot), there is no empirical data on any time scale that shows that CO_2 is a significant climate driver. Conversely, there is an abundance of data that shows that the sun directly or indirectly (i.e.: through ocean cycles, modulating cloud cover, etc.) has a significant effect on the earth's climate on many different time scales. As an engineer, I wasn't happy with just looking at someone else's interpretation. So I opted to get the data from NASA, NOAA, Universities, Scientific Institutions, etc. and review it myself. Charts with downloaded data can be identified by the following text reference (**©-RJD-2018**). The reader can simply review the data I compiled or go get the data themselves. And I encourage everyone to get the data and provide me/everyone with any empirical data showing that CO_2 is a significant climate driver. I am more than open to changing my opinion, but that won't happen without real data. Computer models and unsubstantiated theories will not be enough.

I don't pretend that I can evaluate every aspect of the climate realm, because no one can. But I can evaluate the relationships between the primary parameters (temperature, CO_2 and solar activity). And I can evaluate the effectiveness of using computer models to forecast future temperatures. Very simply, the climate cannot be accurately modelled by a computer because it is a non-linear chaotic system that has hundreds of input parameters (not just CO_2 which is a small component). At best, it is an estimate that is only as valid as the vast number of assumptions that are fed into the computer. The problem with the

"Global Warming" approach to climate forecasting is that they use the computer models as proof of a coming catastrophic warming. Computer models unfortunately prove nothing and to date have totally missed their projections (which will be discussed later). Just critically read every article on "Global Warming" and its consequences and chances are you'll see a reference to the warming predicted by these unvalidated models and/or you'll see a lot of words like could, should, might, may, etc.

A similar article could be written that surmises the consequences of the cooling that will accompany the coming "Grand Solar Minimum (GSM)". And make no mistake, the cooling will be a lot more devastating than any heating caused by rising CO_2. A report out of Britain (April 7th, 2018, Daily Star), showed that 20,275 more people than average died from cold between December and March of this year (with more than double that expected by the end of the winter). Heat or Eat deaths have become a huge problem in Britain (and Europe) where the renewable energy agenda has led to huge and for the most vulnerable, unaffordable increases in energy prices. Unfortunately those numbers will be small compared to the losses we'll see over the next few years. The growing seasons look like they are shortening and they will continue to shorten as we move deeper into the GSM. The crop losses will be devastating and lead to astronomically high food prices and mass starvation consistent with other major solar minimums.

This is Calgary's first snowfall (October 3rd, 2018). This is a problem (a majority of the prairie crops are still in the fields) and it's not isolated to Calgary. Early snowfalls are becoming very regular on the Prairies (and will become more frequent and earlier as we descend further into the Grand Solar Minimum). The worst case was Calgary's Snowmageddon (September 8th, 2014). That unprecedented early snowfall seriously damaged or destroyed 50% of Calgary's tree canopy (roughly 1 million trees).

In reality, warming due to CO_2 increases will temper the cooling effects of the GSM and we should be thankful for that. In fact, I hope that the approximately 1 °C increase we've experienced since the 1850's

(the depths of the Little Ice Age) is due entirely to CO_2. Unfortunately, based on a review of CO_2 and solar activity, I (and many other climate scientists) believe that the net benefit of CO_2 is only 0.4 – 0.5 °C. That will help but we're still in for some rough years over the short to medium term. If the crowd that believes that CO_2's capacity to warm the atmosphere reached saturation around 350 ppm (i.e.: CO_2 is no longer contributing any meaningful atmospheric heating), then we are in for a long, cold couple of decades.

So you are more than welcome to dismiss my views (as outlined above) but to be fair, please review my rationale for those views before you actually dismiss them. But if you outright dismiss my views, then you also have to dismiss the views of such "prominent climate scientists" as Bill Nye, David Suzuki, Al Gore, Leonardo DiCaprio, Neil Young, Barack Obama, etc. For the record, I do have a peer reviewed, published paper that reviews one of the earliest CO_2 sequestration projects implemented in Canada (in 1995). I was the project lead for Co-Enerco Resources' acid gas disposal system (80% CO_2, 20% H_2S) in the Zama field in northern Alberta.

The rest of the discussion is focussed on the data (with some interpretation/opinion thrown in on my part). I don't get into any detailed scientific discussions (i.e.: you don't need a science background to understand this information).

I Fundamentally Agree With Many Global Warming Statements

There are some very simple reasons that I cannot and will not be able to buy into the "Global Warming" hysteria that seems to have overtaken our political establishment. However, before I move ahead with my discussion I would like to point out that there are many aspects of the "Global Warming" argument with which I fundamentally agree. To be clear, my agreement with these statements is based on my confidence in the evidence derived from the data I have reviewed.

1. I agree that climate changes (the planet has warmed and cooled many times on many different time scales and with more dramatic magnitudes than our current warming),
2. I agree that the planet has warmed since the late 1800's (roughly 0.9 °C),
3. I agree that CO_2 has been rising steadily and more quickly since the 1950's,
4. I agree that a significant percentage of the recent CO_2 increase is manmade,
5. I agree that atmospheric CO_2 increases can increase the global temperature,
6. I agree that CO_2 increases have contributed to a significant portion (probably 40 - 50%) of the 0.9 °C temperature increase over the last 150 years,
7. I agree that CO_2 is absolutely vital to all life on this planet and we are currently living in a period that is close to plant starvation levels (plants die off at 150 ppm, we were at a low of 185 ppm just 15,000 years ago and are only at 410 ppm currently and greenhouses routinely increase their CO_2 levels to 1,200 – 1,500 ppm to encourage plant growth).

However, I do not agree with the human caused catastrophic warming mantra that is continually shoved in society's face. And the reason for that is simple. The "exaggerated" future warming is based on computer models that have consistently failed to predict the climate responses correctly over the last few decades. The model failures are not surprising since they are based on unproven theories and there is virtually no empirical data in the historical records (on any time scale) that suggest CO_2 is a significant driver of climate change. Although CO_2 can affect temperature over very short periods of time such as the

1970 – 2000 period, the underlying natural variations (solar activity, ocean cycles, etc.) generally override the CO_2 effects. More detail is provided later in the discussion.

I'll start my discussion by reviewing the available global temperature and atmospheric CO_2 concentrations on a variety of time scales. For the record, CO_2 does not appear to be driving climate change on any of the available data, which will be readily apparent.

Temperatures and Atmospheric CO_2 Concentrations – Past 600 Million Years

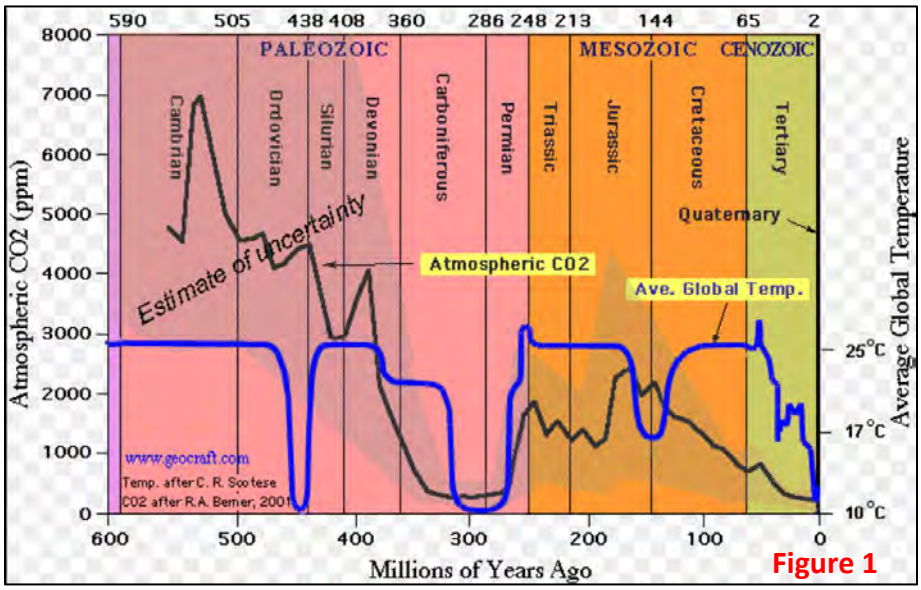


Figure 1

The first time scale we'll look at covers the last 600 million years (Figure 1). The CO_2 levels are obviously not driving global temperatures at this time scale. Global temperatures have actually averaged roughly 10 °C above our current temperatures for 80% of the last 550 million years. We are currently living through one of the major/regular ice ages that occur every 150 million years. CO_2 levels were actually significantly higher (10 times plus) around 450 million years ago but the world was still in a deep ice age (similar to our current temperatures). From 600 up to 350 million years ago, CO_2 levels dropped down to levels similar to our current levels. This was a natural process. Over time atmospheric CO_2 was being sequestered by the planet as hydrocarbons (oil, gas and coal) and carbonate rock. The CO_2 concentrations levelled off during the Permo-Carboniferous ice age about 300 million years ago. The CO_2 concentrations began increasing at the end of that ice age. The rising CO_2 was most likely due to extreme volcanic activity associated with major plate tectonic action. The sequestration process dominated again around 150 million years ago and CO_2 levels began dropping to the current levels. Although CO_2 is not driving the global temperatures it is probably playing a role in modulating the major ice ages. The very high CO_2 levels may have shortened the ice age at 450 million years ago, played a role in ending the ice age at 300 million years ago and shortened/tempered the ice age at 150 million years ago.

Take away:

1. CO_2 and Global Temperatures have not moved in unison over this time scale.
2. Rising CO_2 levels did not cause any runaway temperature increases.
3. The planet's "normal" temperature is roughly 10 °C higher than current temperatures.

Temperatures and Atmospheric CO_2 Concentrations – Past 420,000 Years

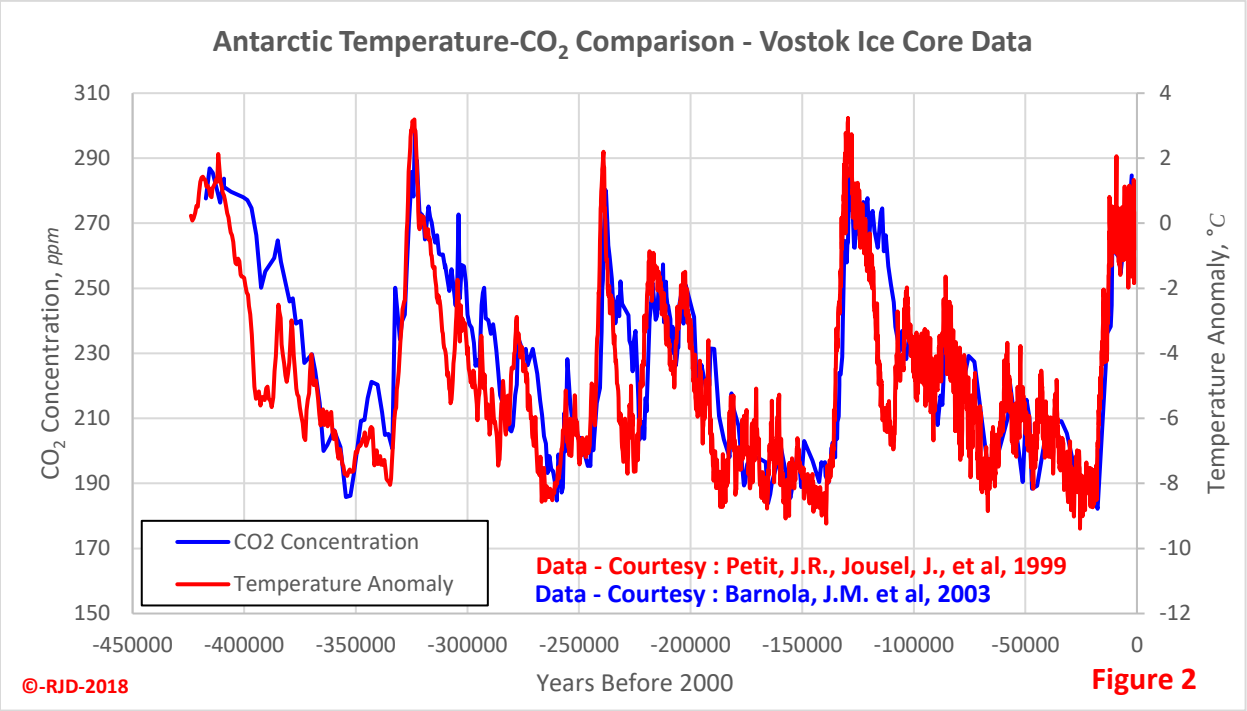


Figure 2

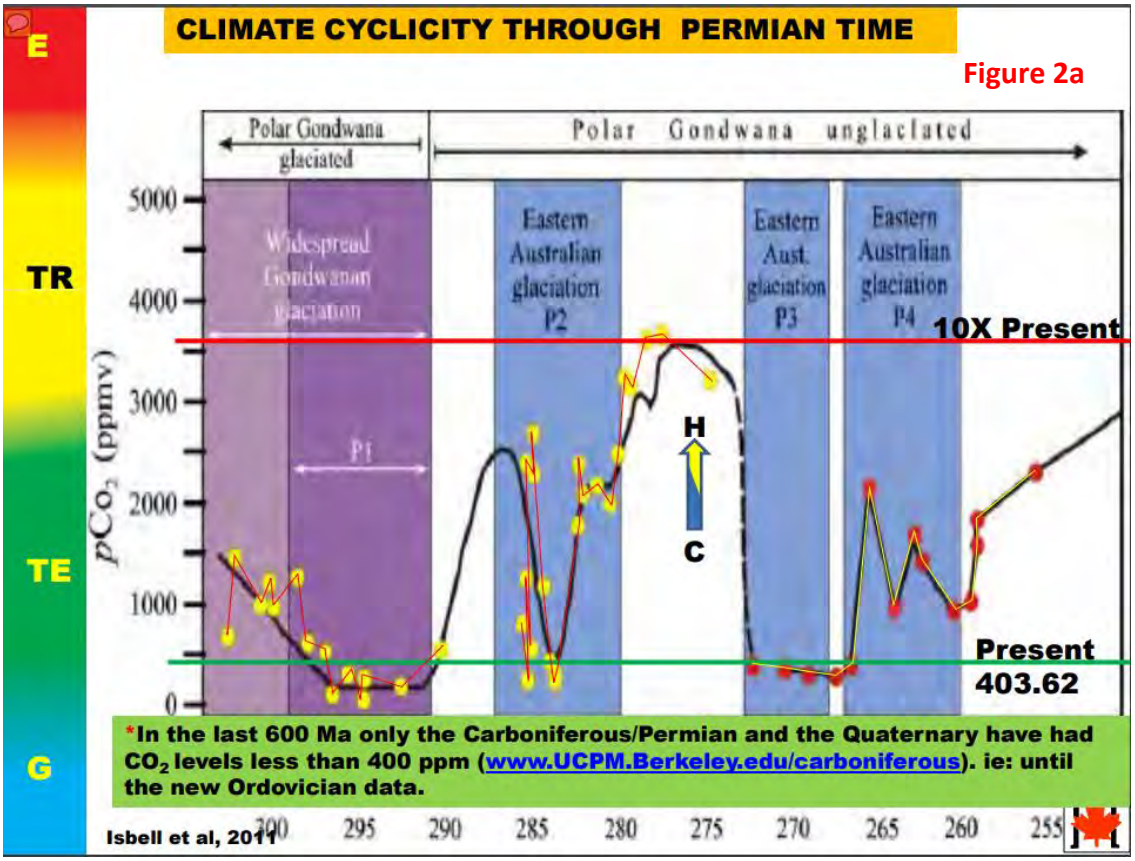
The next time scale to look at is the last 420,000 years (Figure 2). Additional ice core data back to 800,000 years ago is available but the temperature/CO_2 relationships do not change. The ice cores obtained from Greenland and the Antarctic provide a detailed estimate of temperatures and CO_2 concentrations. At this time scale, there is a definite correlation between CO_2 and temperature. However, temperature is driving the CO_2 concentration. When temperatures increase, CO_2 increases (with a delay of several centuries). When the temperatures decrease, CO_2 also decreases (generally with a delay of several millennia). This is just a natural thermodynamic process. As temperatures rise, the CO_2 stored in the ocean is gradually released. The CO_2 response is delayed by centuries, due to the time required to transfer that heat throughout the world's oceans. The reverse happens as the temperatures decline. CO_2 is absorbed by the oceans, but the process takes much longer.

This is the same data that Al Gore used to promote his Inconvenient Truth movie. Somehow, he "forgot" to mention that the temperature moved before the CO_2 concentrations. That was just one of many "misrepresentations" that Al has put forward over the years.

I'm going to present some additional data here that isn't as widely distributed. The plot (Figure 2a) on the following page comes from a presentation by Dr. John Harper (Former Director, Energy Canada – Geological Survey of Canada from July 2009 – May 2011). The data provides a window into some of the CO_2 changes that occurred during the glaciation associated with Carboniferous/Permian time frame (250 – 300 million years ago). CO_2 was not fluctuating with temperature on the 600 million year time scale. In reality, CO_2 and temperature would still need to move in unison (with the appropriate delays) since the Law of Thermodynamics must still be adhered to. You just have to get to tighter time frames to see that relationship (i.e.: the Greenland/Antarctic ice core data or other focussed data such as that presented on the following page). The atmospheric CO_2 levels were fluctuating between 300 and 3500 ppm during this 50 million year period. The same detail is not available on the temperature so we can't make any direct

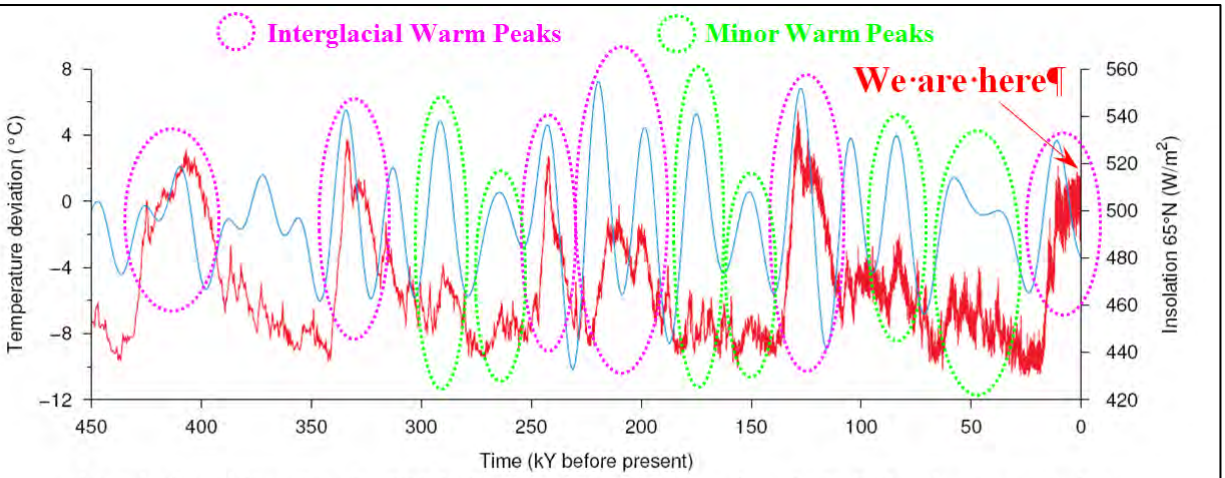
relationship declarations. But realistically the only natural process that could move CO_2 (**both** up and down) on those time frames is significant temperature changes. Cold temperatures drive down the atmospheric CO_2 concentrations to less than 400 ppm during major glaciation periods. When the planet warms up, the CO_2 concentrations rise back up to the ambient levels (3500 ppm for the Carboniferous/Permian period). As an aside, ocean CO_2 concentrations would also have been higher during this period since there was more CO_2 in the system. Most of the atmospheric CO_2 associated with the drop from 3500 - 400 ppm would have been absorbed by the oceans. A much more significant volume of CO_2 than what we as humans can add to the ocean at our current levels of 400 ppm or even the projected levels of 700 – 800 ppm. Ocean life survived these periods of much higher CO_2 concentrations and will survive the current CO_2 levels. A similar process has been occurring during the Quaternary period (as shown in the ice core data) but the ambient CO_2 level is much lower (probably around 700 – 800 ppm based on the CO_2 levels before we descended into the deep ice age, roughly 50 million years ago). Global temperatures at that time were significantly higher than the current temperatures. The current CO_2 level of 410 ppm is the result of both temperature increases out of the deep ice age and more recently the Little Ice Age plus our more recent human emissions. Whether humans existed or not the CO_2 levels would eventually get back into that 700 – 800 ppm range. That is probably millions of years in the future since we just started the current deep glaciation just a few million years ago. The deep glaciations tend to last 10s of millions of years.

I haven't seen the Ordovician CO_2 data mentioned at the bottom of the chart, but if the CO_2 concentrations were down below 400 ppm (and based on the Laws of Thermodynamics they should be), they will provide additional confirmation of the previous discussion. Ambient CO_2 levels would have been a bit higher than the Permian at 4500 ppm.



The Sun as a Driver of Climate

The data sets, laid out in the following two pages, are very interesting and highlight the relatively insignificant role CO_2 has played in directly driving the planet's temperature history. I would suggest that everyone read the following paper "Modulation of Ice Ages via Precession and Dust-Albedo Feedbacks". The paper goes into a lot of detail which I will not get into in this discussion.



A graph of insolation strength at 65°N (blue) vs Antarctic temperatures (red). Each red peak represents an interglacial warming, which occur roughly every 100,000 years. The blue peaks represent Great Summers in the northern hemisphere. Note that not every Great Summer produces an interglacial global warming. Sources: Laskar 2004 orbital cycles, Epica3 2007 temperature data.

https://www.sciencedirect.com/science/article/pii/S1674987116300305

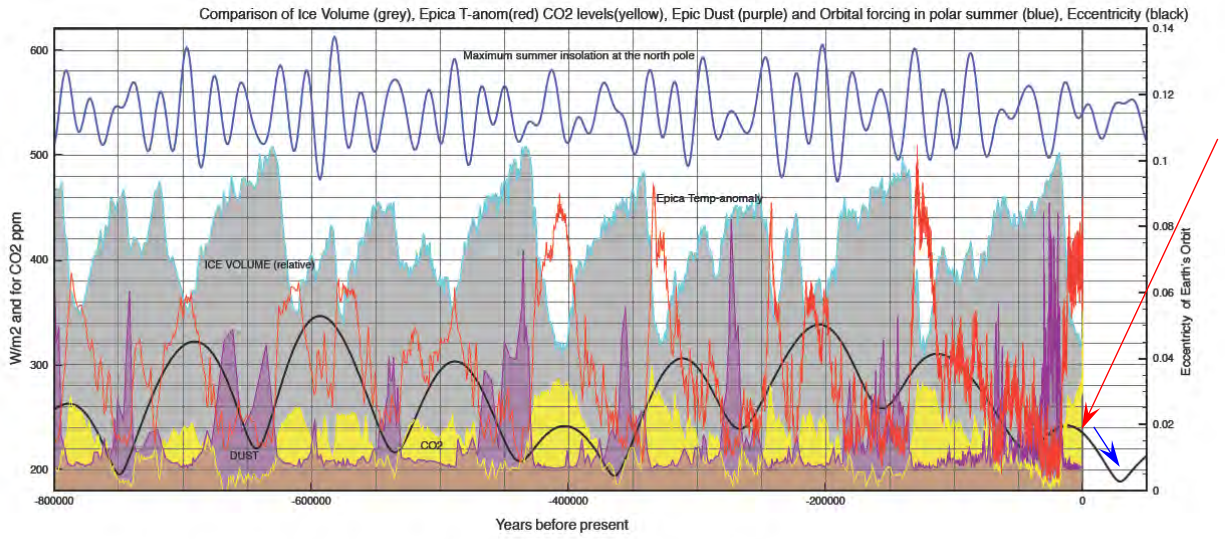
Figure 3

This chart (Figure 3) highlights the sun's role in driving the earth's climate as laid out according to the Milankovitch cycles. The Milankovitch cycle is actually a consolidation of three cycles. The shortest relevant cycle is the Axial Precession at 26,000 years. Axial Precession is the change in the direction of the Earth's axis of rotation (relative to the fixed stars). The Axial Precession is nearing the bottom of its cycle. The longest relevant cycle is the earth's orbital eccentricity at roughly 100,000 years. The eccentricity also fluctuates on a 400,000 year cycle but is not as important in the discussion of average global temperatures. The eccentricity ranges between 0.000055 (nearly circular) to 0.0679 (mildly elliptical) and is currently 0.017 and decreasing. These two cycles consolidate to form the Apsidal Precession that corresponds to the 21,000 year insolation cycles shown above. The third cycle relates to the earth's axial tilt (obliquity). The tilt shifts between 22.1° and 24.5° (and back again) every 41,000 years. The tilt is currently 23.44° and is decreasing. Full detailed descriptions can be found on Wikipedia.

The Temperature fluctuations are shown in red. The major temperature spikes correspond to interglacial warm periods. We are currently living through the Holocene interglacial (far right on the graph). The interglacial warm periods occur every ±100,000 years and correspond directly to the eccentricity cycle highs (Figure 4, on the following page). The temperature anomalies correlate very well with the insolation strength which is not surprising since we receive virtually all of our energy from the sun. As an aside the International Panel on Climate Change (IPCC) uses only the sun's total irradiance (which does not vary significantly, ±1%) in their computer models. The amount of energy actually reaching the earth's surface can vary much more significantly (≈22%) and needs to be factored in. The 100,000 year cycle appears to be the most important factor in establishing interglacial warm periods. Note our position in the current cycle. Insolation strength decreases off the peaks tend to be followed by sharp temperature drops into

deep ice ages. The interglacial warm periods tend to last (on average) 14,000 years. We're currently 15,000 years into the Holocene interglacial. We appear to be sitting in a very precarious position (note that every dip in the eccentricity is associated with a deep ice age and that is the direction we are headed). I (personally) would be more concerned with temperature drops than temperature increases. Hopefully recent CO_2 increases have been keeping us (and will continue to keep us) above the tipping point that drops us into the deep ice ages.

The paper does however, put forward an interesting role for CO_2 and the part it plays in initiating interglacial warm periods. The following chart lays out the data from the previous discussion in a different format and adds in some additional data.



We are here

A summary graph of all the factors that play a role in glacial modulation.

Ice sheet extent grows (light blue), forcing the temperature to fall (red). And CO_2 concentrations (yellow) fall alongside temperatures, as CO_2 is absorbed by the cooler oceans. When CO_2 concentrations reach a minimum of 190 ppm there is desertification and large dust storms (purple). And when the next Great Summer comes along (blue sine wave), the dusty-ice sheets can melt and the world warms into another interglacial (red peaks). Sources: Laskar 2004 orbital cycles, Epica3 2007 temperature data

Figure 4

https://www.sciencedirect.com/science/article/pii/S1674987116300305

For the record CO_2 is not directly driving these temperature fluctuations but does play a role. To understand that contradiction we need to look at Figure 4. The time scale has been expanded to 800,000 years from 450,000 years. The first point to note is the very direct relationship between Temperature (red) and CO_2 concentrations (yellow) on these time scales. When the data is reviewed in detail, it becomes very clear that the temperature changes are driving the changes in atmospheric CO_2 concentration. This is very basic thermodynamics. As the temperature rises, more CO_2 is released from the oceans and when the temperature drops, more CO_2 is absorbed by the ocean. The CO_2 changes take centuries to kick in due to the sheer size of the oceans and atmosphere. To summarize, on this time scale temperature drives CO_2. CO_2 is not driving the temperature.

The interesting data set on this chart is represented in purple. This data represents the amount of dust that has settled in Antarctica over time (based on the Epica ice cores). Every warm interglacial period is preceded by significant dust accumulations. Why is this important? Very simply, dusty ice/snow absorbs more heat than pristine ice/snow. Pristine ice/snow has a very high albedo and reflects most of the sun's energy back into space. The other dataset to note at this time is the earth's eccentricity (black). Every

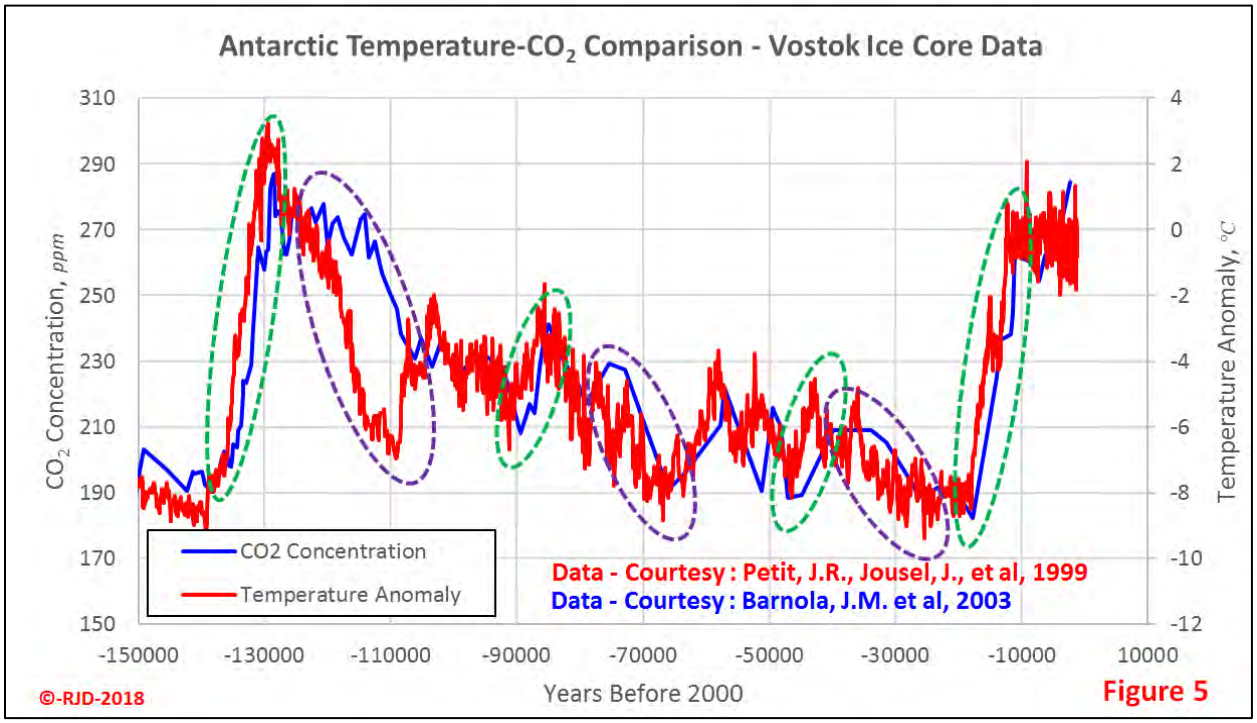
peak in this 100,000 year cycle is associated with an interglacial warm period. That is not coincidence! The amount of dust grows over tens of thousands of years. The earth's albedo continues to decrease over that period and when the earth enters an up eccentricity cycle (combined with an insolation spike), the albedo has dropped to the point where the melting of the massive ice sheets accelerates and temperatures increase significantly thrusting the planet back into an interglacial warm period.

So what is CO_2's role in this process? As I mentioned earlier CO_2 is not directly driving the temperature. However, as temperature drops into the deep ice ages, the atmospheric CO_2 levels drop as well. When the CO_2 levels drop below 200 ppm, plant life becomes very distressed and wide spread desertification occurs. As desert areas expand, dust storms increase and dust accumulations increase at the poles. That cycle is repeated over and over again in the historical records but doesn't appear to be factored into the IPCC's "scientific" process.

CO_2 levels dropped as low as 185 ppm in the last ice age (and have been trending lower with each ice age). At 150 ppm, plant life and therefore virtually all life ceases to exist on this planet. I would suggest that we need to add CO_2 to the atmosphere since plants are still stressed at our current 400 ppm level. Optimum levels for plant growth are closer to 1,500 ppm than our current levels.

The last point I want to make on Figure 4 is the current direction of the eccentricity. The direction is down and will ultimately reach its lowest point in the last 800,000 years. That is not a good sign for temperature direction. Every deep ice age (i.e.: a 100% correlation) over the last 800,000 years (8 in total) has been associated with a low point in the eccentricity cycle and that is where we are headed. The overall insolation strength is currently moving up modestly overall and may hopefully keep us from going into a major deep freeze in the near term. The interglacial warm periods (like the current Holocene) are associated with highs in the eccentricity cycle.

Temperatures and Atmospheric CO_2 Concentrations – Past 150,000 Years



The above chart (Figure 5) focuses in on the last full cycle of temperature and CO_2 concentration to show the relationship in a little more detail. The delayed CO_2 response initiated by temperature changes are readily visible for significant changes (several centuries for **temperature rises** and several millennia for **temperature decreases,** highlighted above).

Take away:

1. CO_2 and Global Temperatures are generally moving in unison over this time scale.
2. However, global temperatures usually move first, followed by CO_2 concentrations (with century and/or millennia delays). A typical thermodynamic response.
3. Rising CO_2 levels did not cause any runaway temperature increases.
4. The sun (in relation to orbital patterns) is the primary driver of global temperatures on these time scales.

Temperatures and Atmospheric CO_2 Concentrations – Past 12,000 Years

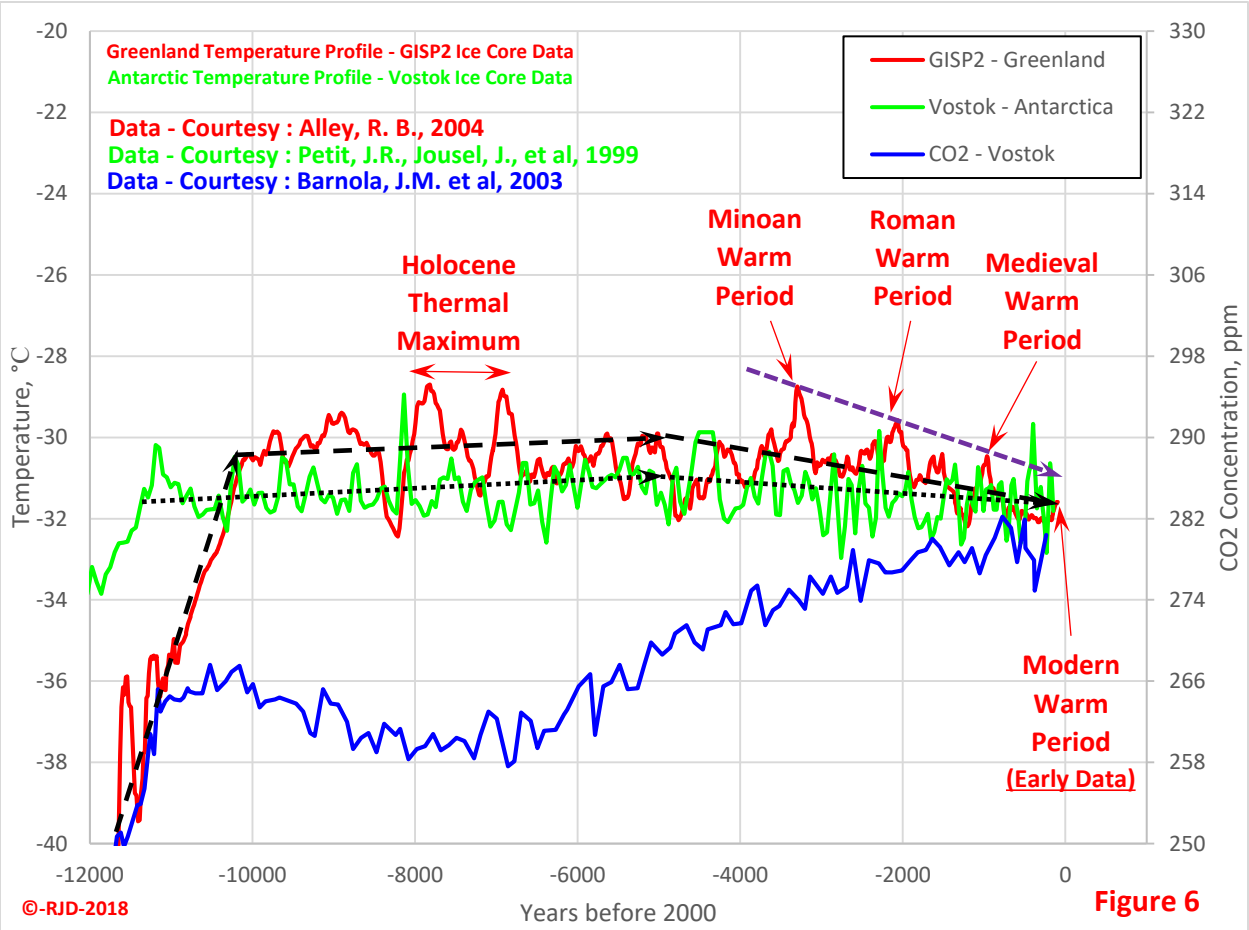


Figure 6

The next focus will be the Holocene interglacial warm period (roughly the last 12,000 years). Figure 6 is a graph of the temperatures from Greenland (GISP2) plotted in red, the normalized temperatures from the Antarctic (Vostok) plotted in green and the historical CO_2 concentration from the Vostok ice cores plotted in blue for the past 12,000 years. The Greenland data demonstrates more pronounced temperature fluctuations than the Antarctic data. The Antarctic data is characterized by a minor temperature rise followed by a minor decline with the inflection point occurring roughly 5,000 years ago. The Greenland data has more defined periods that often correspond to major periods in human history (highlighted with names). The difference in temperature fluctuations is primarily due to earth's geography. The northern hemisphere has a lot more land mass than the southern hemisphere and the north pole is all water (open or frozen) versus the south pole's position on the Antarctic continent.

There are a few key features on this chart that need to be pointed out. Firstly, the temperature in Greenland has been noticeably dropping since the temperature peak associated with the Minoan Warm Period. The Modern Warm Period is not fully represented in the ice core data but will be shown in later figures. Later in Figure 9b I present that the current Greenland average temperature is around -30 °C when we use the NASA-GISS manipulated modern data set. Which of course makes the estimated current Greenland temperature warmer than the Medieval Warm Period (MWP). The evidence of Vikings growing crops in Greenland colonies during the MWP negates the concept that Greenland was colder than present day during the MWP. Qualitatively, this suggests that the NASA-GISS data must be overstated.

In general, humans thrive during the warm periods and suffer through the cold periods (the Dark Ages and the Little Ice Age). When global average temperatures drop by 1 or 2 °C, the earth's growing season in the Northern hemisphere decreases (significantly) and drifts south resulting in major crop failures and less productive land. The obvious outcome has been massive global starvation, epidemics and civil strife.

In the past 12,000 years, there is actually an inverse relationship between temperature and CO_2. Temperatures initially rose as CO_2 decreased, then temperatures began declining after the Holocene maximum (5,000 years ago in Antarctica and 7,000 years ago in Greenland) despite rising CO_2 concentrations. The effect is more pronounced in the Northern hemisphere but the trends are still visible in the Southern hemisphere data.

Take away:

1. CO_2 and Global Temperatures are generally moving in **opposition** over this time scale.
2. Global temperatures have generally been **declining** for the last 5,000 – 7,000 years.

Temperature Records – Since 1850

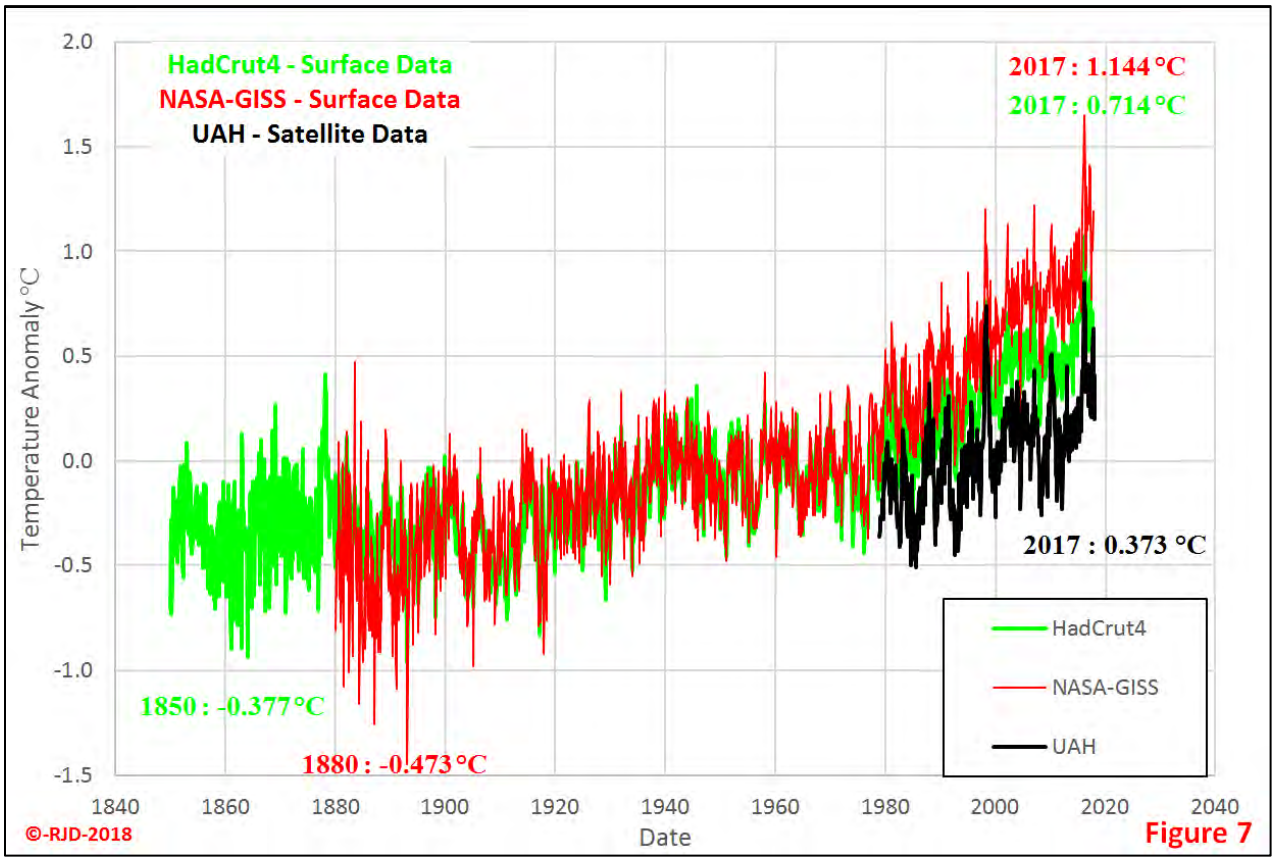


Figure 7

The modern temperature data sets, presented in Figure 7, begin in the mid 1800's. Conveniently, for the Global Warming crowd that corresponds to the end of the Little Ice Age. A rise in temperature is not unusual after periods of lower temperature (i.e.: just look back at the data we have just covered).

The HadCrut4 data set is the oldest estimate of global temperature beginning in 1850. NASA-GISS data begins in 1880 and is initially comparable to HadCrut4. Around 1975 the two data sets begin to diverge from one another. By 2017 the NASA-GISS data set is more than 0.4 °C higher than the HadCrut4 data set. Given that the raw data is obtained from the same source, the difference must be due to the method used to average the data (a process called homogenization). Every group uses their own algorithms to come up with a global average temperature. Given that the science is "settled", you'd think that the NASA-GISS value wouldn't be 40% higher than the HadCrut4 value. Two satellite data sets are also available. The UAH (University of Alabama Huntsville) data (plotted on Figure 7) is another 0.34 °C lower than the HadCrut4 data. The RSS satellite data is similar to but higher than the UAH data (located between the UAH and HadCrut data sets).

So which data set is the right one? I prefer to go with the satellite data for a few reasons. Firstly, the satellite data agrees with the weather balloon data. Secondly, the satellite data has a much tighter sampling grid and covers almost the entire planet making satellite estimates the most accurate method of estimating an average global temperature. If you believe in "Global Warming" you choose the NASA-GISS data set. My issue with the NASA-GISS data set (and the HadCrut4 to a lesser degree) is their homogenization process. I'll provide one example of the process in the next section.

Evidence of Temperature Manipulations

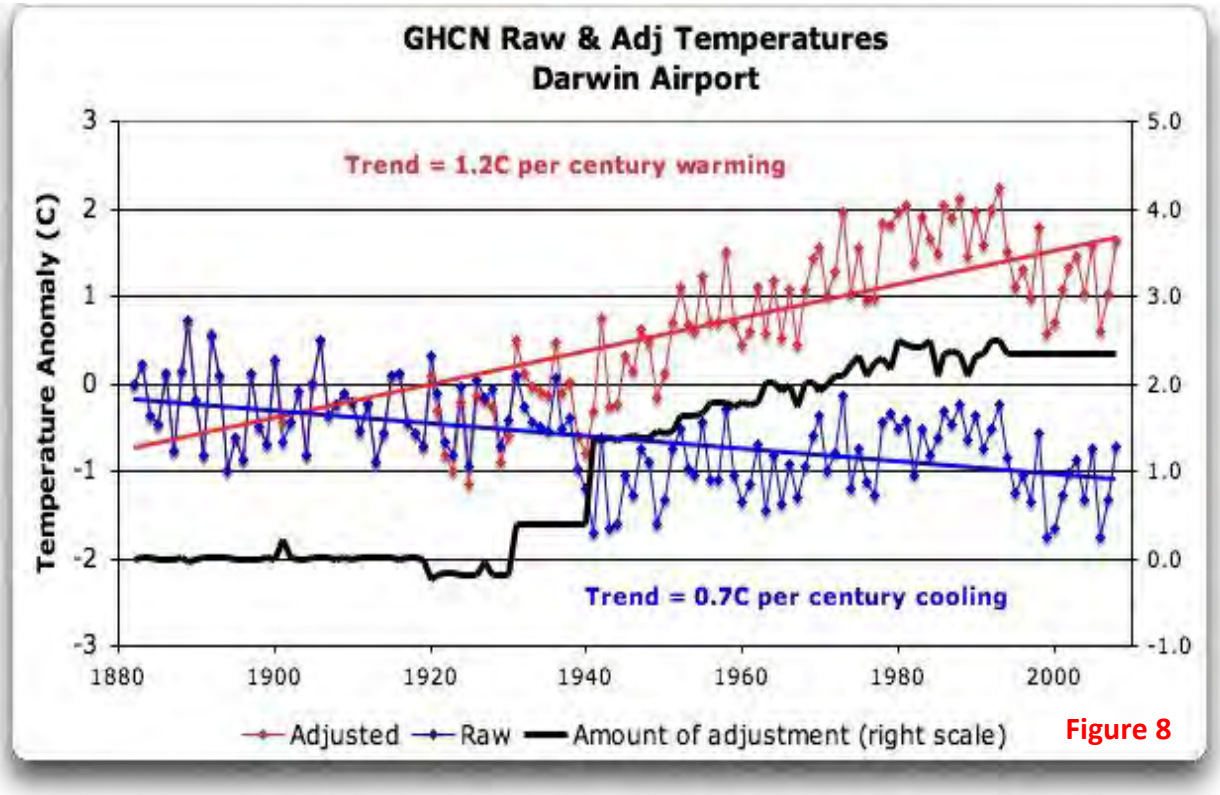
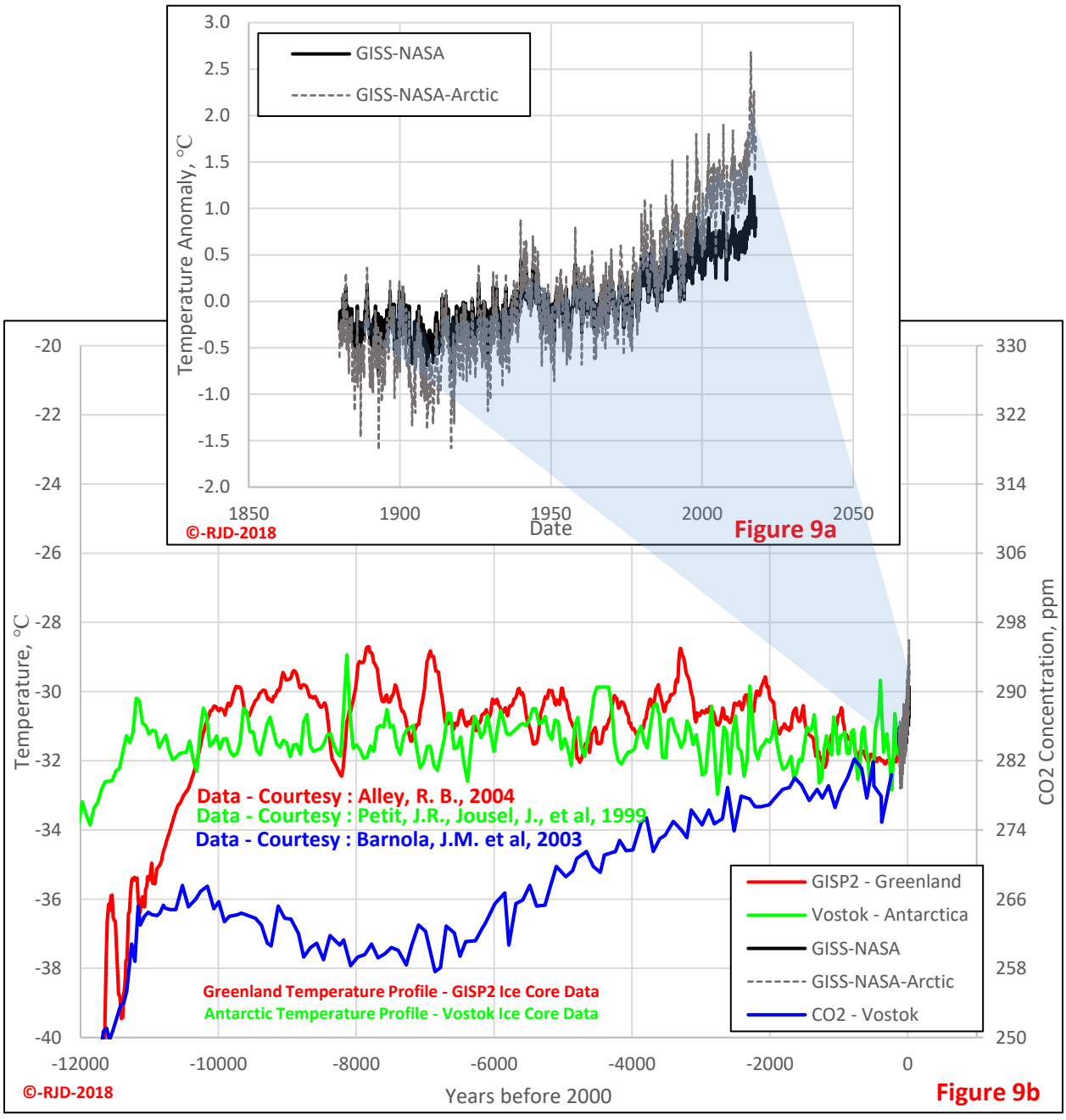


Figure 8

The actual measured temperatures at the Darwin Airport have been declining at 0.7 °C/century since 1880. The temperature trend used in the NASA-GISS averages is an increase of 1.2 °C/century. The homogenization process is adding over 2 °C to the measured temperatures. The global data has to be and is being manipulated (you can't just take the earth's temperature). Unfortunately, the justification for that amount of manipulation has not been opened up for peer review. Which begs the question, what are they hiding?

More Details on Temperature Manipulation

Just so there's no need to get into an argument over which data set to use, I'll go with the NASA-GISS data set for this section of the discussion (despite the unjustified manipulation that I believe they're using). The following charts have the NASA-GISS data set attached to the historical data from ice cores.



I have a couple of simple questions for everyone to contemplate while looking at the above Figures. **How is this temperature change over the last 150 years alarming? How is it any different from the historic fluctuations seen in the GISP2 historic record?**

The NASA-GISS temperature anomaly (Figure 9a) was increased by a factor of 2 to force an equivalent temperature in the polar regions. The temperature change (even using the overstated NASA-GISS values) is not an unusual change in temperature. The historic temperature fluctuations over the last 12,000 years

are not due to CO_2 concentrations changes. The recent warming could easily be a continuation of well-established natural cycles (in whole or in part).

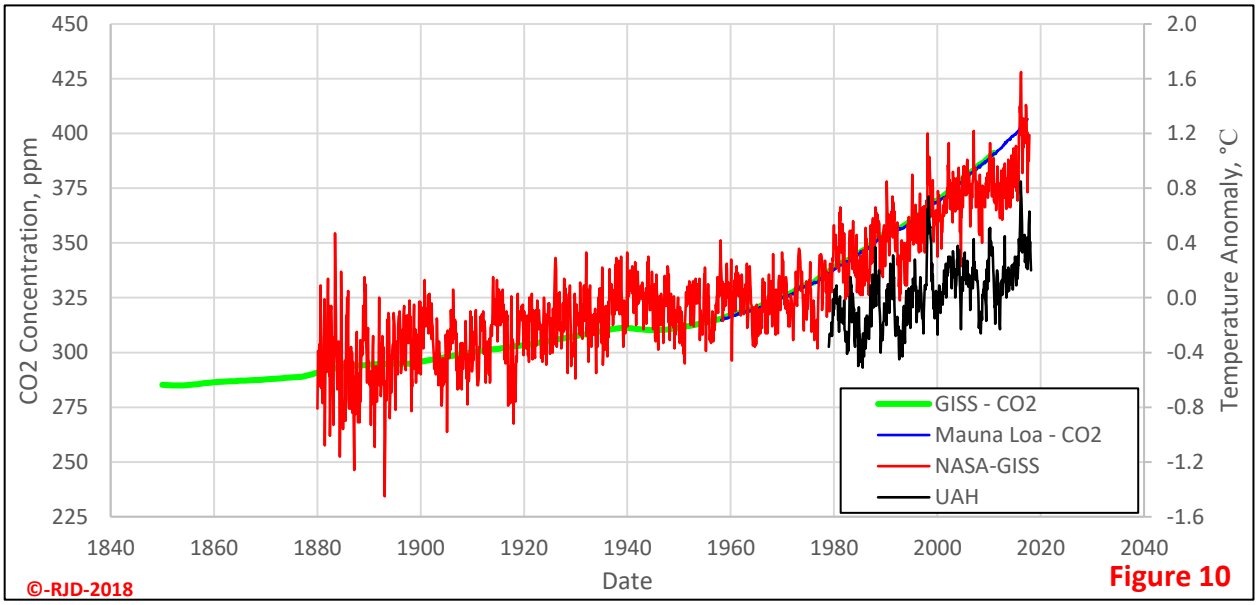


Figure 10

Figure 10 presents the CO_2 concentrations in green alongside the NASA-GISS and UAH (University of Alabama Huntsville satellite data) temperature anomalies. Despite the significant data manipulation NASA has conducted over the years on the GISS dataset, the natural oscillations are still visible.

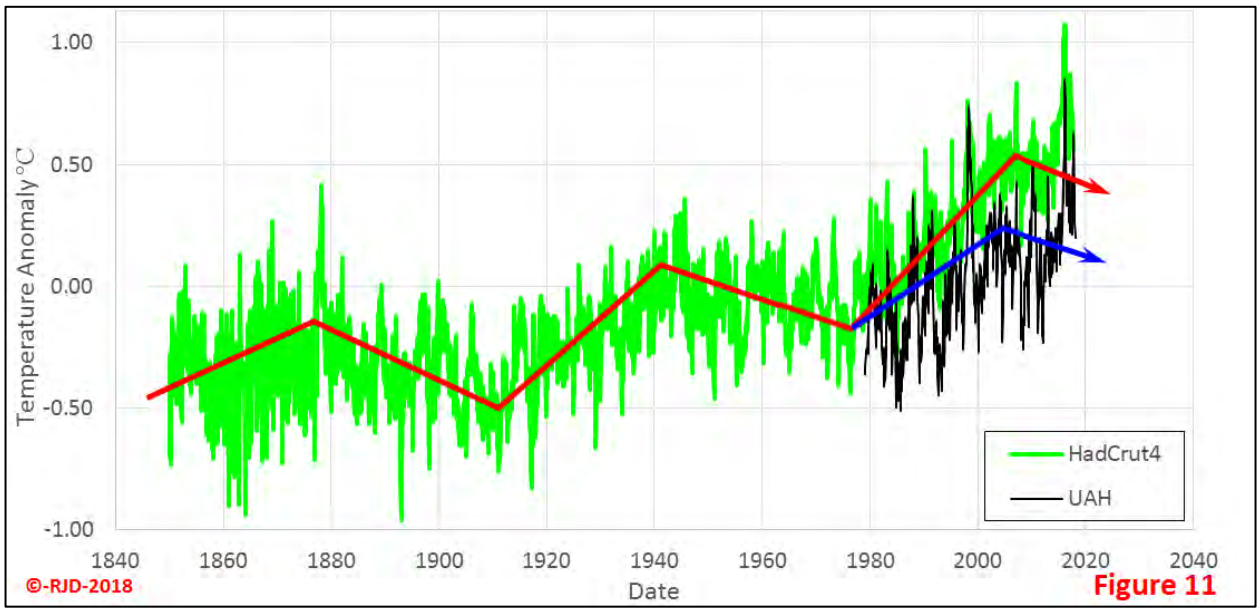


Figure 11

The HadCrut4 data in Figure 11 presents the natural cycles in more detail. The roughly 60 year cycles correspond closely to the Atlantic and Pacific Multidecadal Oscillations (AMO and PMO). The oscillations occur as the average ocean temperatures switch between hot and cold every 30 years. I'm not going to go into detail on the various ocean cycles but they are one of the significant reasons that the temperature dataset is not smooth on this time scale. However, there are a couple of points I would like to mention at this time. Firstly, the overwhelming majority of the energy that drives the ocean cycles comes from the

sun and secondly the ocean affects the atmospheric temperature a lot more than the atmosphere affects the ocean temperature.

The NASA-GISS temperature anomaly over the 1970 – 2000 time period correlates very well with the CO_2 data and it is possible that CO_2 has been a significant contributor to temperature rise over this period. However, the temperature has not increased significantly (if at all) since 2000 (apart from the strong 2016 el Nino which is not a climate change event).

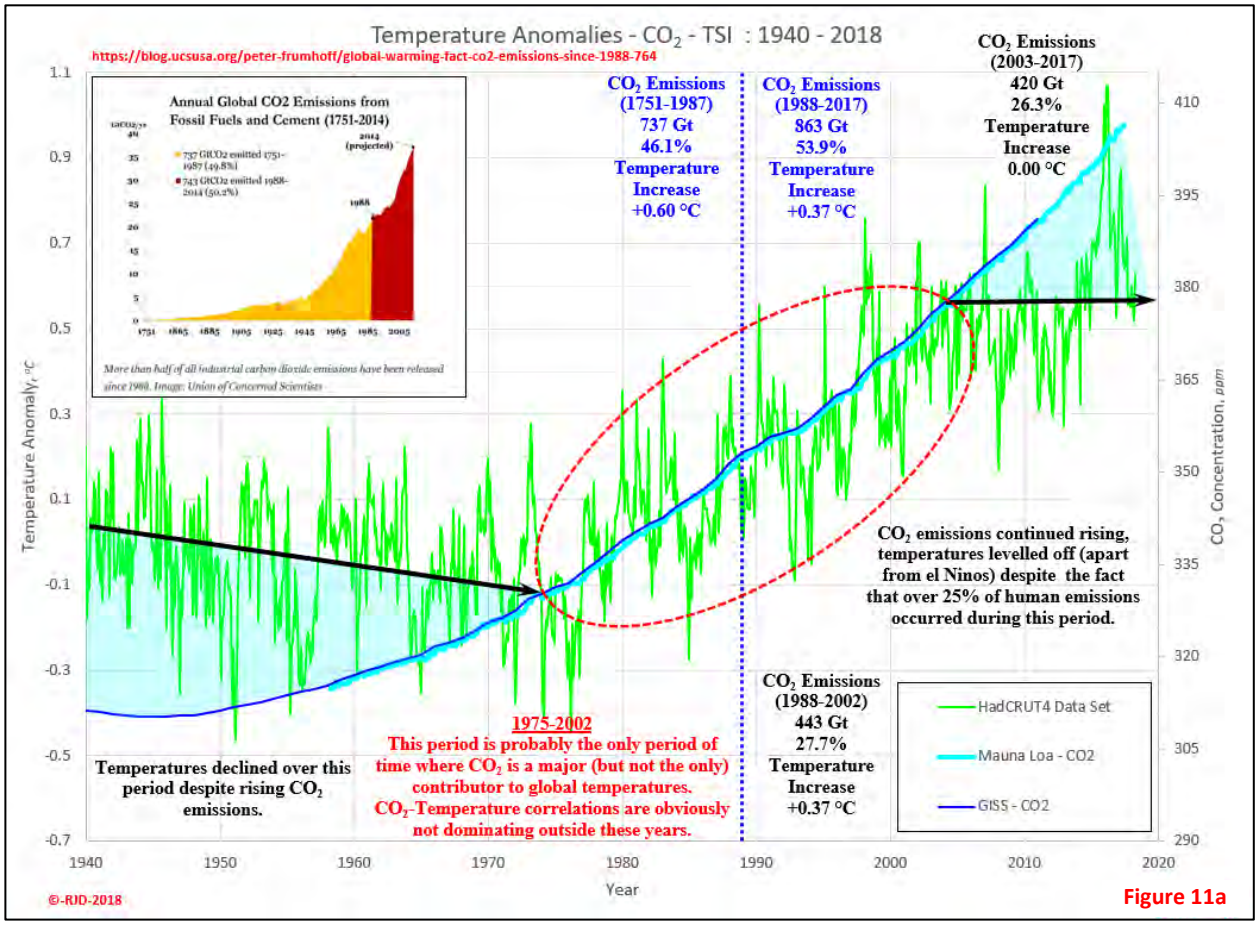


Figure 11a

The actual contribution by CO_2 (over that 1970 – 2000 period) would be mitigated by the ocean cycle effects (both the AMO and PDO). Both cycles began warming in 1970 and would have contributed significantly to the 1970 – 2000 period warming **(i.e.: all of the 1970 – 2000 warming is not due to CO_2 and the presented CO_2/global temperature correlation is not actually totally direct)**.

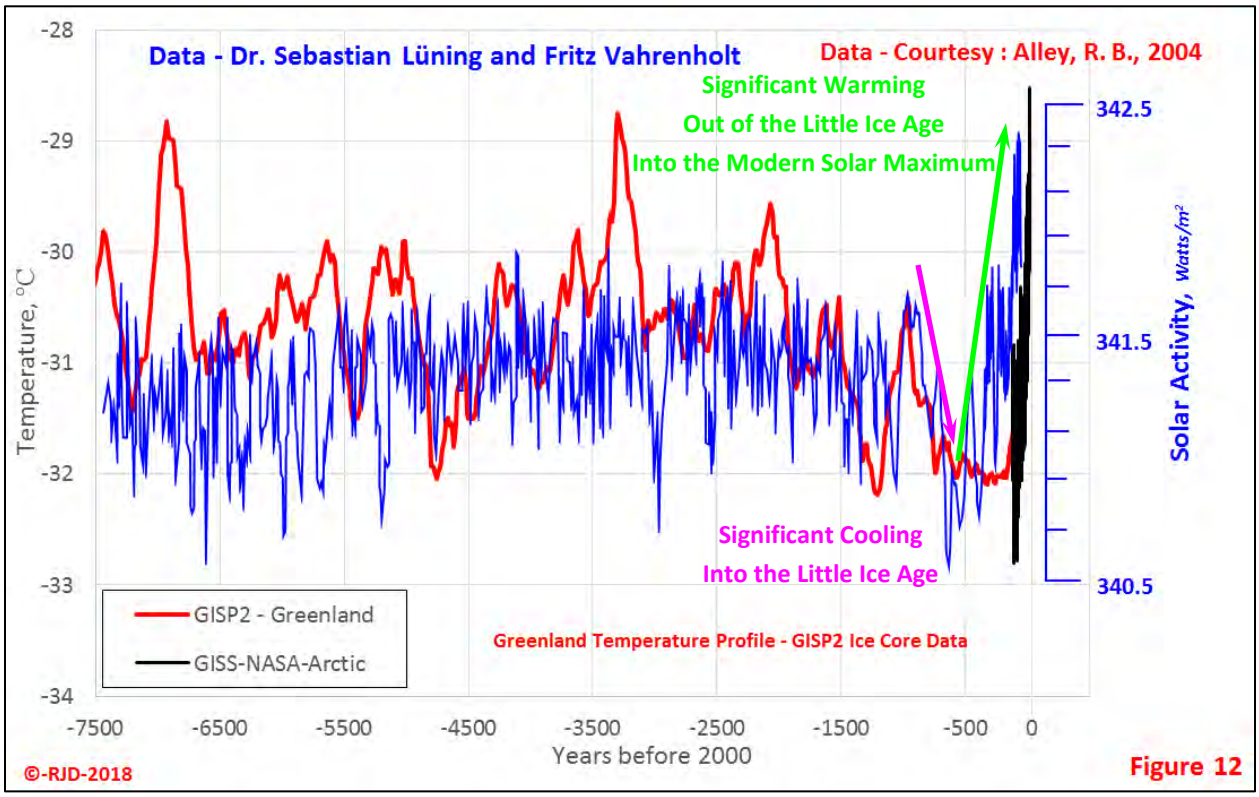
Roughly 1/3 of mankind's CO_2 emissions have occurred since the strong el Nino in 1998, yet temperatures have only increased marginally. CO_2 has not been the primary global temperature driver for the last couple of decades or there would have been a significant rise in temperature as predicted (incorrectly) by the climate computer models.

I'm not going to go into a major discussion on the computer models simply because the forecasts are not data based and are therefore not proof of any future temperature rise or proof of the theories programmed into the simulations. And as I mentioned historical predictions have so far been incorrect. My focus is on the relationship between CO_2 concentrations and global temperatures in the actual data.

Relationship of Solar Activity to Global Temperatures

The previous discussion covers a significant portion of the available global temperature and CO_2 concentration data. The remaining discussion will focus on the levels of solar activity and its relationship with global temperatures. This will not be comprehensive but it will provide an overview on the importance of that relationship.

A variety of time scales covering most of the Holocene interglacial period will be reviewed.



The primary points presented in Figure 12 are the significant solar activity lows experienced through the Little Ice Age (150 to 700 years ago) and the rapidly rising solar activity levels corresponding to the rise in temperature coming out of the Little Ice Age. Solar activity peaked in the early 21st century at the highest levels in the last 7,000 years. The rising solar activity has likely played a significant role in those rising temperatures.

The chart in Figure 13 on the next page zooms in on the past 1,000 years.

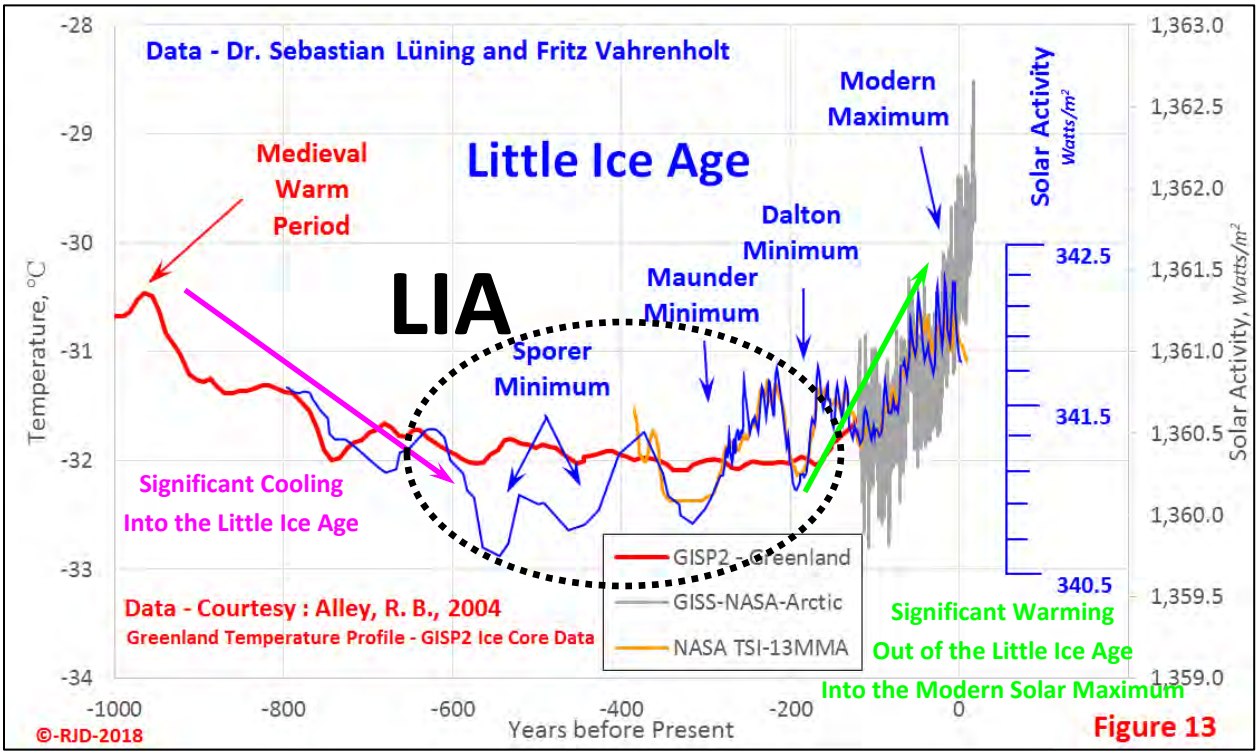


Figure 13 includes NASA's estimate of total solar irradiance (TSI) in orange as a comparison to the Luning and Vahrenholt (1610 - 2016) dataset displayed in blue. The TSI tracks are very similar where they overlap. And again you can see the TSI rising along with the global temperature (NASA-GISS data set) out of the Little Ice Age. That rising TSI would have contributed (directly and indirectly) to the rise in temperature over the last century or two.

The chart on the next page focuses on the past 140 years.

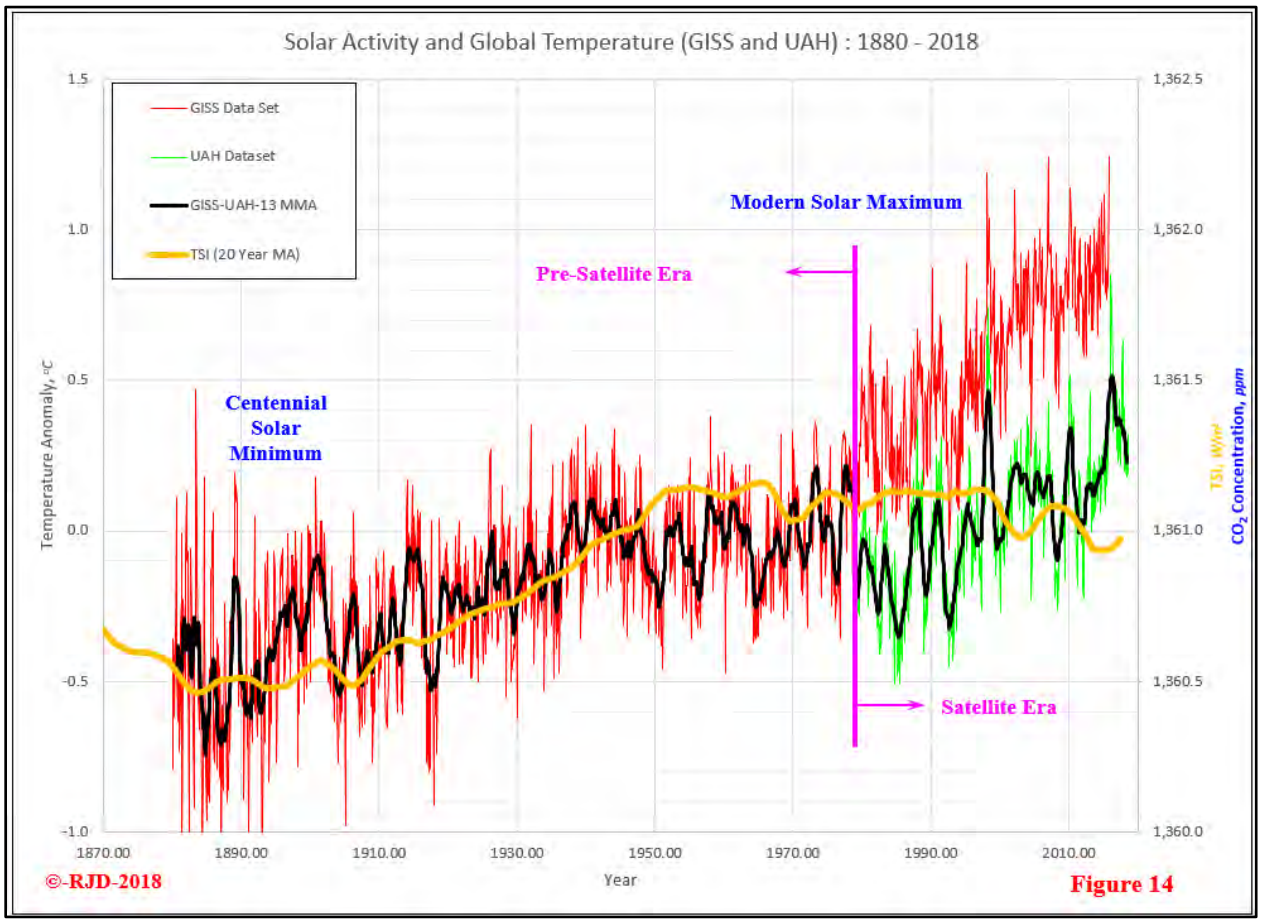


Figure 14 is the final TSI and Global Temperature correlation chart. This 140 year period is conveniently the period the "Global Warming" crowd focuses on. As laid out earlier, the Dalton Solar Minimum was one of the low points (for TSI and temperature) during the Little Ice Age. However, the temperature rise out of the Little Ice Age has not been unusual in duration or magnitude. In fact, the temperature actually correlates very well to the solar activity based on pre-1978 GISS surface data and the 1978-2018 UAH satellite data (the consolidated black curve on a 13 month moving average). The correlation will never be perfect because there are a wide variety of climate drivers (ocean cycles, cosmic ray modulations (cloud cover), etc.) that will cause deviations. The TSI data does not correlate with the NASA-GISS data set post 1978. But as discussed earlier, the NASA-GISS data set has been subjected to very significant manipulation (i.e.: the homogenization process discussed earlier which routinely adjusted the measured temperatures up). Virtually all of the NASA-GISS temperature rise post 1950 is due to the homogenization process. Measured temperatures have not increased substantially since the "dirty thirties" (which still hold the bulk of the record high temperatures). The current UAH global temperature anomaly (August 2018 – +0.19 °C) is actually virtually identical to the NASA-GISS temperature anomaly from the late 1930's, early 1940's. As mentioned earlier, this is also virtually identical to the early years of this century. Given that the homogenization process conveniently lowers the temperatures pre-1950, the currently reported temperature highs are likely significantly lower than the actual 1940's temperatures.

Relationship of CO_2 to Global Temperatures

This is a good point to bring CO_2 back into the discussion. CO_2 increases will lead to an increase in the global temperature. The magnitude of that increase is very much in doubt. There are theories that suggest CO_2 will have very little to no effect on future temperatures and theories that put forward catastrophic temperature increases (and options between these two extremes).

CO_2's ability to act as a greenhouse gas is based on its ability to absorb and re-emit energy to heat the atmosphere. There are peer-reviewed, scientific papers that show that the energy is absorbed in a very narrow band (14 – 17 μm) that is already saturated. Essentially any additional CO_2 above the 350 ppm level will only marginally add to the earth's global temperature. That is a very technical discussion that I'm not going to try and defend in this discussion. The catastrophic viewpoint on the other hand is based solely on computer models that use unsubstantiated theories to multiply the theoretical effect of CO_2. And again I'll remind you that the computer models have not been able to predict the climate over the first 19 years of this century. I have my doubts that their accuracy will improve over the rest of the century. In simple terms, the models assume that any increase in temperature due to CO_2 will lead to more evaporation and therefore additional water vapour (by far the most important greenhouse gas) in the atmosphere. Nothing wrong with that part of the theory. However, what happens to the water molecules after they enter the atmosphere is very poorly understood. If they stayed in the gas phase, the models might be valid. However, based on actual measurements, atmospheric water saturations are not going up. So where are those water molecules going?

The most likely destination is the increased global cloud cover and precipitation that we have experienced over the last couple of years. With respect to the computer models, clouds are simply too complicated to simulate (as per the IPCC's own documents). One of the many reasons the models have not been able to accurately predict the climate. Very simply additional low cloud cover actually cools the planet. The bulk of the energy from the sun never gets to the surface and is simply reflected back into space where low cloud cover exists. And unfortunately, the amount of low cloud cover is expected to continue increasing over the next decade or two as the sun goes into a very quiet phase (a Grand Solar Minimum). These solar cycles are well documented and you'll find that NASA has decided to finally recognize that a solar minimum is coming and will be accompanied by a drop in temperature. However, based on the flawed models, NASA is still pushing the ever increasing global temperatures. Cloud cover increases as the sun's energy output decreases. When the sun's energy decreases, the solar wind strength drops and cosmic ray intensity rises. Cosmic rays play a very key role in initiating cloud formation. Again very technical so I'm not going to get into that discussion here. Review Svensmark's work on cloud formation and the experimental work conducted in CERN's cloud chamber.

Now let's talk briefly about CO_2's heating capacity. CO_2's ability to heat the atmosphere (the Transient Climate Sensitivity (TCS)) is still open to some debate, but effectively a doubling of CO_2 will increase the global temperature by roughly 1.2 °C (based on the IPCC's science). So if we start back in the deep ice age where the CO_2 level was 185 ppm and double that to 370 ppm (which is close to the current 400 ppm) only 1.2 °C of that change from miles of ice over Canada to the present was due to CO_2. Is it not possible that there may be other factors in play? Good chance there is. But let's keep the analogy going. Another doubling will take the CO_2 level to 740 ppm and add another 1.2 °C. One more iteration takes us to 1480 ppm and adds yet another 1.2 °C. Now, NASA states that if we burn all of the oil, gas and coal on the planet

(which won't happen) we would raise CO_2 levels to 1500 ppm. Therefore the maximum that CO_2 alone can raise the temperature in a virtually impossible case (1500 ppm) is another 2.4 °C.

A second measure of CO_2's heating ability is the Equilibrium Climate Sensitivity (ECS). This factors in other feedback loops. The IPCC's most recent estimate of ECS has a range of 1.5 to 4.5 °C (averaging 3.2 °C) for a doubling of CO_2. A more recent study by Nicholas Lewis and Judith Curry puts the ECS estimate at the bottom end of the IPCC range (1.5 °C) using the HadCrut4 temperature history. If a portion of the temperature recovery since the Little Ice Age ended is due to natural causes (i.e.: as laid out earlier, solar activity (directly and indirectly)), the ECS value will drop further. Given that most of mankind's CO_2 contribution has occurred post-1950, natural processes have to be the dominant driver from 1850 – 1950. Corrections for the Urban Heat Island Effect (UHIE) would also push the ECS lower. A significant number of weather stations are located in urban areas (which are warmer than surrounding countryside (the UHIE).

Based on a review of the evidence, my conclusion is that the TCS is at or below 1 °C. Both the TCS and ECS estimates have been trending down over time (and will continue to do so as additional data and evaluation techniques become available). As a side note, these downtrends don't actually back up the concept of "settled science" very well (i.e.: CO_2 climate sensitivities have not been nailed down and they are the number one factor in determining CO_2's ultimate warming capabilities).

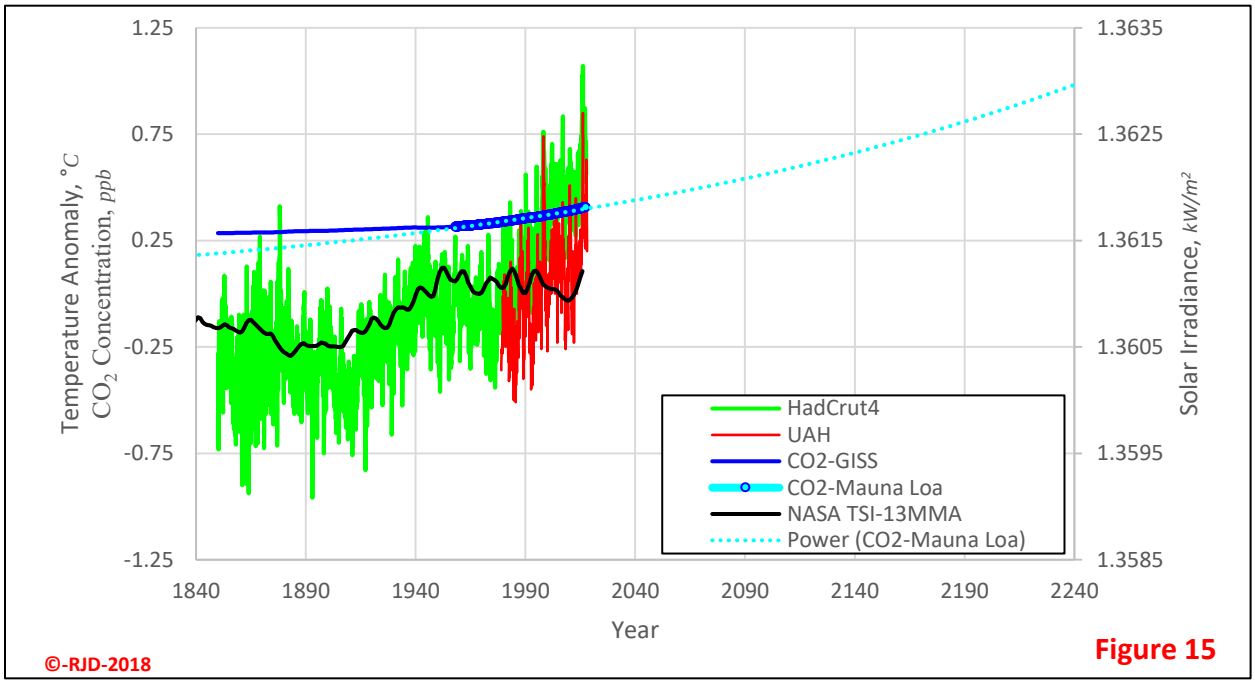


Figure 15

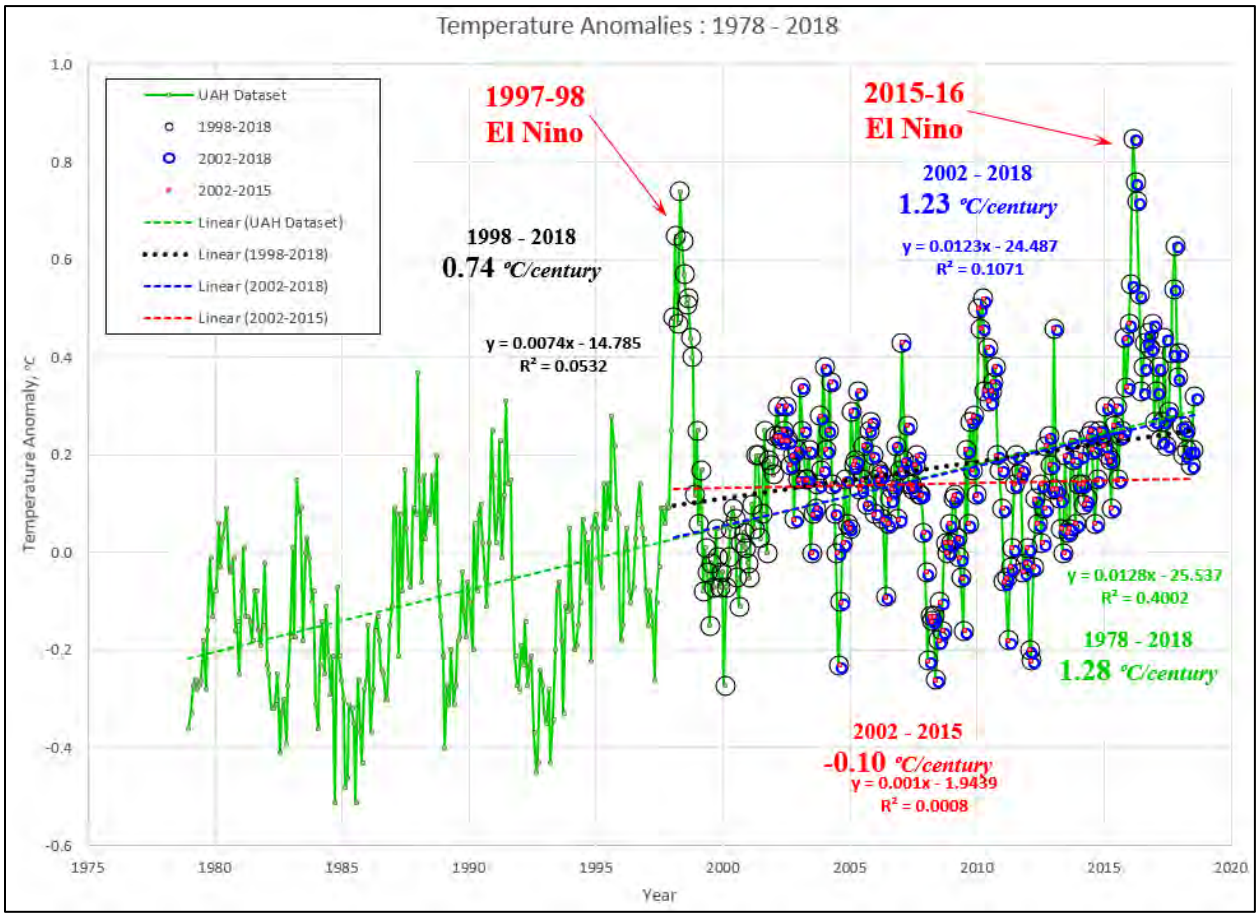
The above chart (Figure 15) combines the temperature anomalies with both the atmospheric CO_2 concentrations and solar activity levels. The solar activity fits much better than the CO_2 data with the temperature data. Especially when the satellite temperature data is used. As discussed previously, the deviation between solar activity and temperature since the 1970's can be attributed (to a large degree) to the homogenization process used by HadCrut4 and I believe a small component of heating due to rising CO_2 levels. I also need to point out that this chart does not factor in the effects of the ocean cycles. And that is the essence of the problem with the anthropogenic global warming crowd. You can't focus on one

component (CO_2) and expect to understand climate change. CO_2 has been moving higher in a very steady manner, unlike temperature anomalies which have been very erratic (regardless of which temperature record (NASA/GISS, HadCrut4, UAH, RSS, etc.) you want to use. The CO_2 concentration is not causing those undulations. The remaining data and discussion points focus briefly on a variety of "Climate Change" topics and up-to-date climate indicators.

The list of additional topic discussions is outlined below. The data and opinions presented in each of the discussions was used in developing the primary discussion. A review of all of these separate discussions is required to fully understand the basics of our current climate situation.

1. **Satellite-Radiosonde Temperature Data**
2. **Model Generated versus Observed Temperature Data**
3. **Disappearing Arctic Ice**
4. **Antarctic Ice Situation**
5. **Extreme Weather Discussion**
6. **Northern Hemisphere Snow Extent**
7. **Sea Level Thoughts**
8. **Ocean Cycles**
9. **Solar Activity and Sunspot Numbers**
10. **Scientific Consensus Thoughts**
11. **Musing on the Benefits of CO_2**
12. **General Comments on the Hypocrisy of CO_2 Demonization**
13. **Final Recap**

1. Satellite-Radiosonde Temperature Data

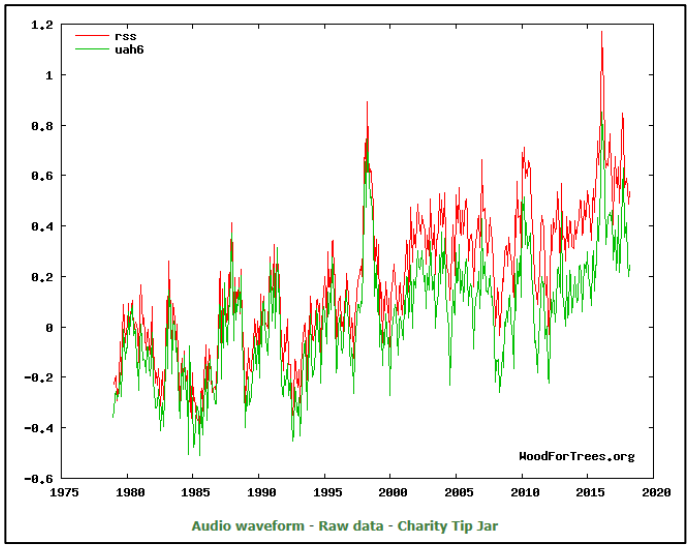


This discussion is a quick focus on the satellite data alone. The top chart is based on the University of Alabama-Huntsville (UAH) satellite data.

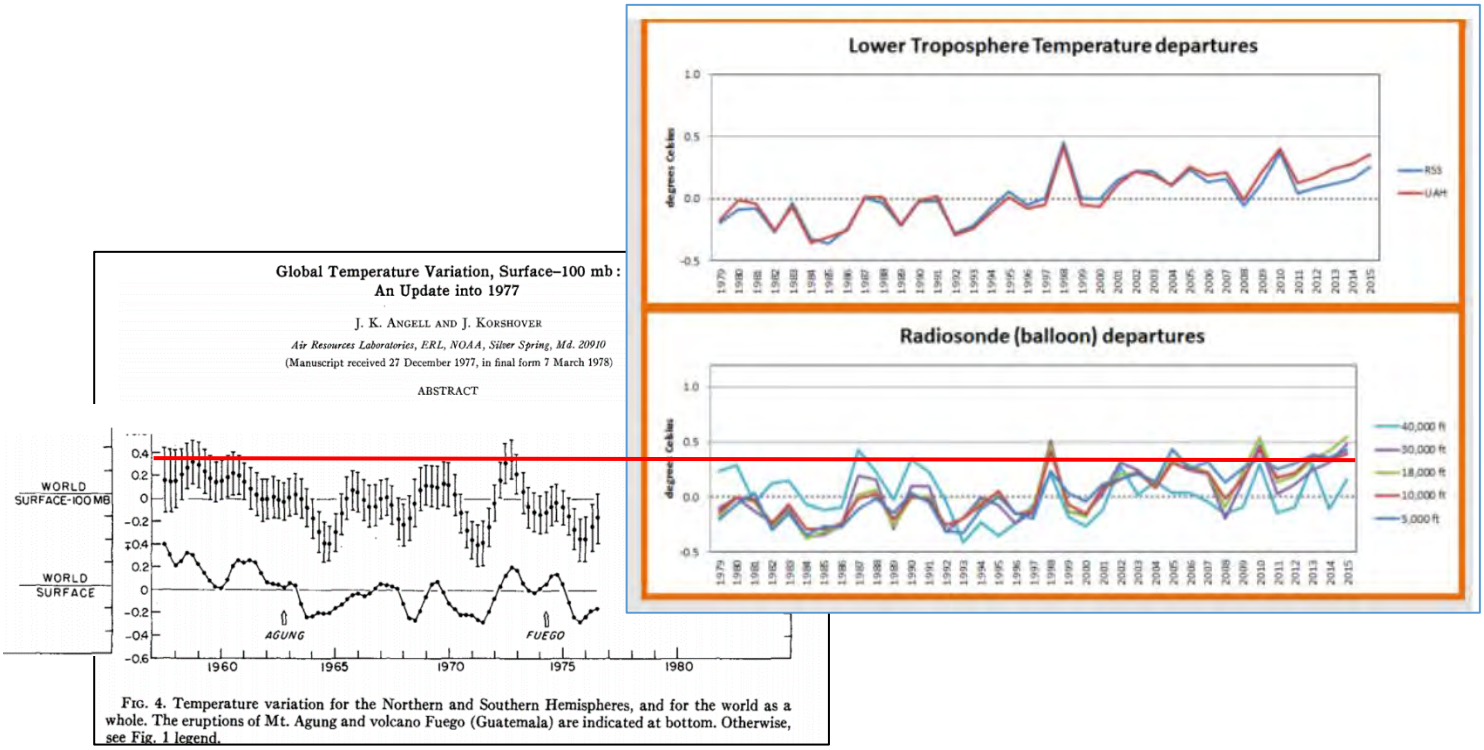
The UAH data has been divided into a number of periods. The full temperature anomaly data set (1978-2018) is increasing at a rate of 1.28 °C per century. The good news is we're on track to keep the global temperature increase to less than the 1.5 – 2.0 °C target laid out in the Paris Accord (and we don't have to change anything we're doing). The 1998-2018 time period is only increasing at 0.74 °C per century rate (even better). To be fair, the 1997-98 el Nino brings the early data up and tempers the overall incline. The temperature incline from 2002-2018 is back up to 1.23 °C per century (similar to the full data set). But with the same rationale, the 2015-16 el Nino is inflating the late data and overstating the recent temperature incline. If the two major el Nino spikes are taken out of the discussion, the temperature over the last couple of decades has been relatively flat. The temperature actually declined over the 2002-2015 period at a rate of 0.10 °C per century.

The July 2018 temperature anomaly was +0.32 °C. The August 2018 temperature anomaly was back down to +0.19 °C. The January – August 2018 temperature anomalies ranged between +0.18 and +0.32 °C.

The chart on the right, compares the UAH data with the RSS data (this interactive chart is available at woodfortrees.org/plot/).

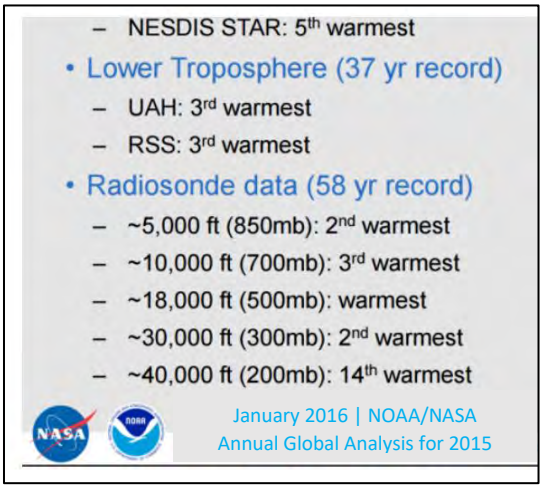


The two satellite datasets begin to diverge around the turn of the century. Clearly the satellite data has been subject to some interpretation of the raw data inputs much like the interpretation applied to surface data sets. However, the satellite data manipulation is not as profound as the surface temperature data manipulation; as can be seen in the following charts, the satellite data is consistent with the radiosonde (weather balloon) data sets. As a result, the satellite data is still the more accurate global temperature estimate.



The radiosonde temperature data has also been included for comparison. I have not located the actual data sets yet so I'm using publicly available charts. The first chart is the pre-satellite radiosonde data. The second chart is the data available for both the radiosonde and satellite data. The later data chart was from an early 2016 press briefing NASA/NOAA released to announce that 2015 was the hottest year ever (based on their homogenized surface data estimates (not shown here)).

The adjacent table, from the same press briefing, shows that 2015 was not the warmest year based on both the satellite and radiosonde data sets (except for the temperature at an altitude of 18,000 feet).

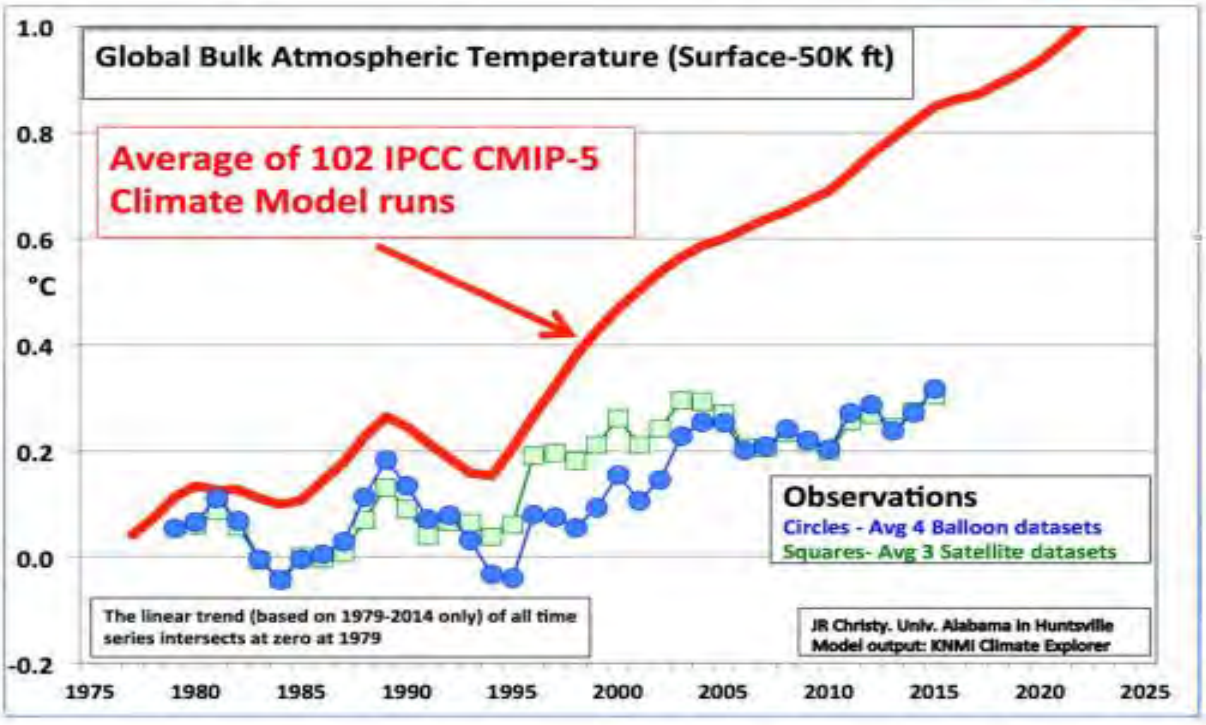


What they did not show during the press briefing was the early radiosonde data (pre-satellite). If the only data shown is the satellite period, the temperature data is erratic but generally rising. If all of the radiosonde data is plotted together you get a much different picture.

The radiosonde temperatures from the early 1960's were very similar to the current temperatures. The temperatures dropped off that early 1960's period peak and have been recovering since the early 1990's.

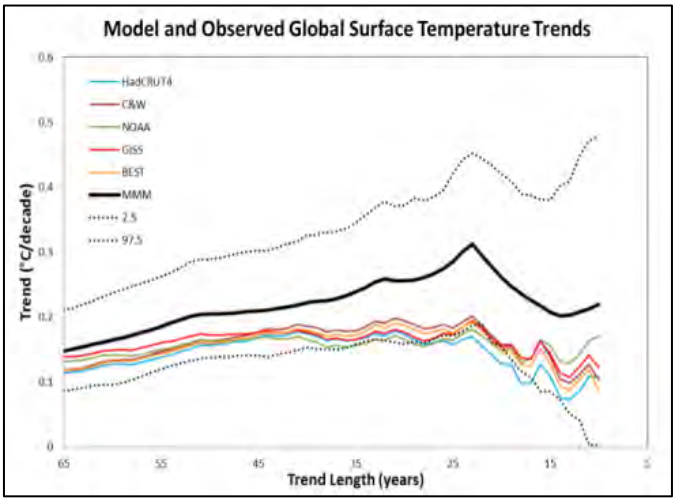
Apart from the el Nino peaks (1997/98, 2010 and 2015/16), the temperatures are still below the early 1960's peak. Unfortunately, these data sets do not go back to the dirty 30's. A large percentage of the current high temperature records were set back in that period. Older NASA/GISS datasets actually showed higher temperatures during the 1930s. Manipulation of the data over the last few decades has reduced older temperatures as well as augmenting more recent temperatures. The result is a NASA/GISS surface dataset that appears to rise continuously since the late 1800's. The original temperature measurements look nothing like the "official" NASA/GISS temperature profile.

2. Model Generated versus Observed Temperature Data



Given that the discussion has repeatedly referred to the difference between computer model generated temperature profiles and the observed global temperatures, I am compelled to include a brief discussion to address those differences. The above presentation (or some variation) is routinely used to compare the model generated temperatures with weather balloon and satellite measurements. I do not have the data tables to plot the data myself so I am relying on the work of others. These charts come from a temperature comparison discussion put forward by Judith Curry (judithcurry.com/2015/12/17/climate-models-versus-climate-reality/). That discussion is worth reading and is much more detailed than what I will present here.

The temperatures plotted here represent the earth's mid-Troposphere (surface to 50,000 feet). Do not confuse these temperatures with surface temperatures. The Troposhere temperature is chosen because this is the atmospheric layer that should be most affected by rising CO_2 levels (according to the computer models). That just isn't happening. The temperatures have been relatively flat through the first 16 years of this century based on both satellite and weather balloon data.



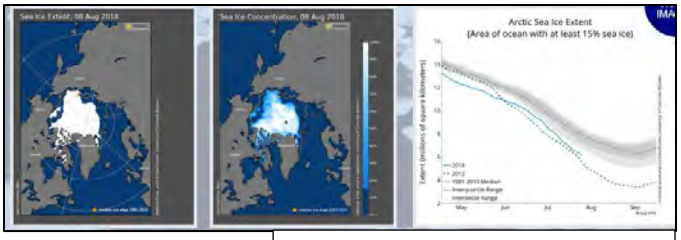
The models predicted that the mid-Troposheric temperature anomalies would be 0.85 °C above the base (0.0 °C). The actual temperature anomaly is only 0.3 °C. The models are overstating the temperature by 183.3%. Sadly,

these models are still being used to justify climate change policy despite their obvious inaccuracies.

The surface temperature estimates in the models are also overestimated. Actual measured surface temperature trends are well below the model averages (despite the homogenization processes' upward adjustments). The trends are generally closer to the lower limit (2.5%) than the average for most of the dataset. All of the recent trends are below 0.2 °C/decade (2 °C/century) and declining. Those are not alarming numbers.

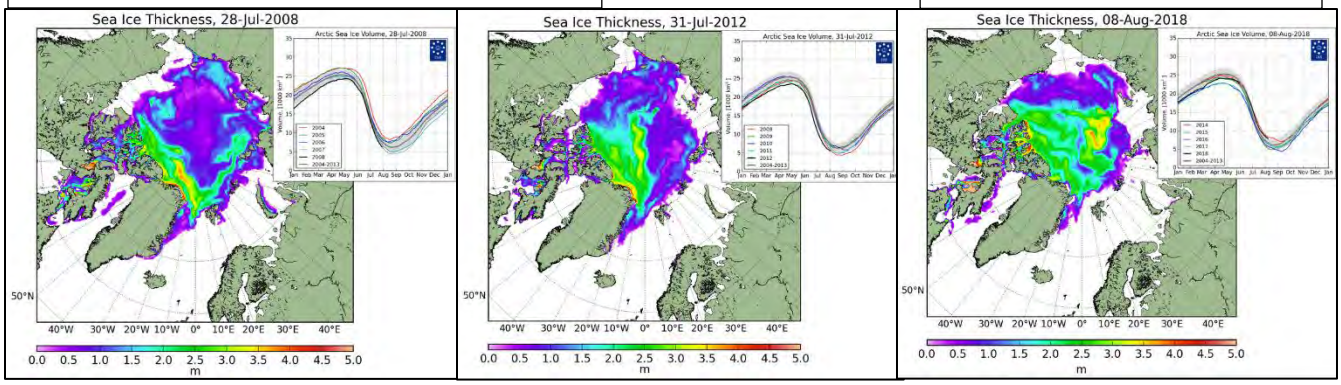
3. Disappearing Arctic Ice

This is a quick look at the ice situation in the Arctic. The reports you'll hear on mainstream media (MSM) tell us that the ice is disappearing and will soon be gone. And if you look at the ice extent graph from NSIDC to the right, you could be forgiven for just accepting that false reality. Yes, the ice extent (this year) is lower by roughly 0.588 million square kilometers (only 8.6% below the interdecile range). However, that is only a small part of the story.

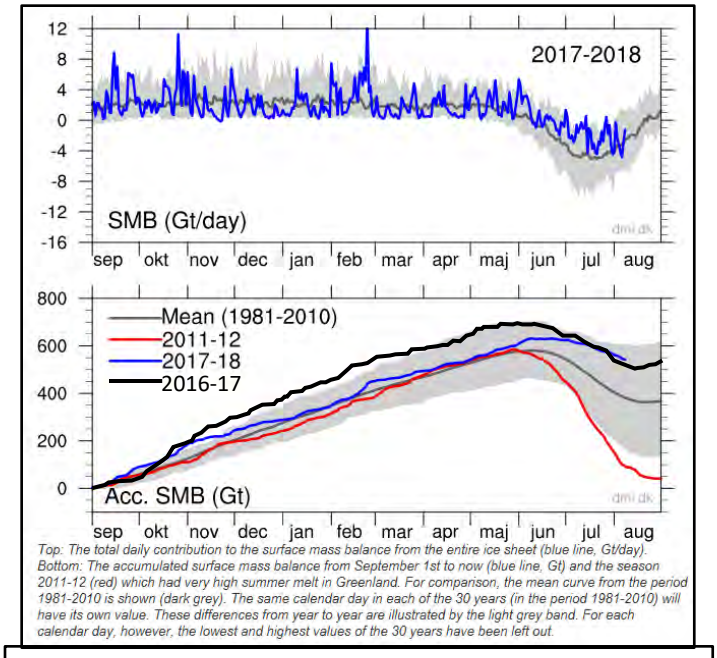


http://nsidc.org/arcticseaicenews/

http://ocean.dmi.dk/arctic/icethickness/thk.uk.php



The ice "volumes" as of August 8th, 2018 are actually at the top of the normal range. They are also well above the 2016 and 2017 el Nino affected years and higher than 2012 and 2008 years (as shown in the three charts from Danish Meteorological Institute (DMI)). The ice extent can easily fluctuate due to the effects of ocean currents and strong winds (as well as the time of year). Bottom line there is still lots of ice left in the Arctic. And guess what it is still very cold overall in Greenland and the Arctic. Did you know that an all-time Northern Hemisphere July cold record was measured at the Summit in Greenland on July 4th, 2017. This middle of the summer -33 °C record beat the old record by 2.3 °C. The risk of Greenland melting anytime soon is very low (especially given that we are headed into a Grand Solar Minimum). In fact, the Surface Mass Balance (SMB) in Greenland has been increasing (i.e.: more ice by Giga tonnes/day) at higher than average levels for the past 19 months. The ice increases were well above the normal range throughout the 2016-17 period.

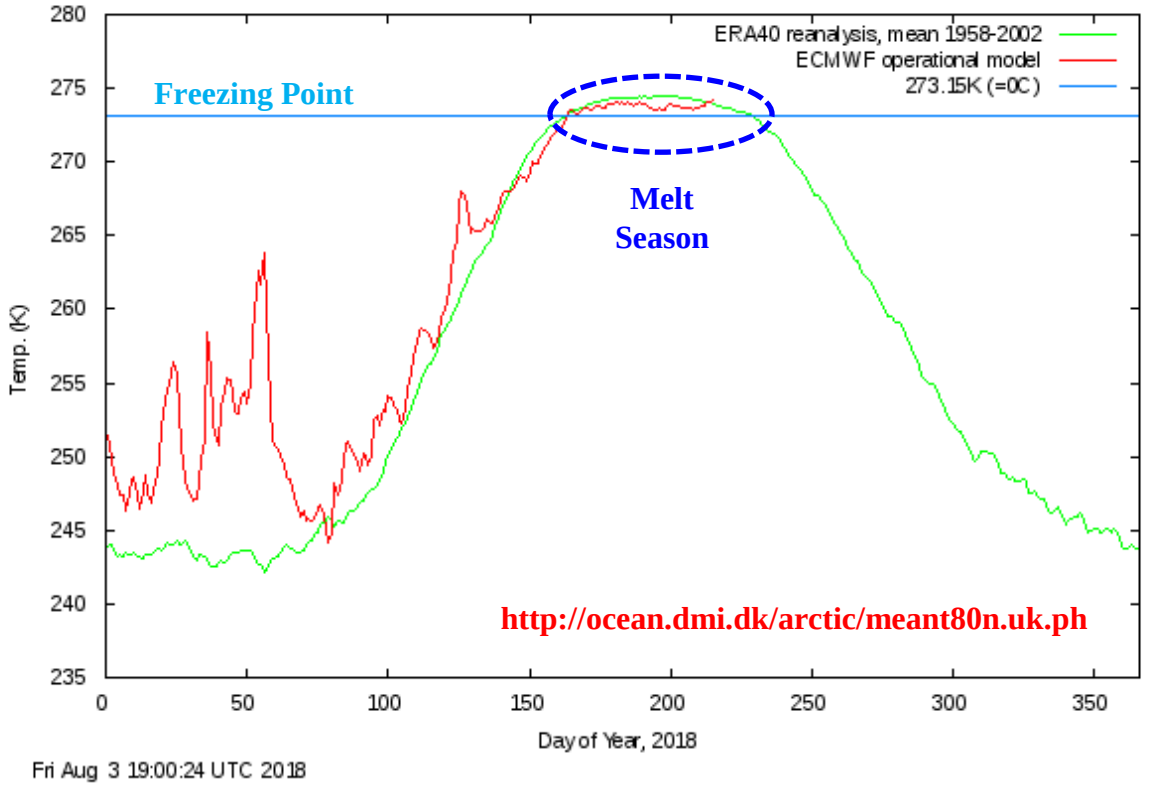


Top: The total daily contribution to the surface mass balance from the entire ice sheet (blue line, Gt/day). Bottom: The accumulated surface mass balance from September 1st to now (blue line, Gt) and the season 2011-12 (red) which had very high summer melt in Greenland. For comparison, the mean curve from the period 1981-2010 is shown (dark grey). The same calendar day in each of the 30 years (in the period 1981-2010) will have its own value. These differences from year to year are illustrated by the light grey band. For each calendar day, however, the lowest and highest values of the 30 years have been left out.

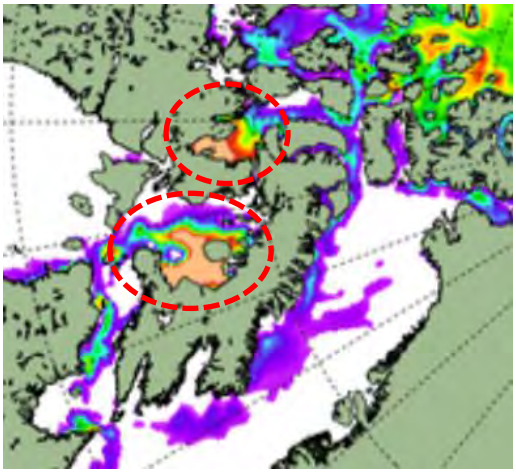
www.dmi.dk/en/groenland/maalinger/greenland-ice-sheet-surface-mass-budget/

Overall, the arctic sea ice data does not indicate that we are going to have any ice free summers any time soon. Certainly not by 2013 as Al Gore so ominously suggested. And again CO_2 is not controlling arctic sea ice extent. The sea ice extent has been fluctuating both above and below "normal", CO_2 concentrations are not fluctuating up and down (apart from the yearly seasonal cycles).

The 2017-18 SMB is continuing to diverge from the average because the temperatures in Greenland are colder than normal and the ice is melting more slowly as a result. Interestingly, DMI has stopped displaying the 2016-17 data (a year with SMB gains above the average range) but still display the 2011-12 data (a year where the SMB went below the average range (during the melt season)). I added in the 2016-17 SMB data. In my opinion, to be fair both extremes should be shown or neither extreme should shown.

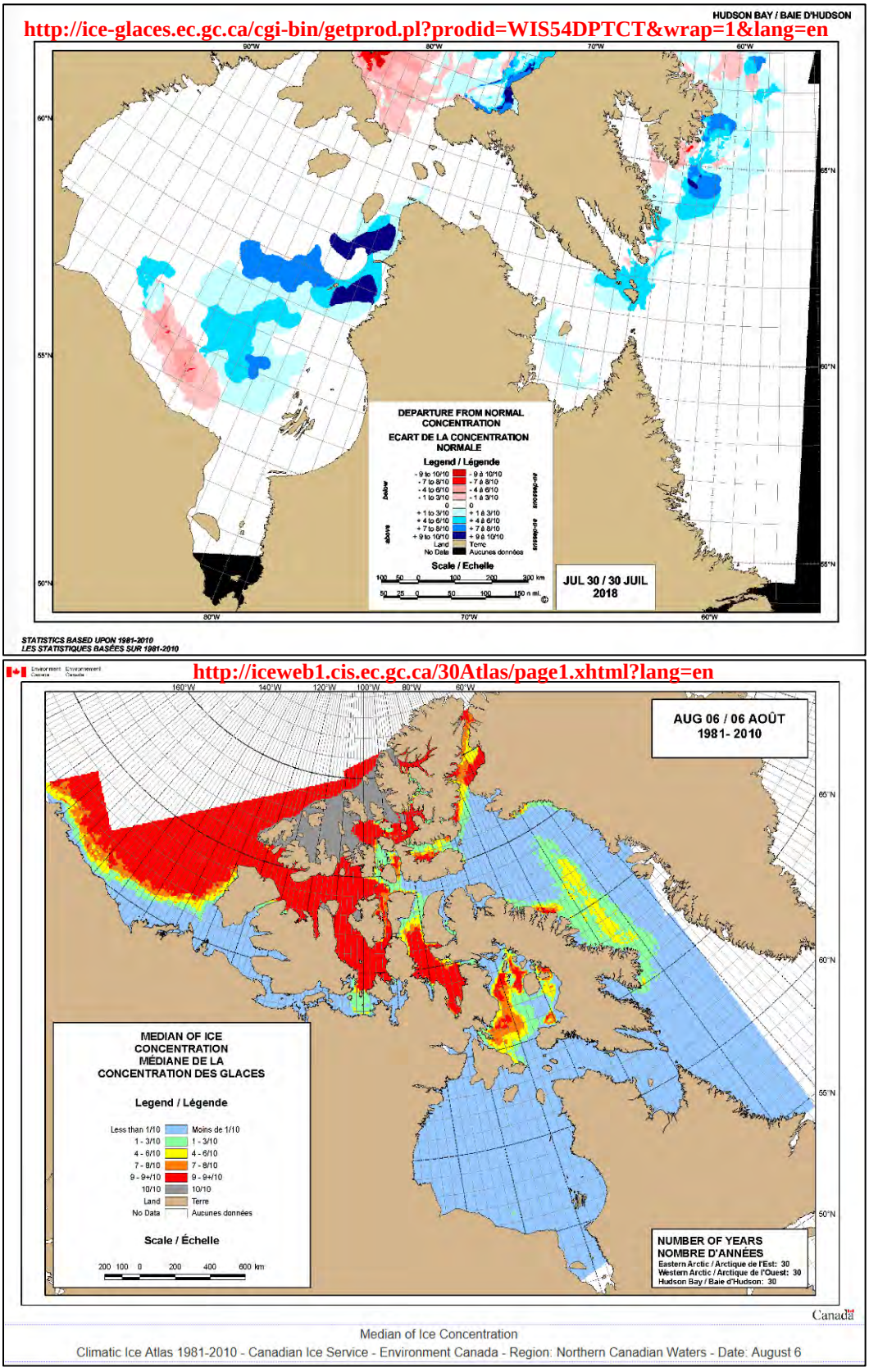


Daily mean temperature and climate north of the 80th northern parallel, as a function of the day of year.



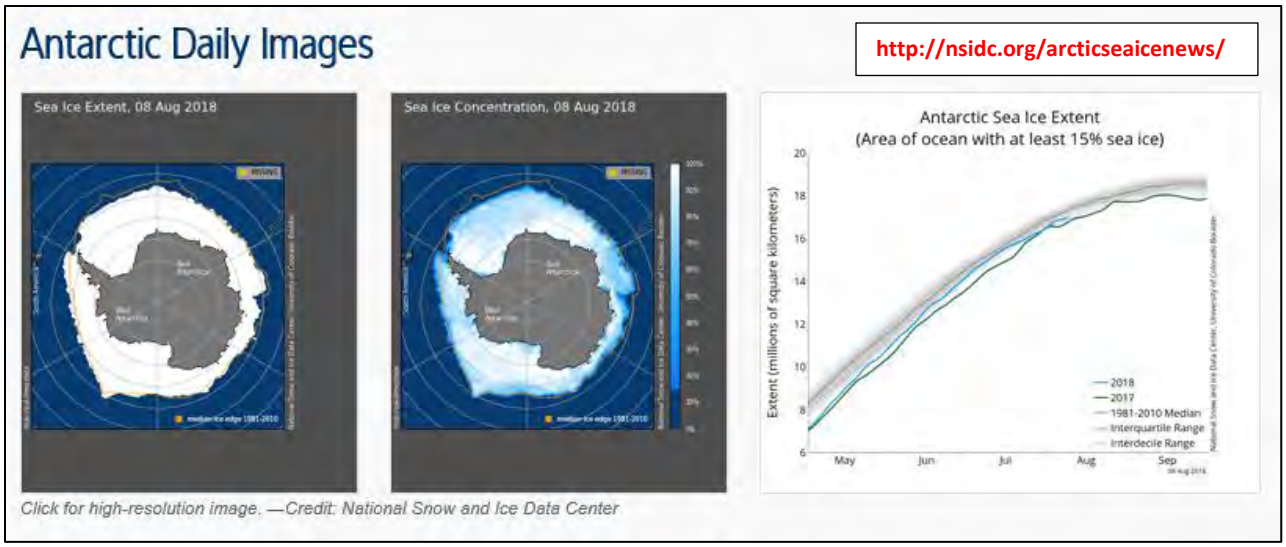
The above chart clearly shows, the temperatures during the Arctic melt season have been below normal (barely above freezing) for virtually the entire melt season to date. Obviously, arctic ice will not be disappearing over the remaining one month of the 2018 melt season.

As an aside, the ice thickness in areas around Baffin Island (highlighted in red to the left) is still greater than 5.0 meters (greater than 16.4 feet). Those thick ice areas have been building up over the last decade (as per the links on the previous page. Interesting, because Baffin Island is where the last Great Ice Age was initiated. Let's hope it's not already starting again.

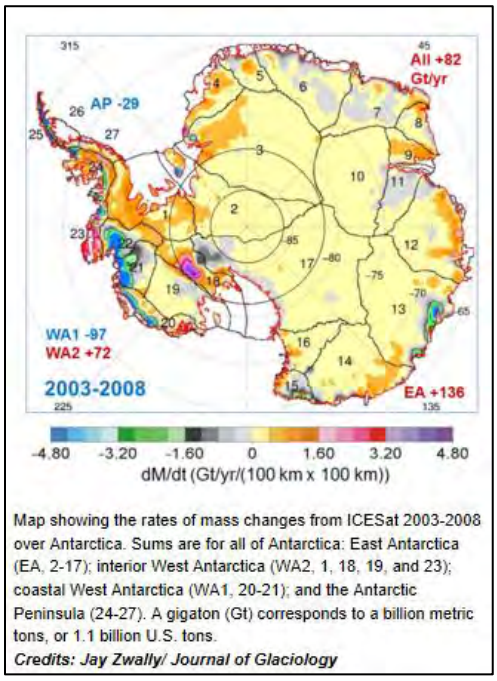


Hudson Bay has had a significant ice problem this year. Normally the ice is gone by the end of July (as shown in the lower map). This year they had to bring in ice breakers at the end of July to get supplies to the northern communities. The top map shows the deviation from normal. Still lots of ice considering it's the middle of summer.

4. Antarctic Ice Situation



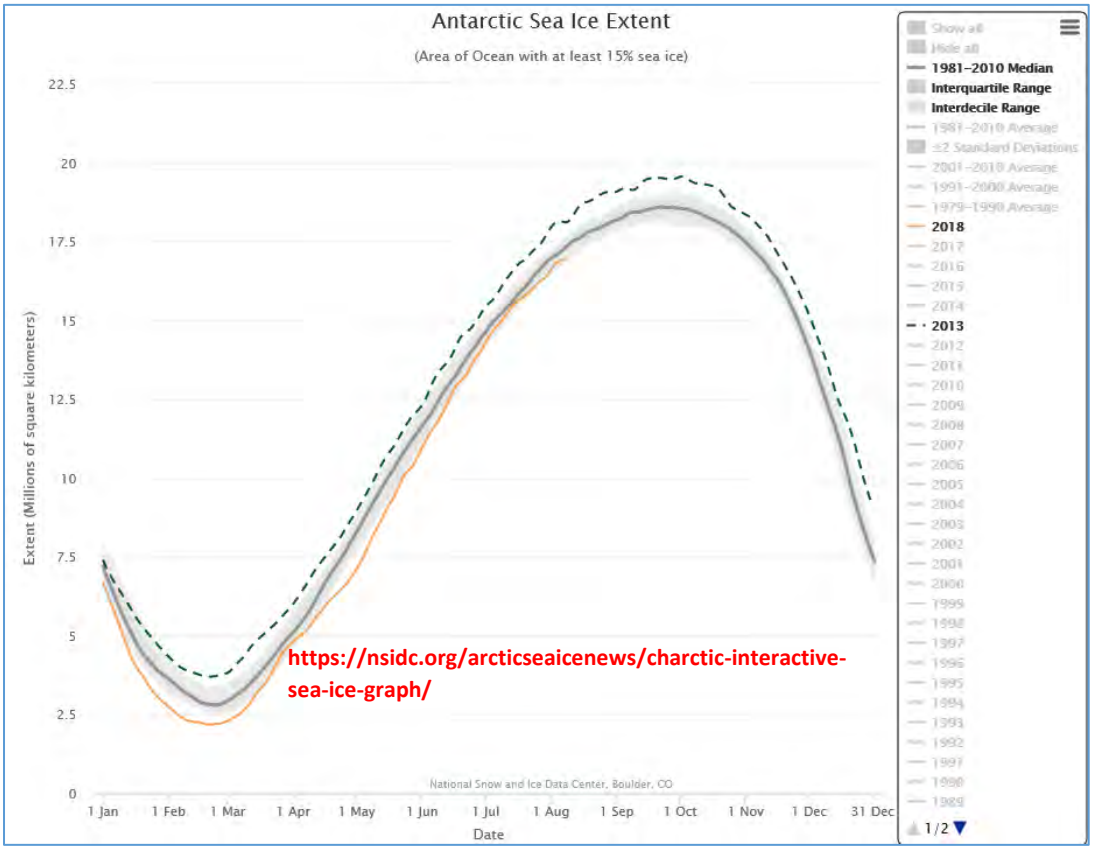
Here is a quick look at the ice situation in the Antarctic. The MSM has been a lot quieter on the Antarctic (apart from the potential breakup of some of the ice shelves surrounding the continent). The actual sea ice extent has generally been above normal since 2012. More ice somehow doesn't fit very well into the "Global Warming" narrative. To be fair, the sea ice extent was below normal through 2016/17 but has since recovered back into the normal range. Remember 2016 and 2017 were influenced by a very strong el Nino (i.e.: higher than normal global average temperatures).



Map showing the rates of mass changes from ICESat 2003-2008 over Antarctica. Sums are for all of Antarctica: East Antarctica (EA, 2-17); interior West Antarctica (WA2, 1, 18, 19, and 23); coastal West Antarctica (WA1, 20-21); and the Antarctic Peninsula (24-27). A gigaton (Gt) corresponds to a billion metric tons, or 1.1 billion U.S. tons.
Credits: Jay Zwally/ Journal of Glaciology

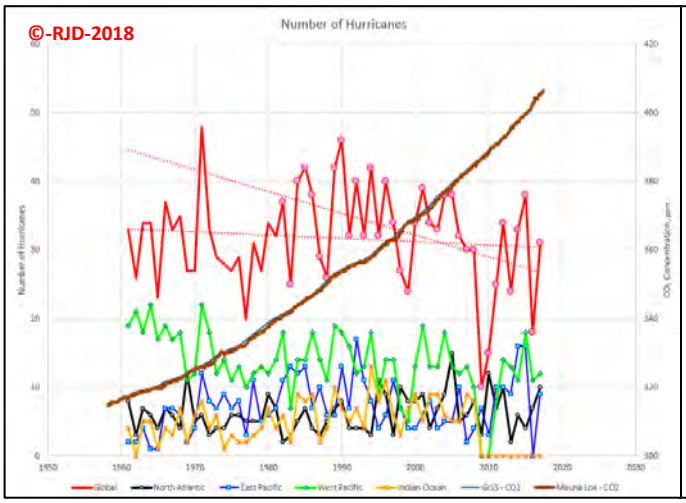
https://www.nasa.gov/feature/goddard/nasa-study-mass-gains-of-antarctic-ice-sheet-greater-than-losses

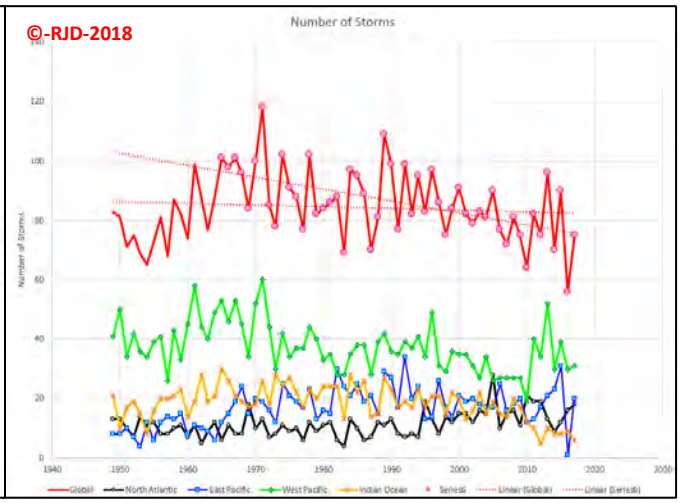
A 2015 NASA study looked at the ice changes in the Antarctic. Based on their analysis, the Antarctic ice sheet gained roughly 112 billion tons of ice per year between 1992 and 2001 and 82 billion tons per year between 2003 and 2008. That's a gain of roughly 1.4 trillion tons of ice over that period (when we were supposedly warming).



As a quick aside, the lowest temperature ever measured on the planet occurred in June of this year (2018) at the Antarctic summit (-144 °F (-97.8 °C)), beating the old record by 15.4 ° F (8.6 °C). Again, these facts are not ringing endorsements for the “Global Warming” narrative. Antarctica is not melting anytime soon.

5. Extreme Weather Discussion



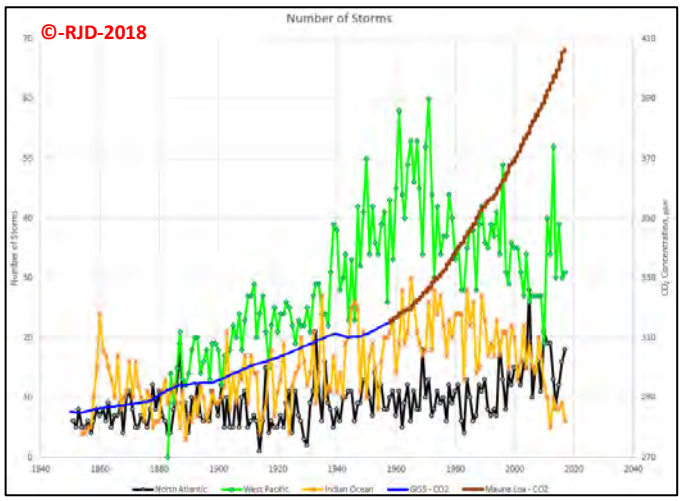


https://www.wunderground.com/hurricane/

This is another area where the mainstream media loves to mislead its audience. Every hurricane, every wildfire, every drought, etc. is another example of climate change. No, they are just weather events. Hurricane Harvey and Irma were devastating storms, but they aren't indicative of a climate trend. The 12 years without a Category 4+ hurricane that proceeded 2017 is more trend worthy than 2017. The global hurricane data is plotted in the upper left corner. There has been no statistical increase in the number of hurricanes over the 1961 to 2017 time period. Activity did pick up a bit after 1975 but has been steadily declining since the early 1980's. There are two trend lines plotted. The flatter one includes all of the data, the steeper decline is based on the 1982 – 2017 time period. Note that 2017 was a very typical year based on the number of hurricanes. I've also plotted the CO_2 data which has no correlation with the number of hurricanes.

The number of storms (tropical depressions including hurricanes) lays out a similar story. The data goes back a bit further to 1949. The number of storms actually peaked in 1971 and has been declining steadily since then. Again, there are two trend lines plotted. The flatter one includes all of the data, the steeper decline is based on the 1965 – 2017 time period. Note that 2017 was again a very typical year based on the number of storms.

I've also included a chart of the number of storms back to 1850. If the older historical data is correct, there was definitely a notable increase in storm activity in the Western Pacific and a more moderate increase in the Indian Ocean up until about 1960. Both areas have dropped off significantly from those peaks. The North Atlantic storm activity has been on a much more subdued but generally steady incline. Again, the CO_2 does not correlate with the long term storm activity. Shortly after CO_2 began its post-War accelerated



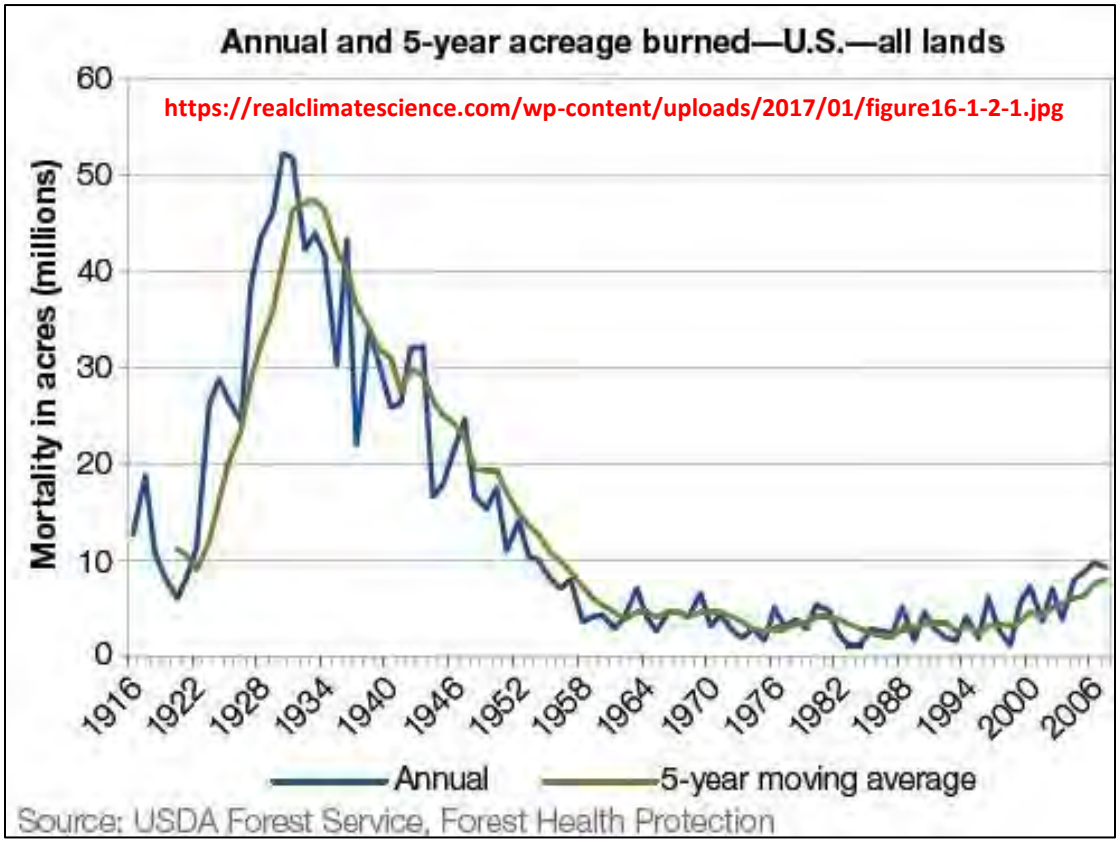
increase, the number of storms began to drop. Obviously rising CO_2 levels have not resulted in increasing tropical storm/hurricane activity.

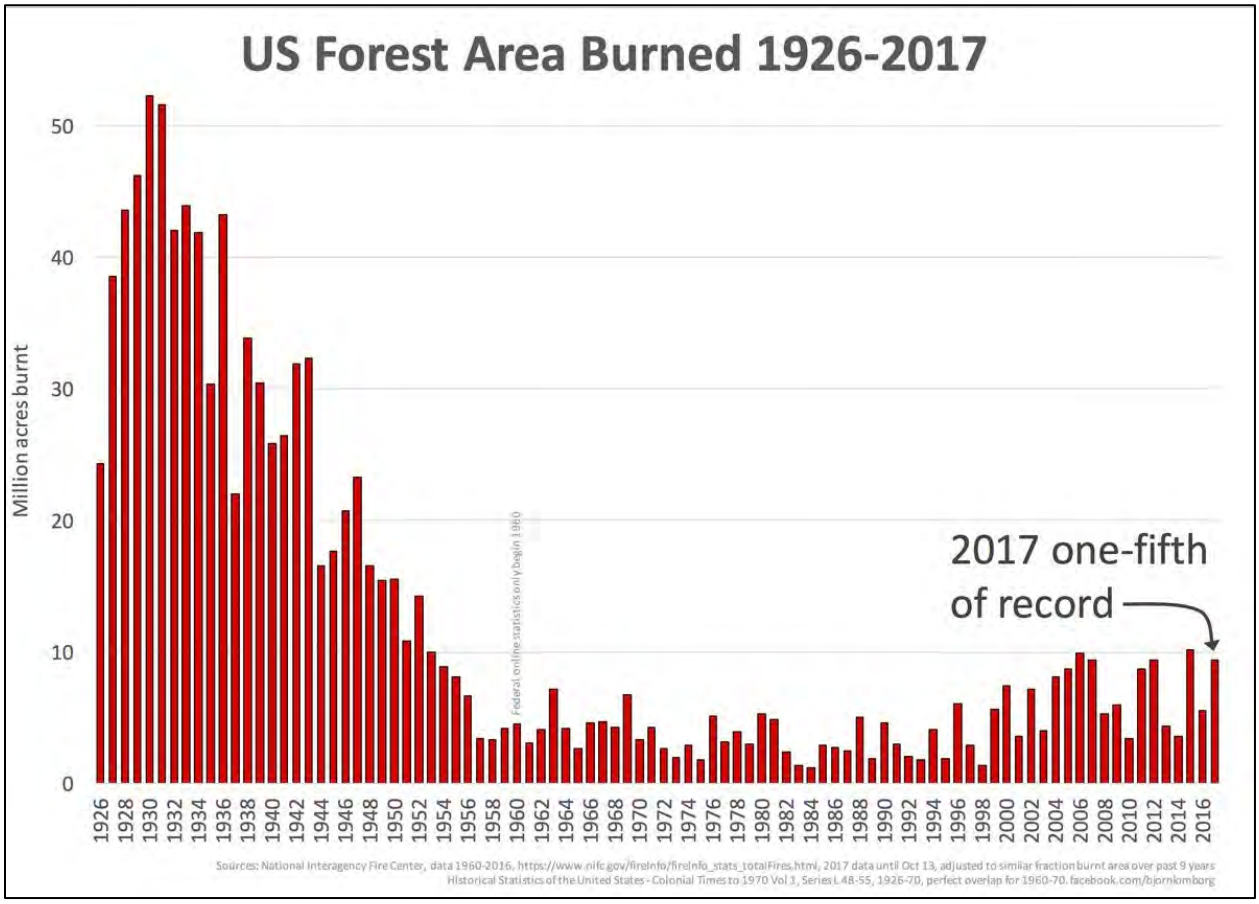
As of August 9th, 2018, (source: Miami Patch, Paul Scicchitano) NOAA has downgraded their hurricane outlook for the remainder of the 2018 season. They are only expecting 9 – 13 named storms (wind speeds of 39 mph or greater). Of those four to seven storms are expected to become hurricanes with winds of 74 mph or greater. Major hurricanes (wind speeds of 111 mph or greater) may not even occur this year (with a maximum of two expected). 2017 was a typical year for the number of Atlantic storms, 2018 looks like a below average year. The data just does not support the argument of more extreme weather put forward in the mainstream media.

The same type of analysis can be and has been done for droughts, wildfires, tornado activity, etc. I'm not going to go through that exercise but I will point you to Roger Pielke Jr.'s presentation to the Subcommittee on Environment of the Committee on Science, Space, and Technology of the United States House of Representatives hearing (titled A Factual Look at the Relationship of Climate and Weather, December 11th, 2013).

http://sciencepolicy.colorado.edu/admin/publication_files/2013.38.pdf

The following discussion focusses on the current forest fire situation since that specific natural disaster scenario was not covered in Roger Pielke Jr.'s referenced submission.





Given that summer is here once again in the northern hemisphere, a lot of people on the "Global Warming" side of the discussion need to be reminded that summer temperatures can get hot and the fire season coincides with summer. As usual the current media fixation on some record highs and devastating fires do not consider the historical trends. The planet has also been experiencing record lows and increased levels of precipitation. Individual weather events must be averaged across the globe and not taken in isolation. The early portion of the 20th century had a much more significant problem with forest fires. The burnt areal extent was 5 times higher during the 1930s. The table on the following page provides a general overview of what's occurred since the USDA graph was finalized. The 2018 fire season (to date in the US) although higher is not significantly higher than the 2008-2018 average. Although the fire season is still in full swing, the overall burned acreage will not likely even get close to the levels experienced in the 1930s.

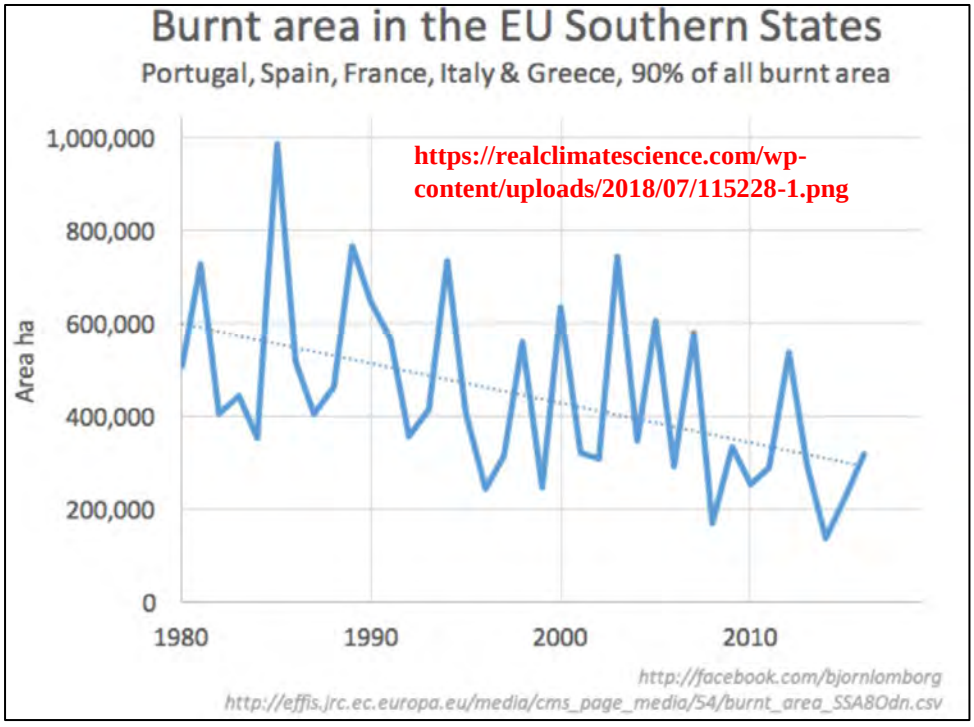
Even if 2018 turned out to be a record fire season (unlikely), that would still not be considered a trend and/or a direct correlation to "Global Warming". You also have to separate out the severity of the fires from the fires themselves. Some fires may have become more damaging and newsworthy (i.e.: the recent Slave Lake and Fort McMurray fires in Canada and this year's fires in California, Greece and Scandinavia) but the overall trends don't back up a correlation with "Climate Change".

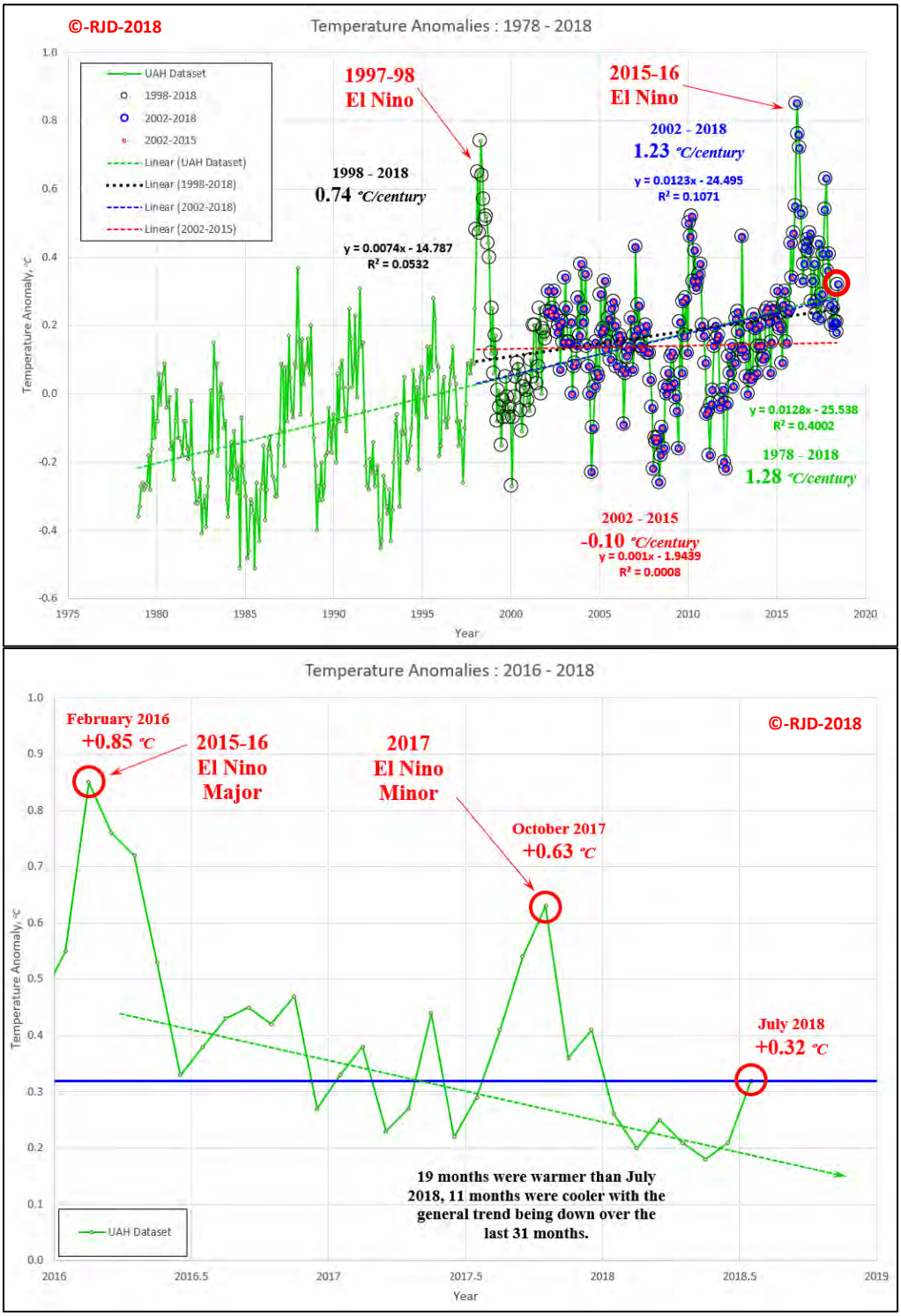
https://realclimatescience.com/wp-content/uploads/2018/07/2018-07-26045926_shadow.png

NATIONAL INTERAGENCY FIRE CENTER

Year-to-date statistics		
2018 (1/1/18 - 7/25/18)	Fires: 36,141	Acres: 3,981,701
2017 (1/1/17 - 7/25/17)	Fires: 36,516	Acres: 5,128,482
2016 (1/1/16 - 7/25/16)	Fires: 332,228	Acres: 3,025,850
2015 (1/1/15 - 7/25/15)	Fires: 34,894	Acres: 5,569,966
2014 (1/1/14 - 7/25/14)	Fires: 31,559	Acres: 1,671,523
2013 (1/1/13 - 7/25/13)	Fires: 26,807	Acres: 2,205,716
2012 (1/1/12 - 7/25/12)	Fires: 35,886	Acres: 4,028,341
2011 (1/1/11 - 7/25/11)	Fires: 42,888	Acres: 5,997,028
2010 (1/1/10 - 7/25/10)	Fires: 35,501	Acres: 1,931,342
2009 (1/1/09 - 7/25/09)	Fires: 54,146	Acres: 3,125,247
2008 (1/1/08 - 7/25/08)	Fires: 53,658	Acres: 3,458,609
10-year average Year-to-Date		
2008-2017	Fires: 38,118	Acres: 3,576,956

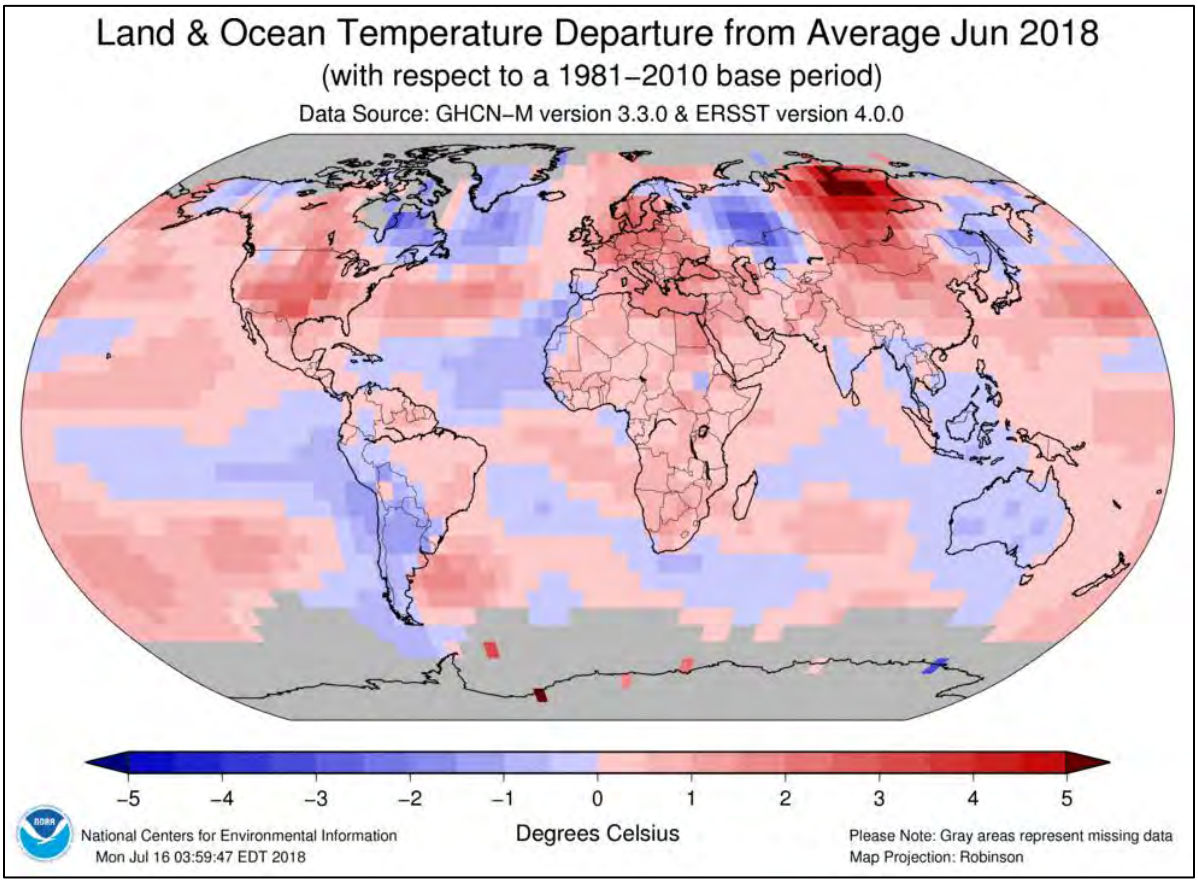
The burnt area in the southern European Union Southern States has also been declining since 1980.





The satellite temperature data (UAH) is not showing any significant temperature increases that would make 2018 any more prone to record global temperatures or forest fires than any other year in the satellite period. In fact, the 2018 global temperatures are at the same levels experienced through most of the 21st century to date. Both 1998 and 2016 were noticeably warmer than 2018. July is the first month that has had a temperature anomaly greater than +0.3 °C in 2018. July 2018 (at +0.32 °C) is noticeably lower than the peaks in February 2016 (+0.85 °C) and October 2017 (+0.63 °C).

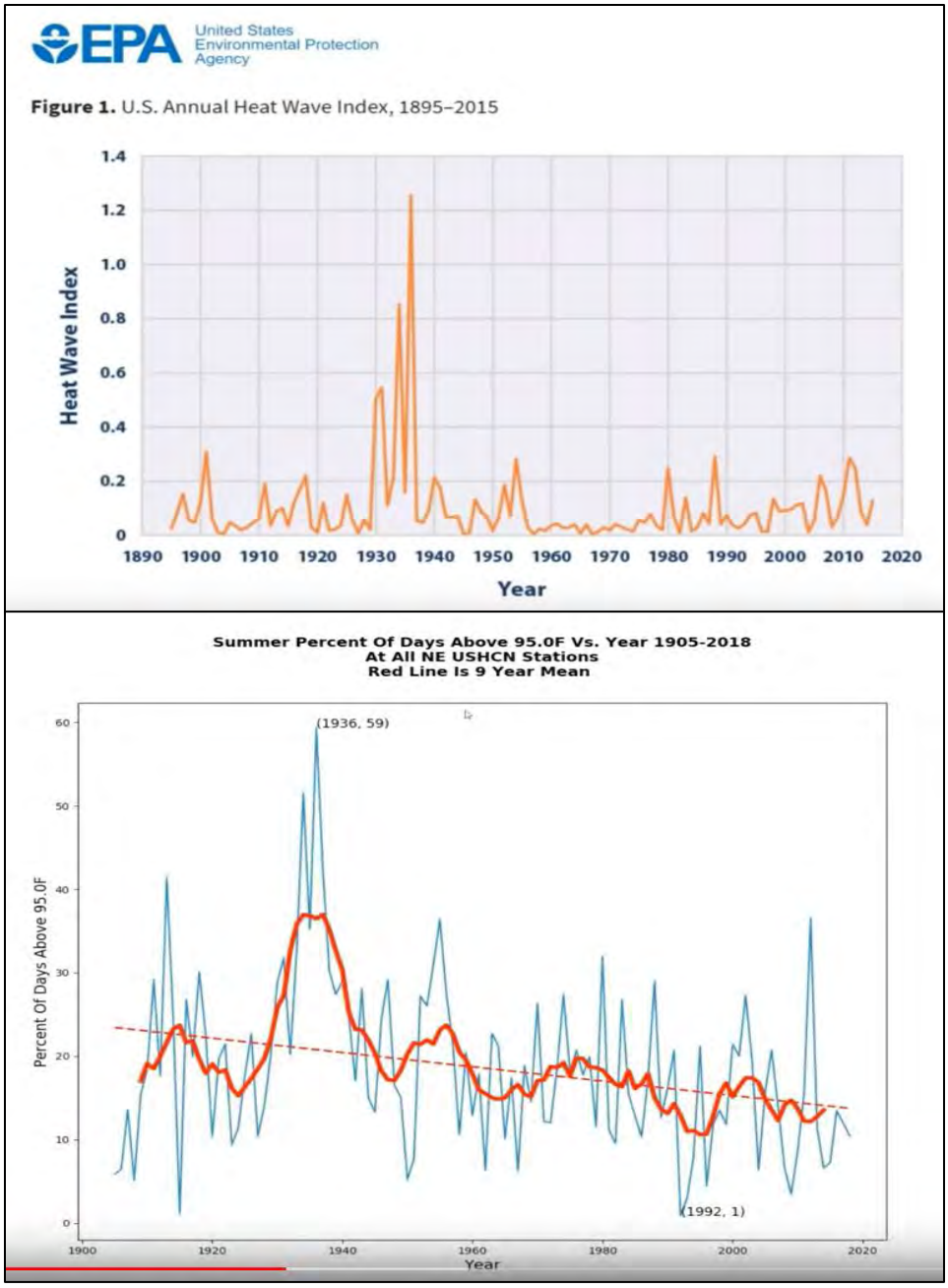
And we'll just close out the forest fire discussion by addressing a perfect example of the misinformed hyperbole that various politicians and pundits employ which needlessly frightens the public and skews rational policy discussion. California Governor Jerry Brown recently declared (according to the True Pundit, August 3rd, 2018) that **"since civilization emerged 10,000 years ago, we haven't had this kind of heat condition, and it's going to continue getting worse and that's the way it is."**



As shown, on the previous page, global temperatures were generally higher in 1998, 2010, 2016 and 2017 (you don't have to go back 10,000 years). So if you want to specifically talk about conditions in California in 2018, you have to frame the discussion as a weather discussion not a climate change discussion.

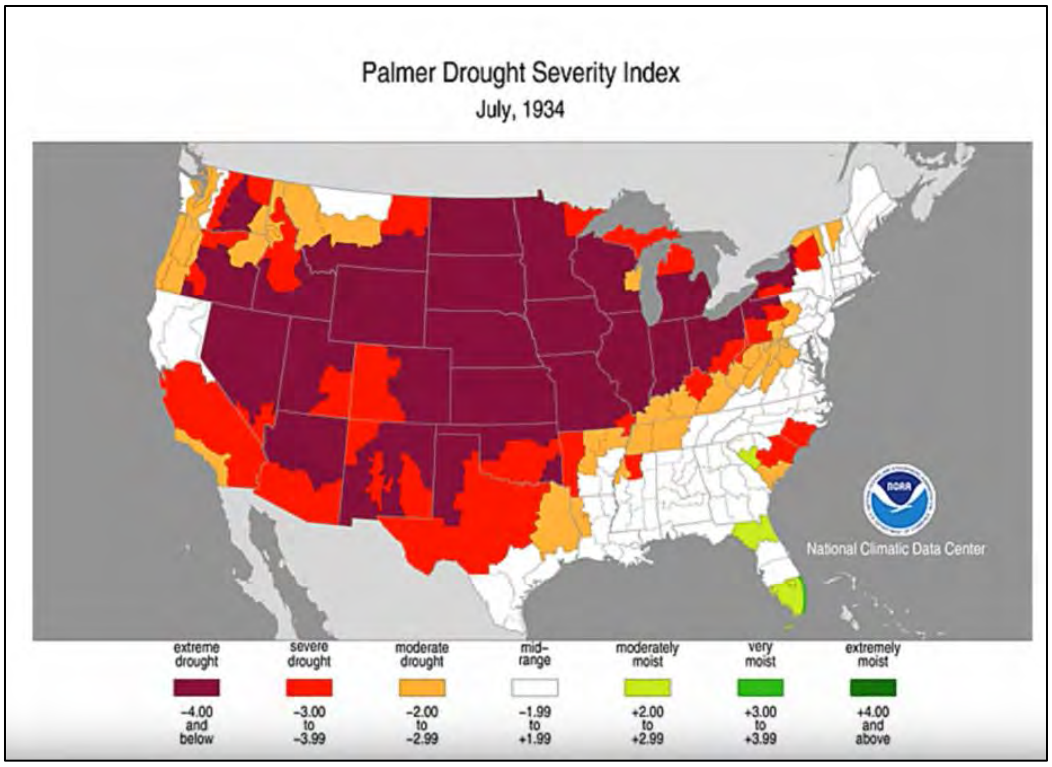
News reports (such as those coming out of California now), unfortunately focus only on the areas that are experiencing warmer than normal temperatures. The NOAA map to the left shows the global temperature anomalies for June 2018. A significant portion of the globe is also covered by areas that are colder than normal and an equally significant portion (Antarctica and the Arctic) are not even represented. That is the problem with the public discussion on "Climate Change". Current events in weather mean virtually nothing in a true climate discussion unless they are tied into the longer term global trends.

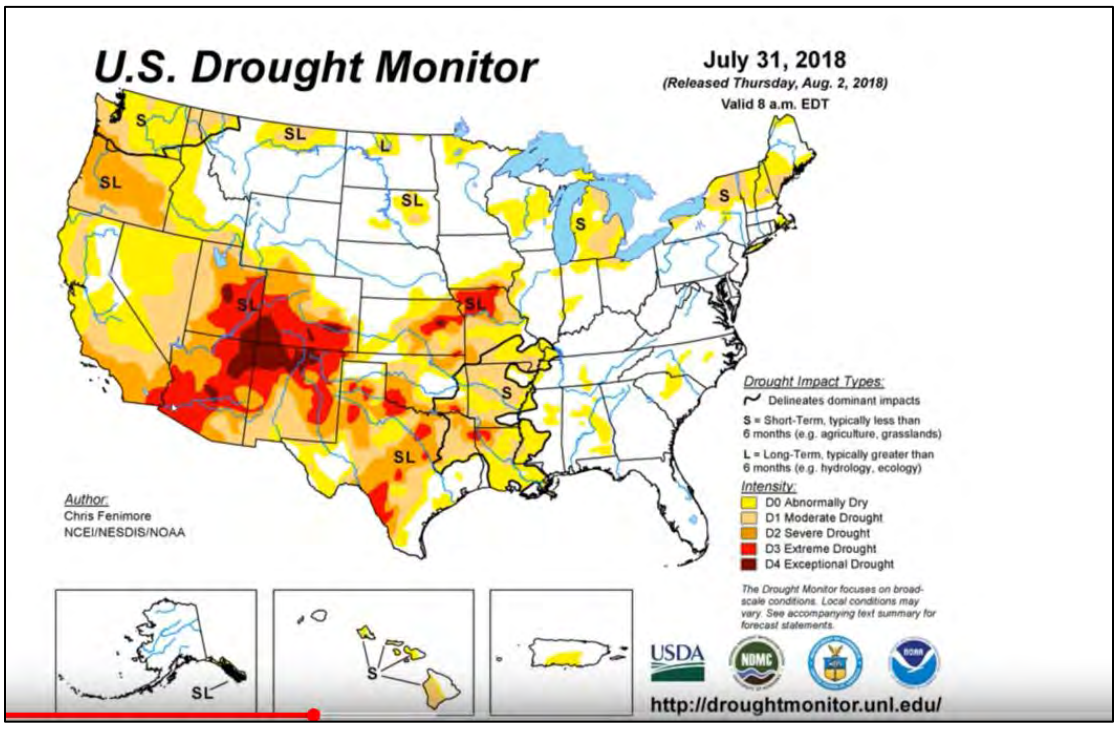
But to get more area specific we can look at the longer term general temperature trends in the United States. The 1930's were (by far) more affected by unusually high temperatures. The current heat wave index does not begin to compare with the severe heat those who lived through the 1930's experienced. And most of them did not have the luxury of widespread air conditioning that fossil fuels have provided for us.



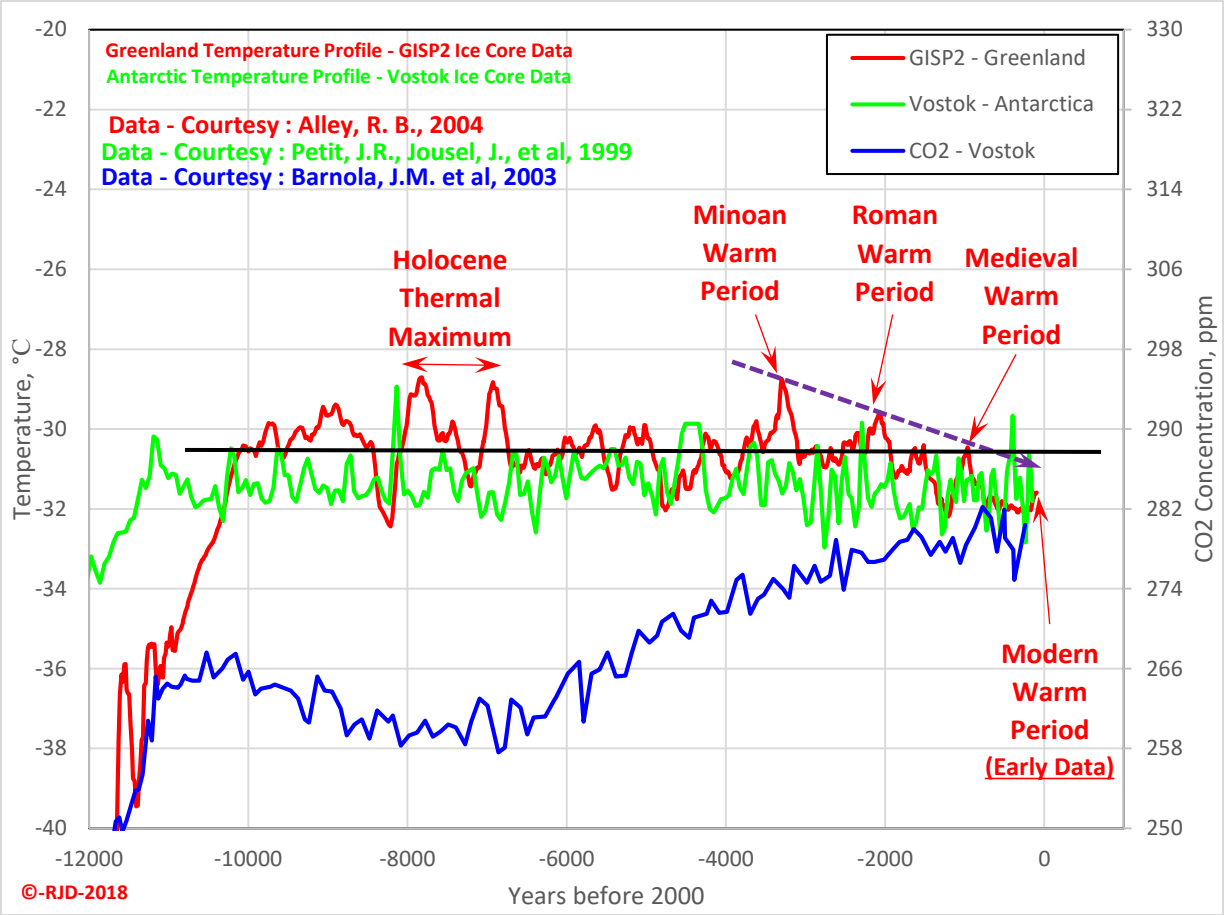
Another way of looking at the temperature data is to look at the number of days where temperatures reached extreme levels. The graph below lays out the percentage of summer days above 95 °F in the US. Again the 1930's are substantially higher than the current conditions and the trend is down. The data trends for similar plots at 100 °F and 105 °F also trend downward.

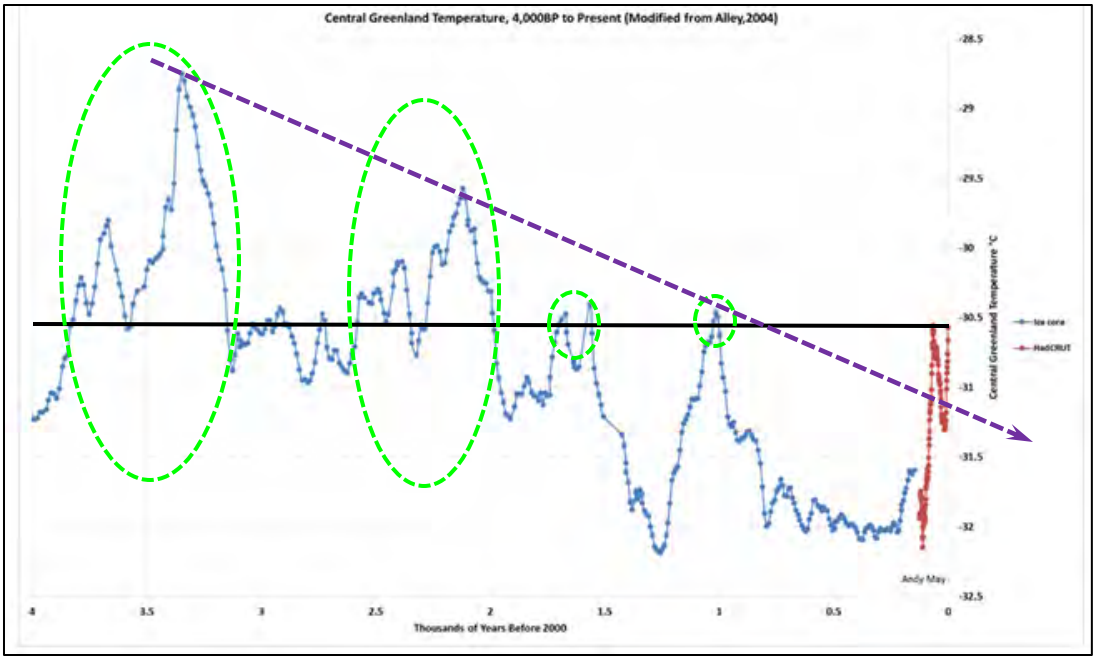
I'll also refer you back to the earlier fire discussion. Not surprisingly, the number of acres burned by fires was substantially higher in and around the 1930s. The drought conditions during that period were way beyond anything the US is currently experiencing. The plots below show the comparison between July 1934 and July 2018. To be fair to Governor Brown, California is going through an extremely difficult period but the situation is localized and is therefore a case of short term weather not climate (which is measured by changes in weather patterns over 30, 50, 100 year and millennial timescales).



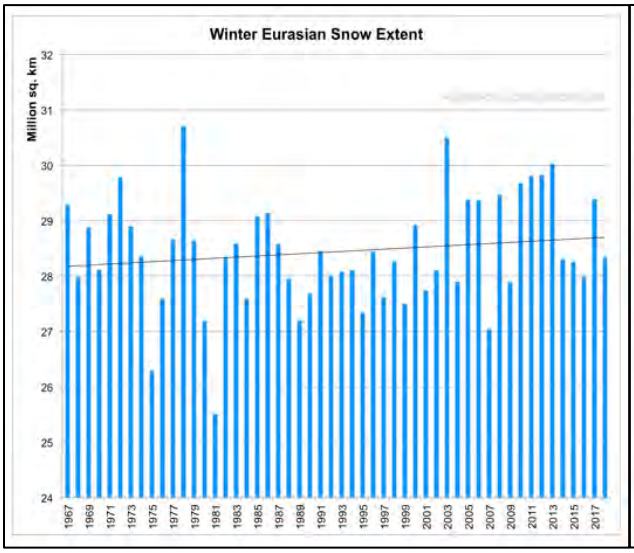


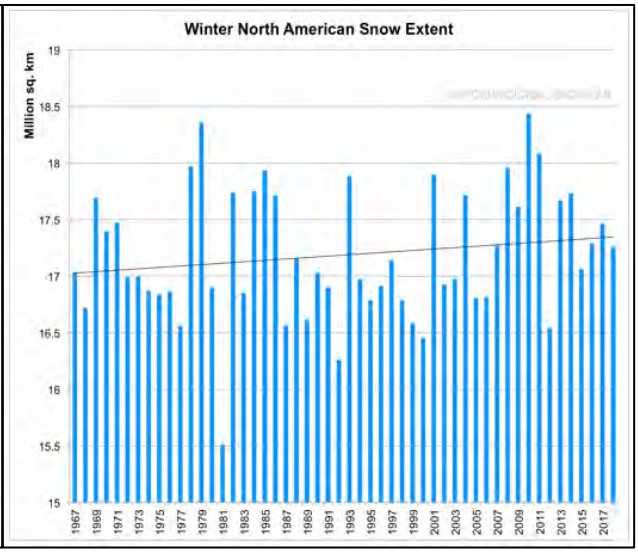
You don't have to go back 10,000 years to find temperature conditions that were warmer than this summer. But just to close out the loop, I've added a graph from earlier in the discussion that puts today's temperatures into perspective. The temperatures for both Greenland and Antarctica have obviously been higher than current temperatures. The lower graph has combined the Greenland ice core temperatures (over the last 4,000 years) with the more recent HadCRUT Greenland temperature data.

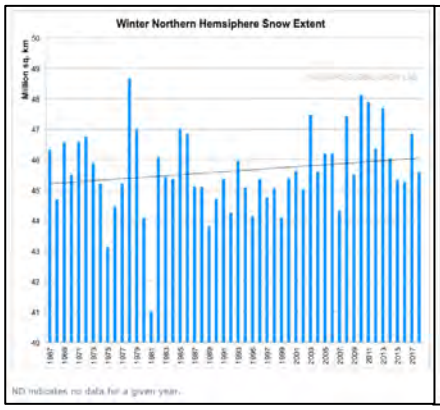


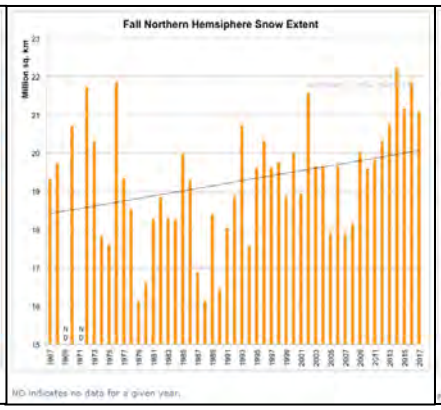


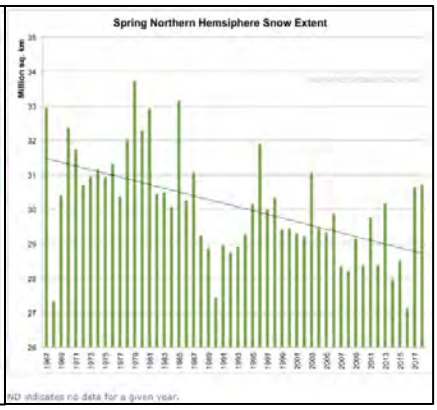
6. Northern Hemisphere Snow Extent











Here is another one of the fallacies being put forward by the "Global Warming" crowd. The prediction by Al Gore and many others that more CO_2 will mean less snow is more alarmist propaganda.

Winter snow cover in the northern hemisphere has been overall increasing since satellite observations became available. That statement is valid for both North America and Eurasia (i.e.: these are not localized phenomena). Fall snowfall extents have also been increasing. Spring snow extents have been decreasing. However, 2017 had a large jump in snow cover and 2018 was slightly higher than 2017.

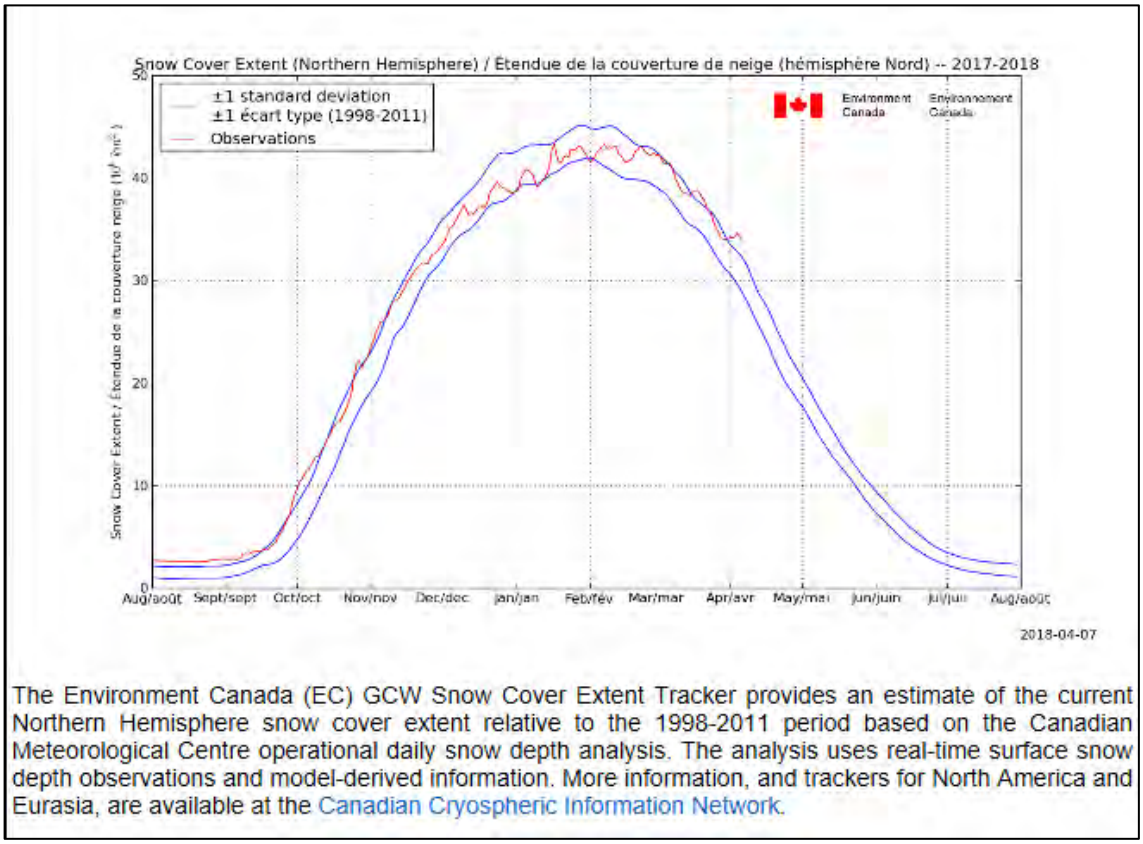
I wonder if they're including the April snow in Saudi Arabia or the various significant snowfalls this winter through Northern Africa (i.e.: Morocco, the Sahara Desert, etc.). And before anyone starts whining that's just weather, I understand the principle difference between weather and climate. One snowfall in the Sahara Desert is not indicative of climate change. However, this is the third year in a row that the snows have occurred, and the volumes have been increasing.

Exactly what you should expect heading into a Grand Solar Minimum. Is it proof that "Global Warming" is done. No, but it certainly doesn't help the GW case. But if we want to talk weather versus climate, then you also have to disregard any pronouncements like 2016 was the hottest year ever. I actually believe that

statement is true. However, that means nothing with respect to a climate discussion. The record applies only to the period from 1850 to Present.

The planet has been significantly warmer over many periods in its history. Over 80% of the planet's history since abundant life developed has been roughly 10 °C higher than today's temperatures. In addition, the 2016 high temperatures were due to a strong el Nino, which allowed us to beat the 1998 el Nino year by a whopping 0.02 °C. Ultimately, the weather events that occur in any particular year are meaningless. The long term trends (discussed earlier) dictate where the climate is headed.

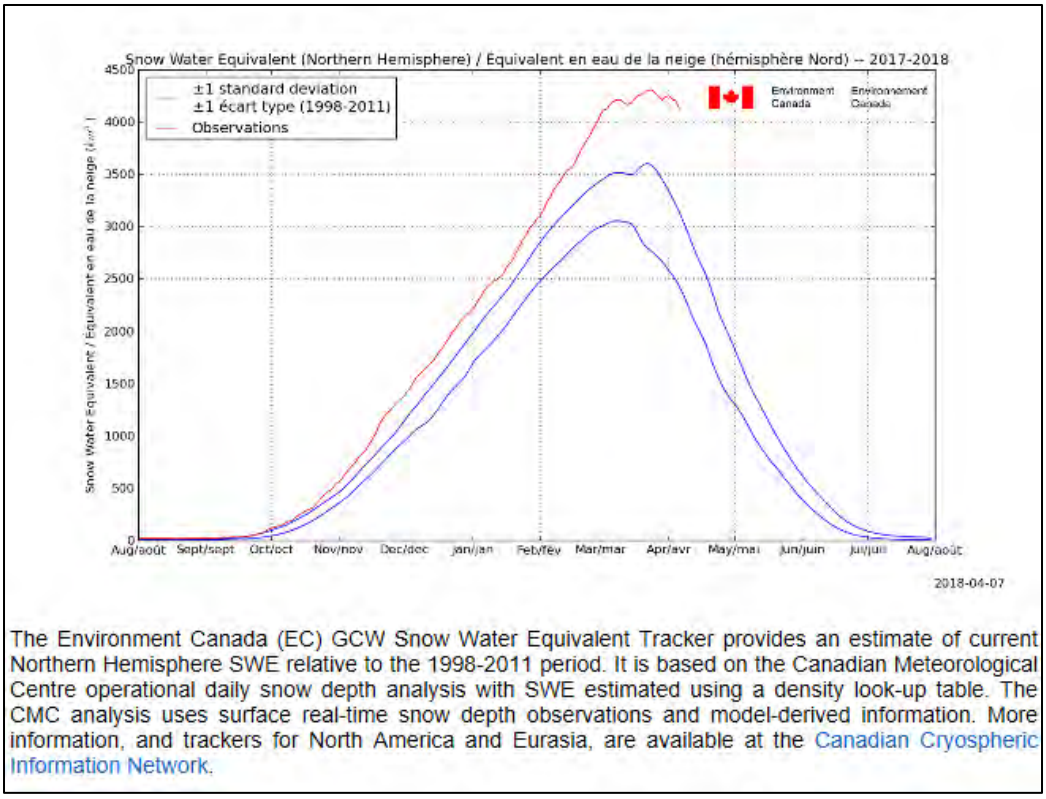
Another good general site to see what's happening with the global ice, snow, etc. is the Global Cryosphere Watch (globalcryospherewatch.org/state_of_cryo/snow/). A few of the charts are outlined and discussed below.



The Environment Canada (EC) GCW Snow Cover Extent Tracker provides an estimate of the current Northern Hemisphere snow cover extent relative to the 1998-2011 period based on the Canadian Meteorological Centre operational daily snow depth analysis. The analysis uses real-time surface snow depth observations and model-derived information. More information, and trackers for North America and Eurasia, are available at the Canadian Cryospheric Information Network.

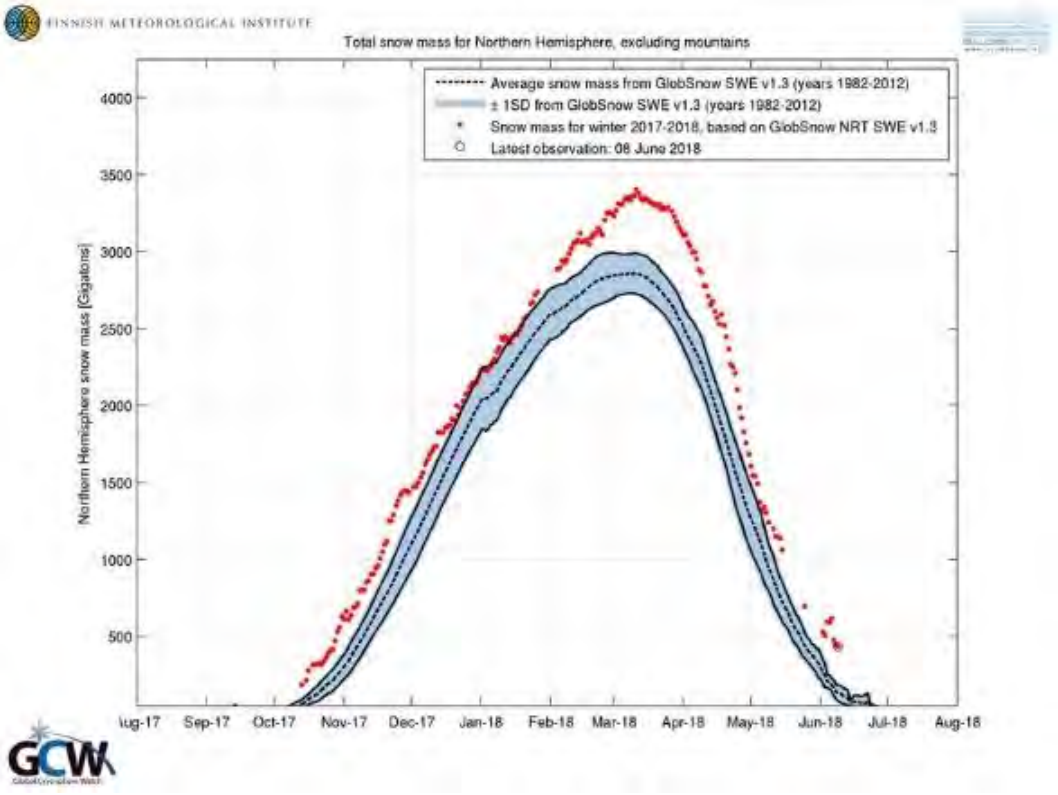
The chart of Northern Hemisphere snow extent was generated by Environment Canada. The 2017-18 winter snow extent is a bit on the high side but really not all that far from typical. The snow extent (April 7th, 2018) moved out and past one standard deviation above the average 1998-2011 levels. The additional snow through April and May kept the curve at the +1 standard deviation level. The updated plot was not available.

But much like the discussion with Arctic sea ice cover, that chart doesn't tell the whole story. Environment Canada also puts together a Snow Water Equivalent chart.



The Environment Canada (EC) GCW Snow Water Equivalent Tracker provides an estimate of current Northern Hemisphere SWE relative to the 1998-2011 period. It is based on the Canadian Meteorological Centre operational daily snow depth analysis with SWE estimated using a density look-up table. The CMC analysis uses surface real-time snow depth observations and model-derived information. More information, and trackers for North America and Eurasia, are available at the Canadian Cryospheric Information Network.

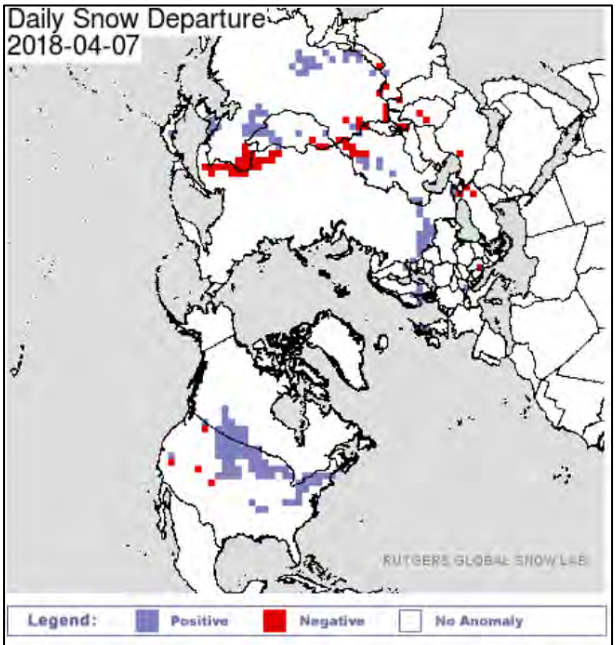
As you can see the amount of snow that has fallen is substantially higher than the 1998-2011 average. The Finnish Meteorological Institute puts out a similar chart (updated to July 2018) as shown below.



The Finnish Meteorological Institute chart for the Northern Hemisphere is very similar to the Environment Canada chart supporting the concept that total snow mass is increasing in the northern half of our planet.

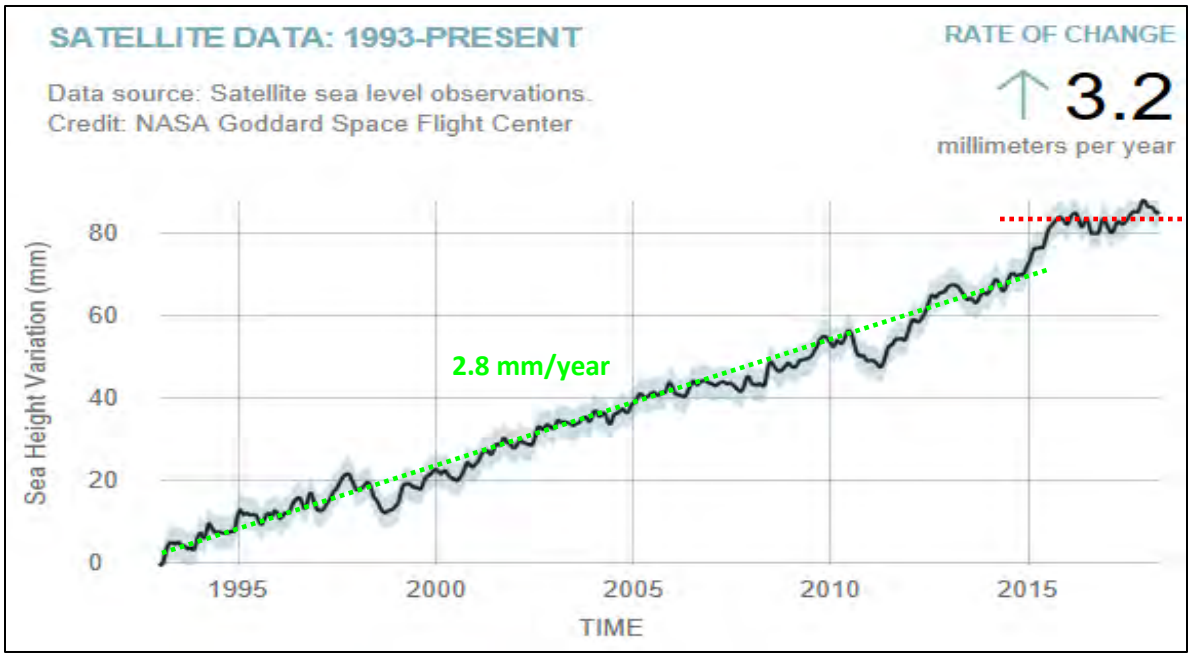
The mainstream media doesn't like to promote any stories that might bring into question "Global Warming". So record colds, record snowfalls, etc. tend to be only broadcasted locally. There have been many record snowfalls and cold temperatures established over the last few years (despite the lack of reporting).

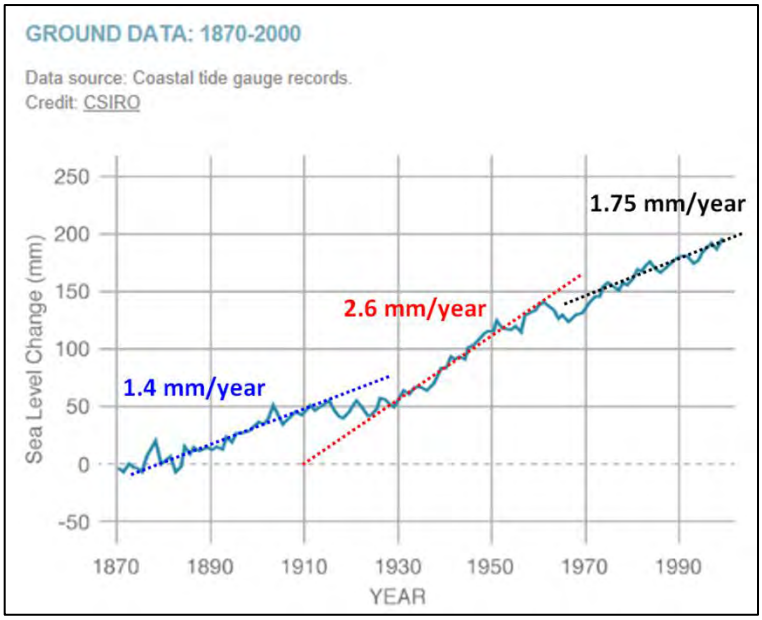
The map on the right shows the current (04-07-18) northern hemisphere snow extent anomaly. It clearly presents that there was above average snow extent for North America and a mix in Eurasia.



The Rutgers Global Snow Lab, Rutgers University, generates many snow products. This is the daily IMS snow cover departure from the long-term average. Text annotations were added here.

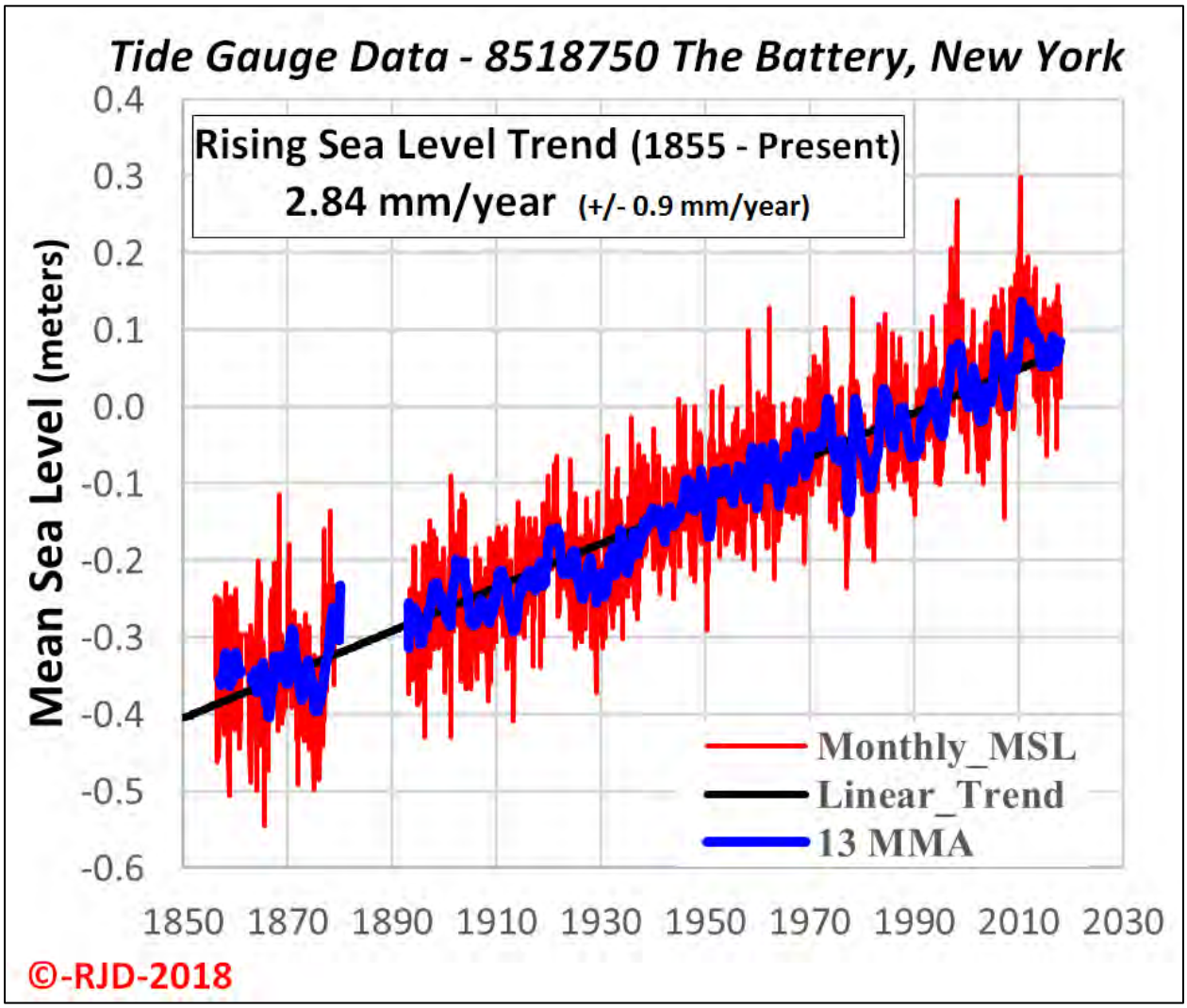
7. Sea Level Thoughts





The global sea level data shown above comes from the NASA website climate.nasa.gov/vital-signs/sea-level/. It's unfortunate that NASA uses two different data sets (satellite in the top chart and tide gauges in the lower) to highlight the sea level changes. There's nothing wrong with having both sets but to do a proper evaluation, the evaluator needs to see how the two data sets compare to one another where they overlap. Sea level changes from the depths of the Little Ice Age have actually been relatively consistent at ±1.6 mm/year based on the tide gauge data. As shown sea level changes do fluctuate to some degree. Obviously, something other than atmospheric CO_2 concentrations is affecting sea level rise (since CO_2 is rising very smoothly (once yearly seasonal fluctuations are removed)). Given that most of mankind's CO_2 contribution has occurred since 1950, it seems strange that the sea level rise post 1950 actually decreased to 1.75 mm/year. Correct me if I'm wrong, but CO_2 was steadily rising which should have lead to temperature increases which should then in turn lead to escalating sea level rises. The 2.6 mm/year rise

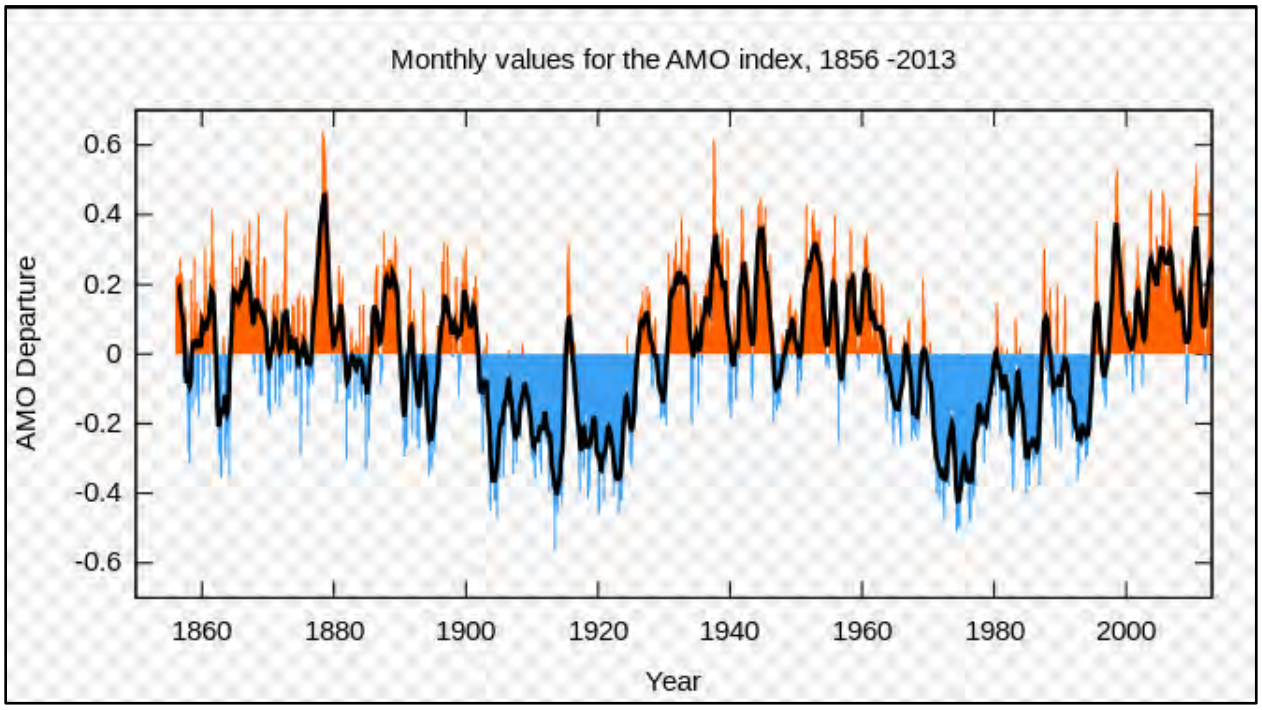
from 1930 to 1960 (tide gauge data), is very similar to the 2.8 mm/year rise between 1990 and 2015 (satellite data). So nowhere in this NASA data is the sea level data escalating to catastrophic levels. In fact, sea levels, as shown by the red line on the satellite data, have been essentially flat since late 2015.

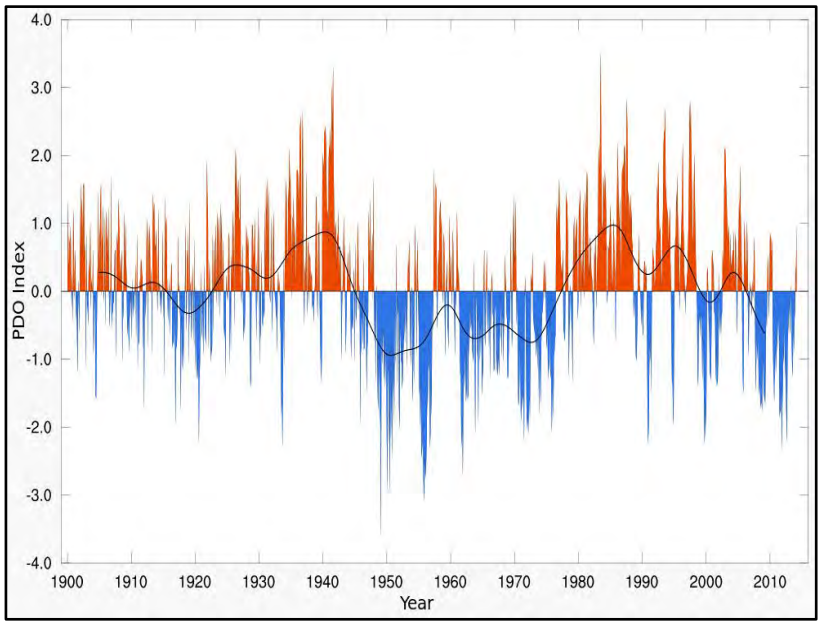


The tide gauge data from New York (and many other places in the world) has been rising very steadily. In fact, anyone with a pencil and a ruler could have extrapolated the data from the late 18th and early 19th century to show that New York was going to have some issues with rising sea levels. We did not need Al Gore and his super computers (and the billions of dollars) to confirm that. You also don't hear much discussion on the drop in sea level at New York since the peak in 2010 back to an average baseline. It is very possible that sea levels will continue to decline as temperatures drop due to lower solar activity through the Grand Solar Minimum.

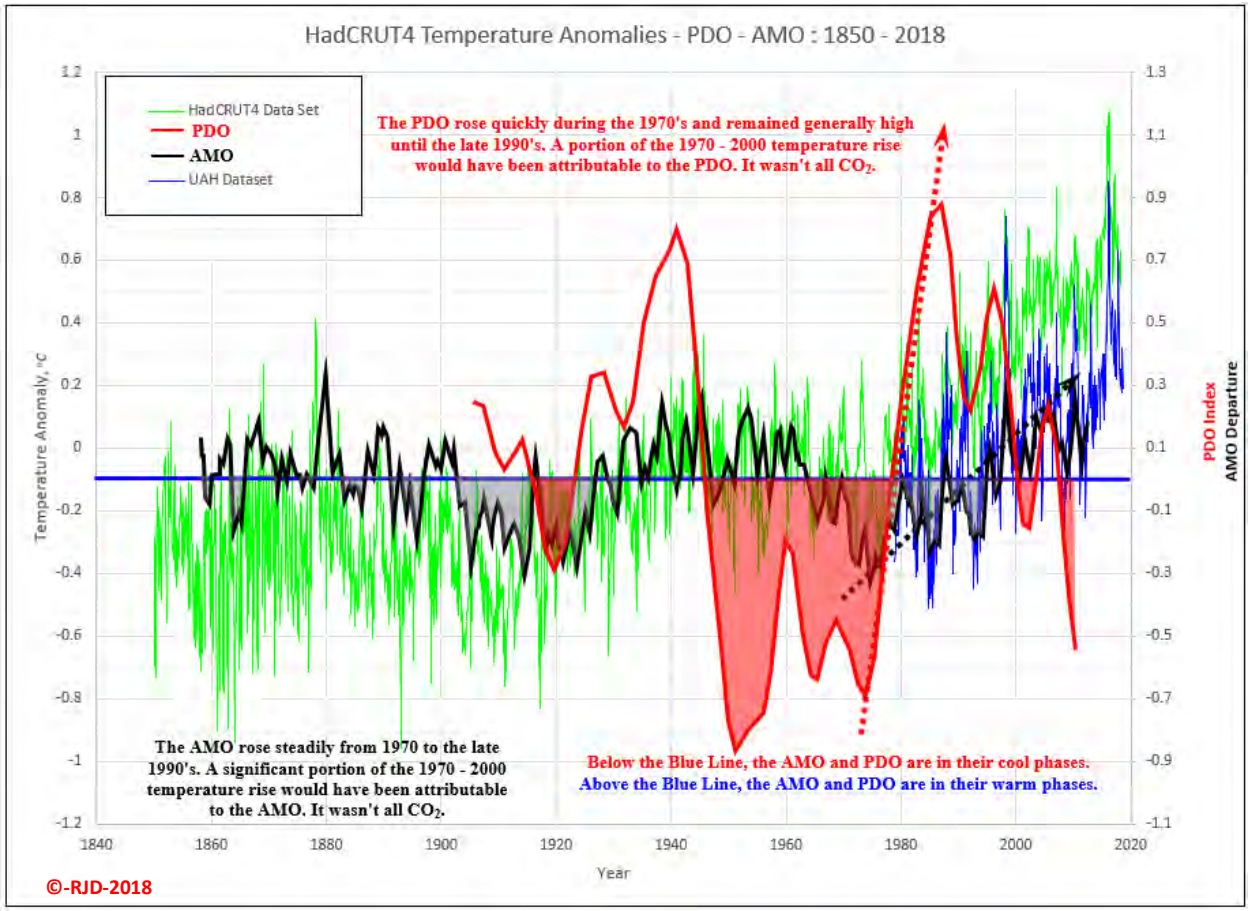
8. Ocean Cycles

The ocean cycles play very important roles in regulating global temperatures. The two primary cycles are the Atlantic Multidecadal and Pacific Decadal Oscillations (i.e.: the AMO and PDO). The Atlantic and Pacific Oceans cycle between hot and cold over a period of 60 – 65 years. Note they are not moving in unison despite similar cycle times. The AMO is just beginning to turn down to go into a cooling phase. The PDO has already entered its cool phase. The indexes for both (pulled from Wikipedia) are included below.



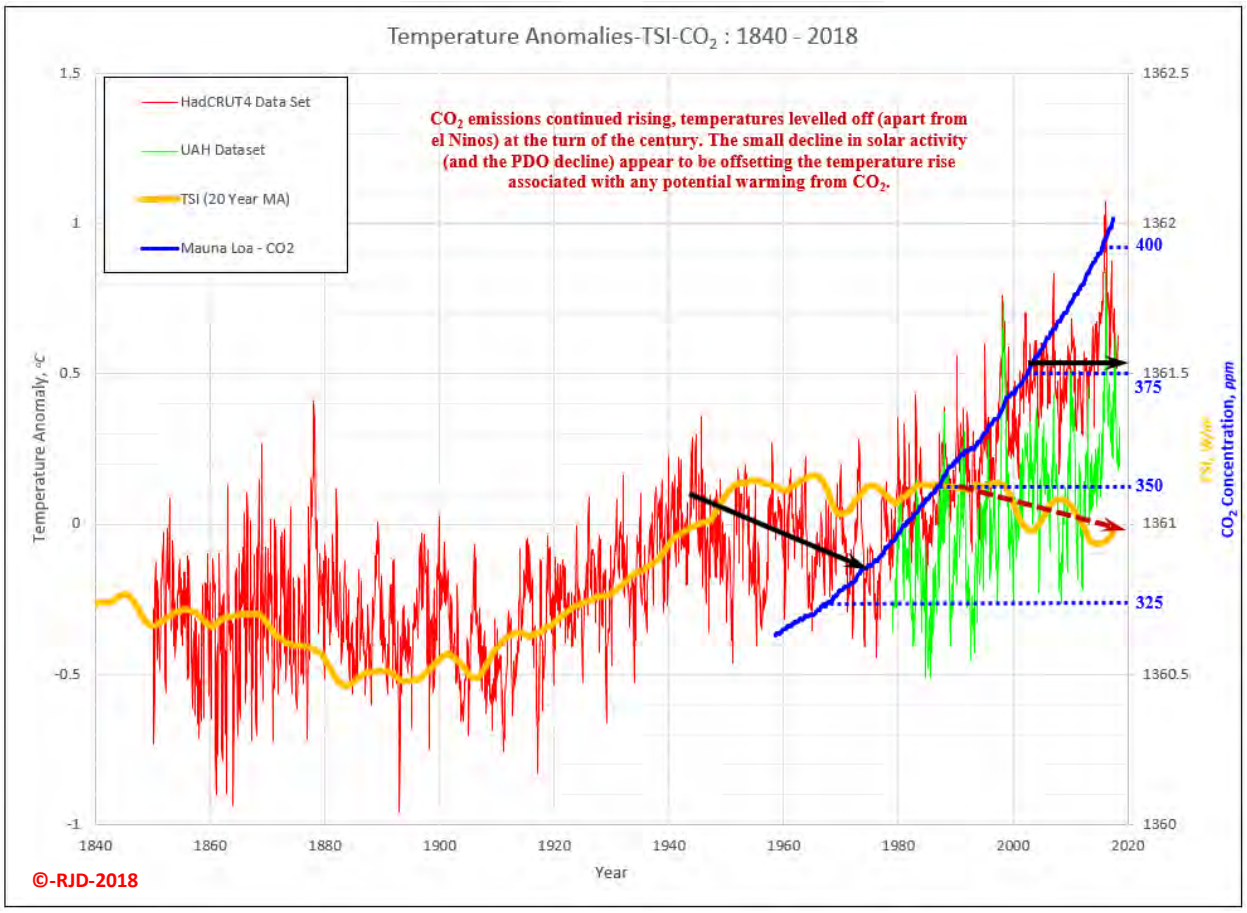


The plot below superimposes the AMO and PDO on the HadCRUT4 and UAH temperature data sets. One thing that should jump off the page is the correlation between the AMO and the early HadCRUT4 data (pre-satellite) combined with the UAH satellite data. The satellite period HadCRUT4 data deviates from the correlation and the UAH data. Most of that deviation is remarkably similar to the temperature values that have been added by the homogenization process. Hmmmm…



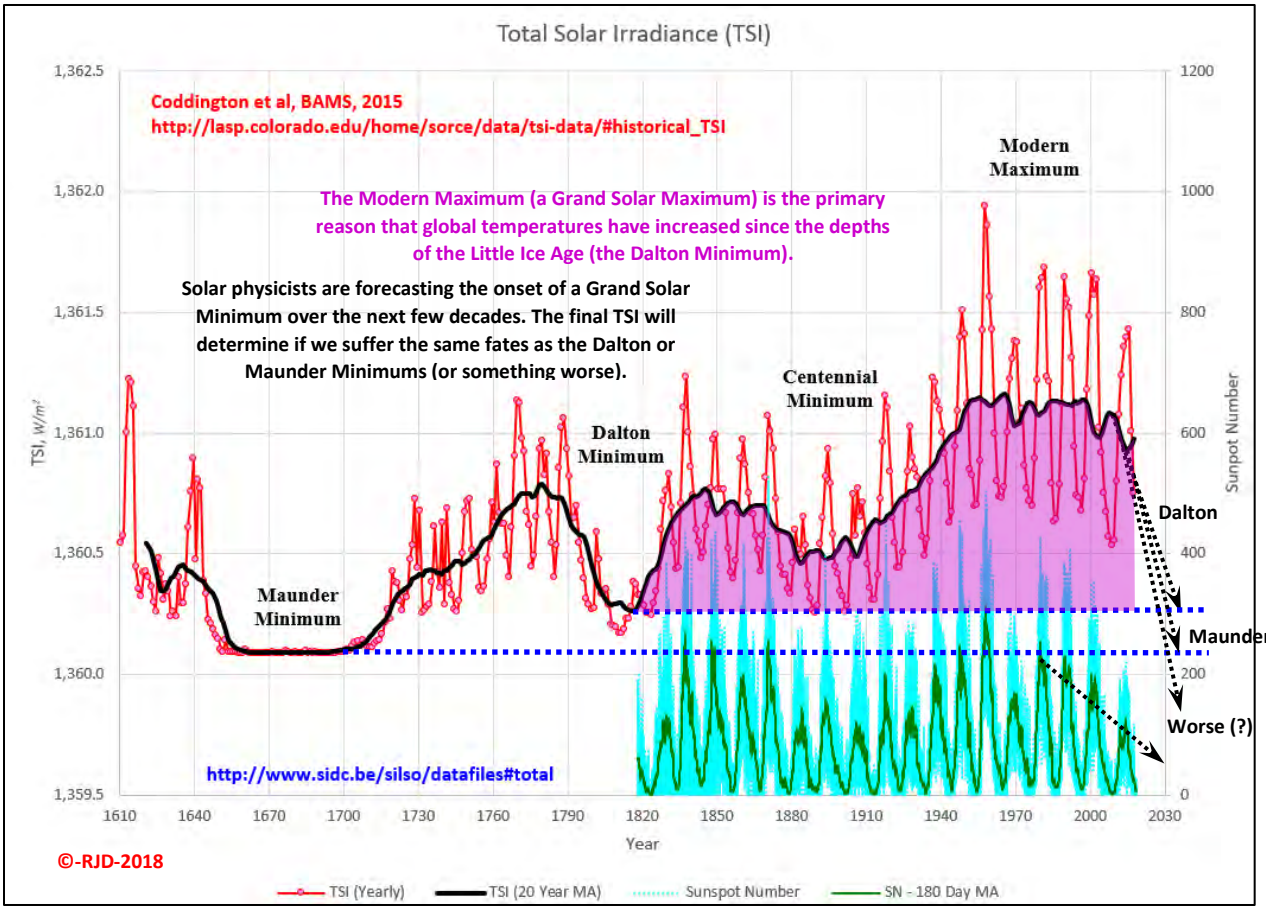
In an earlier portion of the discussion, I pointed out that the only period where CO_2 appears to correlate well with the global temperatures is between 1970 and 2000. As I mentioned in that discussion, not all of the temperature rise was due to increasing CO_2 concentrations. The AMO and PDO would have also contributed to the rising temperatures during that period. Based on the correlation between AMO and the pre-satellite HadCRUT4 data combined with the UAH data, you could argue that CO_2 was not much of a contributing factor during the 1970 – 2000 period. The AMO appears to be a dominant factor over the throughout the last 1.5 centuries.

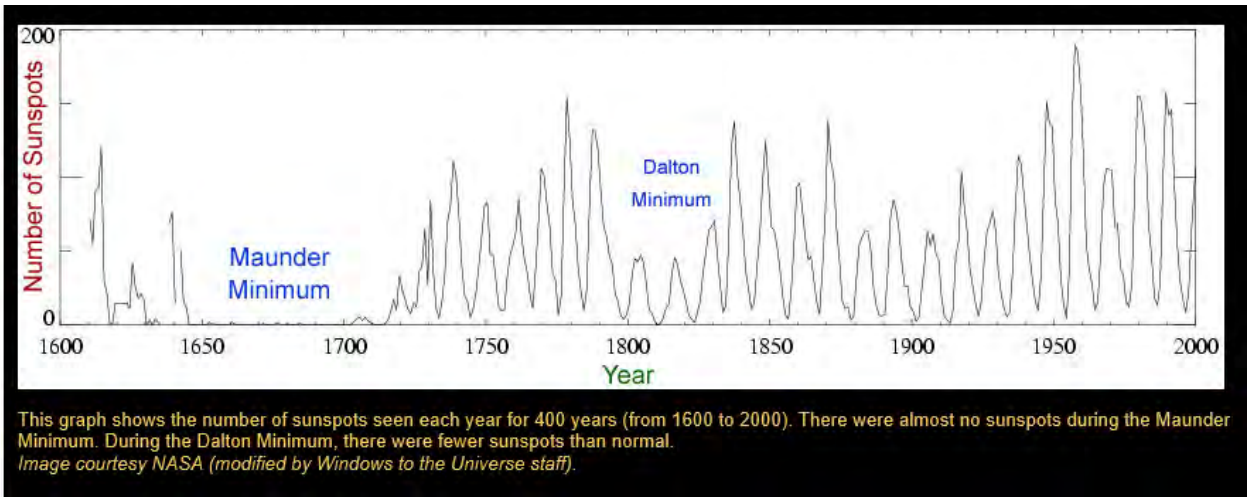
The same temperature data can be plotted against the solar activity with similar results. The solar activity correlates well with the pre-satellite HadCRUT4 data combined with the UAH satellite data. The declining solar activity since 2000 (with help from the declining PDO) may have been enough to keep global temperatures flat since 2000. Solar activity is forecasted to decline quickly and dramatically over the next decade or two. Declining solar activity is going to be the real "Climate Change" problem and right now we are ignoring the problem politically and economically. A big mistake in my opinion.



As shown on the previous page, the AMO had a better correlation with the same temperatures. The period from 1940 – 1970 was characterized by declining global temperatures (using the HadCRUT4 data). Remember the coming ice age scare being promoted during the 1970's. The solar activity was flat through this period and the CO_2 concentrations were continuously rising yet the temperature still went down. Coincidentally, the AMO was declining through this period. Just one more indication that CO_2 is not a significant climate driver.

9. Solar Activity and Sunspot Numbers





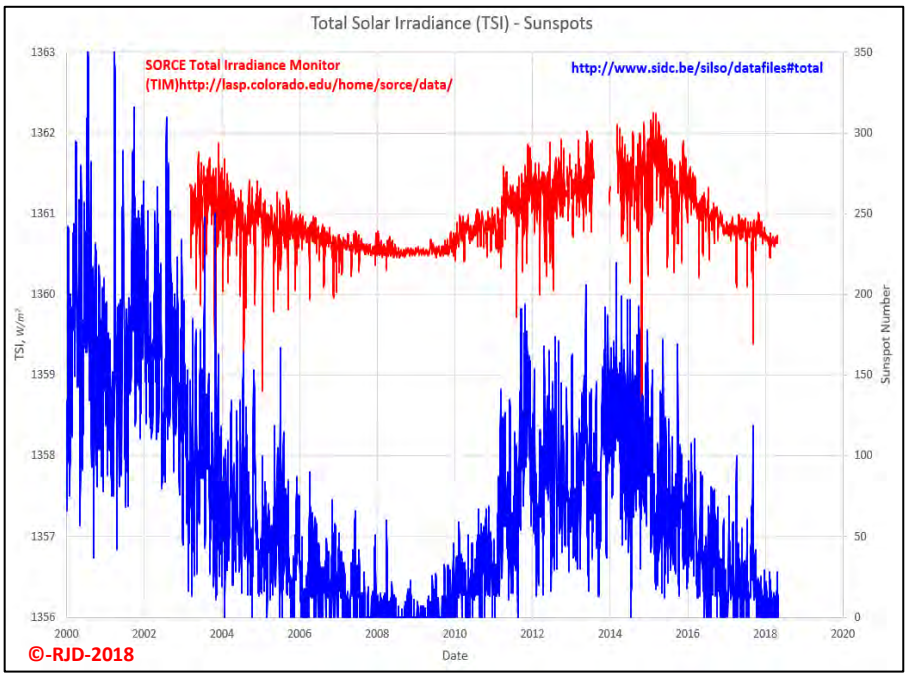
This graph shows the number of sunspots seen each year for 400 years (from 1600 to 2000). There were almost no sunspots during the Maunder Minimum. During the Dalton Minimum, there were fewer sunspots than normal.
Image courtesy NASA (modified by Windows to the Universe staff).

In general, low sunspot numbers are associated with colder periods in our history. The Little Ice Age (LIA) lasted for several centuries (early 1600's to the late 1800's). The Maunder Minimum represented the depths of the LIA. The Thames River in England routinely froze over during this period (as evidenced by the winter fairs). The Dalton Minimum was another cold period across the entire Northern Hemisphere. Crop shortages, mass starvation and civil strife were common during these cold periods. More recently, those old enough will remember the cold and winter storms we experienced during the 1960's and 1970's. Those lower temperatures correspond to Solar Cycle 20 (a dip in both sunspot numbers and solar activity).

And despite media reports of continued "Global Warming", four of the last six winter years in North America have been colder and snowier than average (2013/14, 2014/15, 2015/16 and 2017/2018). The story is similar in Europe with several colder and snowier winters than normal since the new millennium (2002/03, 2005/06, 2009/10, 2011/12 and 2017/2018).

However, the sunspot numbers are very qualitative and therefore only loosely associated with climate changes. Solar activity (as measured by Total Solar Irradiance (TSI)) ties much better to climatic changes. Solar activity has increased significantly since the depths of the Little Ice Age. A significant portion of the increased temperature over the last 150 years is due to that increased solar activity. Solar activity peaked around 1950 and has remained relatively stable since then. As a result, I believe the temperature increase since 1950 has been strongly influenced by the increasing CO_2 levels in the atmosphere, but that future influence will be negligible over the next two decades.

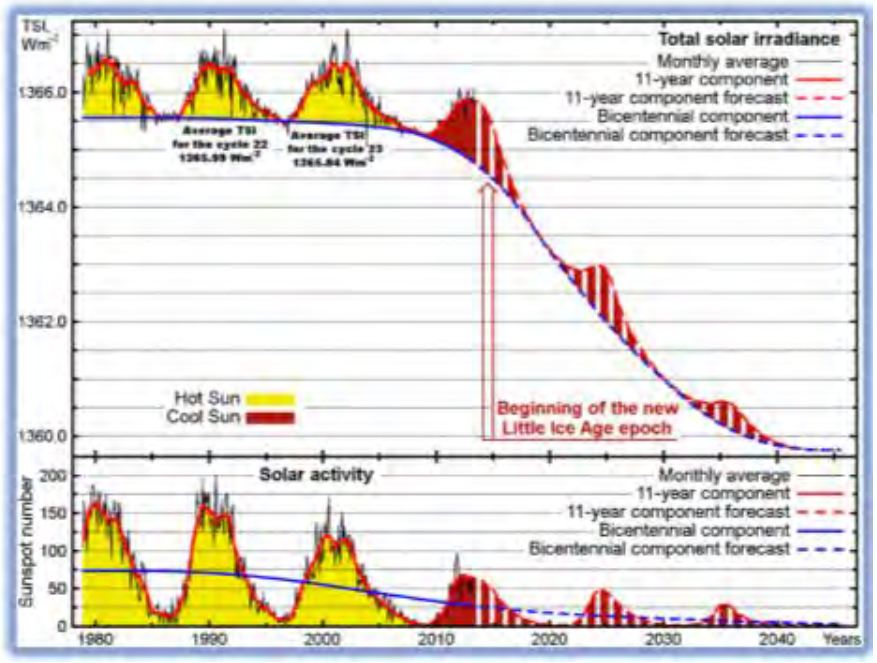
Future solar activity is forecasted to decline quickly over the next few years/decades. If those declines take us back to the Dalton and Maunder Minimum TSI levels, we are going to experience the same hardships associated with every historical "Grand Solar Minimum" humankind has experienced. The moderate warming effects of CO_2 will not prevent the cooling effects associated with the decline of our sun's activity.



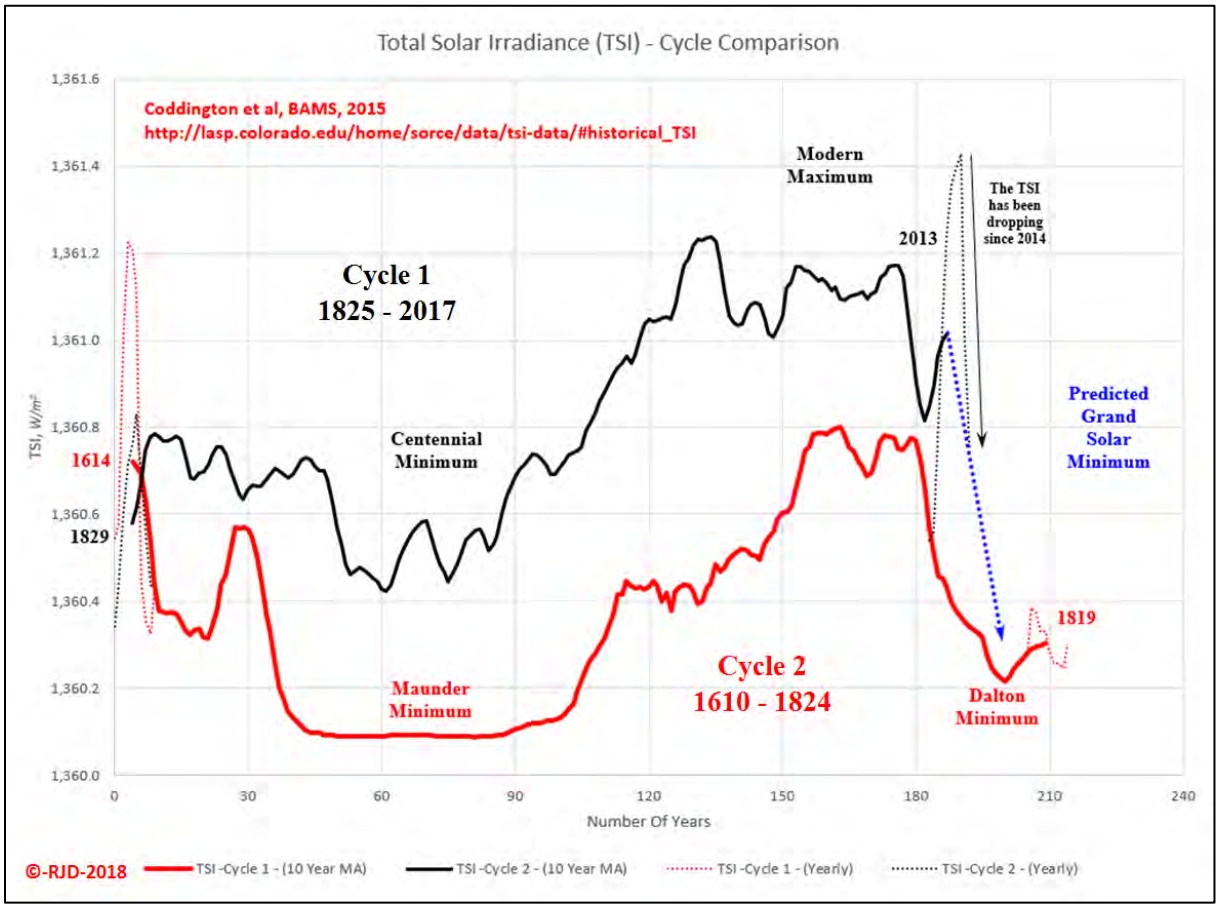
Cycles 23 and 24 are detailed in the above chart, with sunspots in blue and TSI in red. Cycle 24 has a sunspot number count that is reminiscent of the Dalton Minimum. However, TSI is higher than the Dalton Minimum. As a result, temperatures have not yet begun to fall (although they have stagnated for the last 20 years). A couple of quick notes. Cycle 24's duration (9 years) is noticeably shorter than the typical 11 year cycle. Sunspot activity is very low right now with 106 out of 199 days in 2018 showing zero sunspots. Sunspots were only present for 4 days in July 2018 with no sunspots over the last 10 days.

Cycles 25 and 26 are forecasted to have both lower sunspot numbers and TSI. Colder temperatures and extended winters are very likely to soon become the norm.

A Russian scientist, (Abdussamatov) published the adjacent forecast which I've included to illustrate that a small drop in sunspot number can be associated with a significant drop in TSI. A more recent paper, "Heartbeat of the Sun from Principal Component Analysis and Prediction of Solar Activity on a Millennium Timescale" published in Nature recently and available at www.researchgate.net, is also predicting a Dalton/Maunder like Solar Minimum (for those that want a more technical discussion). NASA is also forecasting additional drops in Sunspot Numbers for Cycle 25.



The chart included below compares the solar activity over the last 200 years with the solar activity of the previous 200 years.



The two tracks are remarkably similar. The solar activity magnitude is different for each of the periods, but the general trends are consistent. The Total Solar Irradiance (TSI) has been declining rapidly since the yearly 2014 peak. That decline is not yet showing up in the 10 year MA (moving average) but the decline will become noticeable as we move further into the upcoming Grand Solar Minimum. As mentioned on the previous page, Abdussamatov's forecast suggests solar activity levels will drop back down into a range equivalent to the Dalton or Maunder Minimums.

The solar activity levels over the most recent 200 years is noticeably higher than previous 200 years. The previous 200 years corresponds directly to the Little Ice Age (LIA) and includes both the Maunder Minimum and the Dalton Minimum. Low solar activity and cold temperatures began right after the Medieval Warm Period as shown in Figures 12 and 13 from the main text and also included the Sporer Minimums. The LIA corresponded closely with the lowest solar activity in the last 7,500 years. The Modern Maximum corresponds closely with the highest solar activity over the last 7,500 years.

Solar and astrophysics are not my area of expertise so I'm not going to go into detail on the science. I'll stick to looking at the data and the correlations. I have however included a quick summary below from a colleague scientist that highlights the bigger solar picture and is in line with my own views.

"Connections between variations in earth climate and changes in solar radiation have been known by historic observers, but measured in more detail only since the last century.

*** The glacial stages of the Pleistocene and the behaviour of the interglacials were tied to the eccentricity of the earth' orbit around the sun by Milankovitch' painstaking manual calculations.**
*** Detailed isotope work and paleobotanic research ascribed variations in solar radiation as the cause of distinct cyclic climate changes occurring in the (interglacial) Holocene as well.**
*** Svensmark's cloud chamber experiments and those with the CERN reactor showed how the galactic cosmic ray stream could be influenced by changes in solar radiation and so eventually affect cloud cover on earth.**

The cyclic patterns of changing climate can range from tens of years (the historic ones) to thousands of years (100,000 years In the case of the ice ages). That should be no surprise because these patterns are astronomic and find their origin in the conjunctions and oppositions of our fellow planets circling the sun. The large "inner planets" (Jupiter, Venus, Saturn) are able to affect the circular pattern that the sun follows around the gravitational centre of our solar system.

The interior solar convection and the sun's dual dynamo are apparently affected by the process, because the inner orbital behaviour of the sun shows a cyclicity with elements similar to that of the magnetic output.

It is not per se the solar radiation which directly affects climate on earth. But the solar variations can be found in cyclic patterns of temperature, oceanic oscillations, cloud cover and precipitation. Atmosphere and oceans are the transmitters, and all with various amounts of time delay."

The IPCC's mandate is to assess human influence on climate, and though it does include some review of natural forces, many solar physicists say the review is cursory and typically confined to changes in Total Solar Irradiance (TSI), which is only one element of solar activity. As has been noted, one IPCC report contained reference to only one solar physicist who cited their own single research paper as evidence that the sun's role was minimal. It is unusual to draw a scientific conclusion from a single reference.

10. Scientific Consensus Thoughts

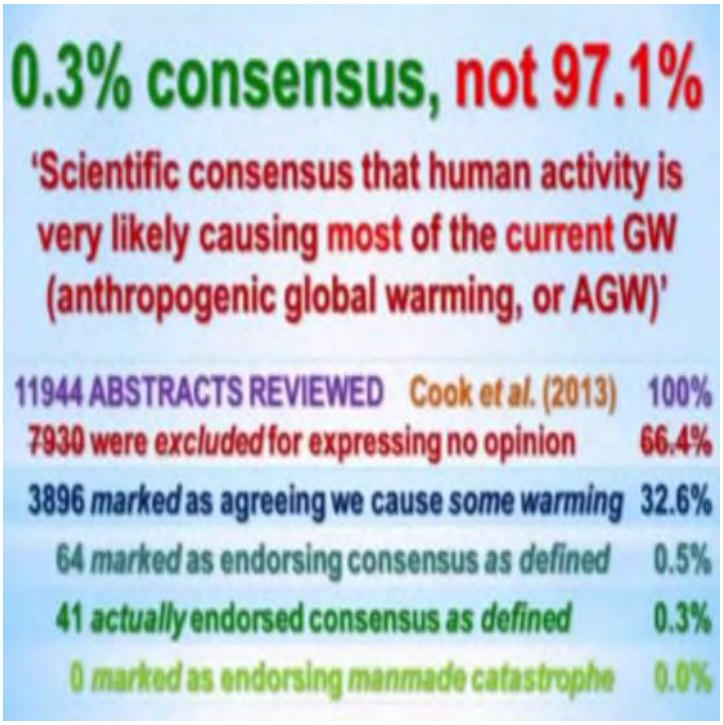
Scientific consensus is not a sound argument. Galileo went against the consensus and earned himself house arrest for most of his life (despite being correct). Einstein was required to fight the consensus against his Theory of General Relativity. And he rightly pointed out that proving him wrong could be done by one person (i.e.: a consensus is not required). And up until the Nazis took Eugenics to a new level, the world wide consensus was solidly behind Eugenics. So consensus can provide support for a position but that doesn't guarantee the position is correct.

The problem with the "Global Warming" consensus is the large volume of scientists that have and are continuing to speak out against the premise of projected catastrophic global warming. An example of this skepticism is the Oregon Petition which was signed by 31,487 American Scientists (9,029 with PhDs). The petition position is stated below.

"We urge the United States government to reject the global warming agreement that was written in Kyoto, Japan in December, 1997, and any other similar proposals. The proposed limits on greenhouse gases would harm the environment, hinder the advance of science and technology, and damage the health and welfare of mankind.

There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate. Moreover, there is substantial scientific evidence that increases in atmospheric carbon dioxide produce many beneficial effects upon the natural plant and animal environments of the Earth."

And to be fair, I'll point you to skepticalscience.com, a site that dedicates itself to debunking climate skeptics. As usual they provide no actual evidence to dispute the petition statements. They (Skeptical Science) try to minimize the number of signatories (31,487) as only 0.3% of the 10.6 million science graduates since the 1970-71 school year. That is most likely a correct number. In response, please show me the documents with a similar volume of signatures backing human caused catastrophic global warming. Shouldn't be any problem given that 10.3 million scientists (based on the so called 97% consensus) should be backing the concept. They do provide a reference to studies that supposedly back up the 97% consensus. One of those studies (Cook et al) is highlighted here. Cook reviewed 11,944 climate related abstracts to quantify their position on the Scientific consensus stated above. Cook came up with a 97% consensus by discarding the papers (7,930) that had no opinion and including papers (3,896) that agreed that we cause "some", not the majority of the warming. In actual fact, only 41 (0.3%)



of the papers endorsed the consensus as defined. The other studies have also been reviewed and are very subject to interpretation.

As mentioned by Skeptical Science, the petition is a little out of date. But I see the petition as surprisingly prophetic. The proposed limits on greenhouse gases has been harmful to the environment and mankind. Moving to solar and wind has had many unintended harmful consequences. Wind turbines are responsible for millions of bird and bat deaths every year and are responsible for health issues in both humans and livestock (based on harmful sonic frequencies). The wind turbine vibrations also appear to be causing problems with aquifer water quality (releasing fines making the water unusable). Solar is also not environmentally benign. The rare earth minerals required to make solar panels are not obtained in environmentally friendly manners. As the name implies, these minerals are "rare" and require huge tracts of land to be stripped. The same problem applies to both solar and wind on the battery side of the argument. Since both are intermittent, they have huge battery requirements to store energy for when the sun isn't shining and/or the wind isn't blowing. Lithium (a basic requirement for today's batteries) mining is a huge environmental problem. There could also be serious future environmental issues related to cleaning up out of date solar and wind sites. Both solar and wind also require large tracts of land to implement when compared to current options. A few examples are shown below.

Description	**Detail**	**Energy Density (W/m^2)**
London Array (Offshore Wind)	630 MW over 100 km^2	2.5
Desert solar PV farms		20
Germany solar PV farms		5
Bio Fuel	Corn (or equivalent) ethanol (best case)	2
Bio Fuel	Corn (or equivalent) ethanol (typical case)	0.5
Conventional Power Plants		±1000

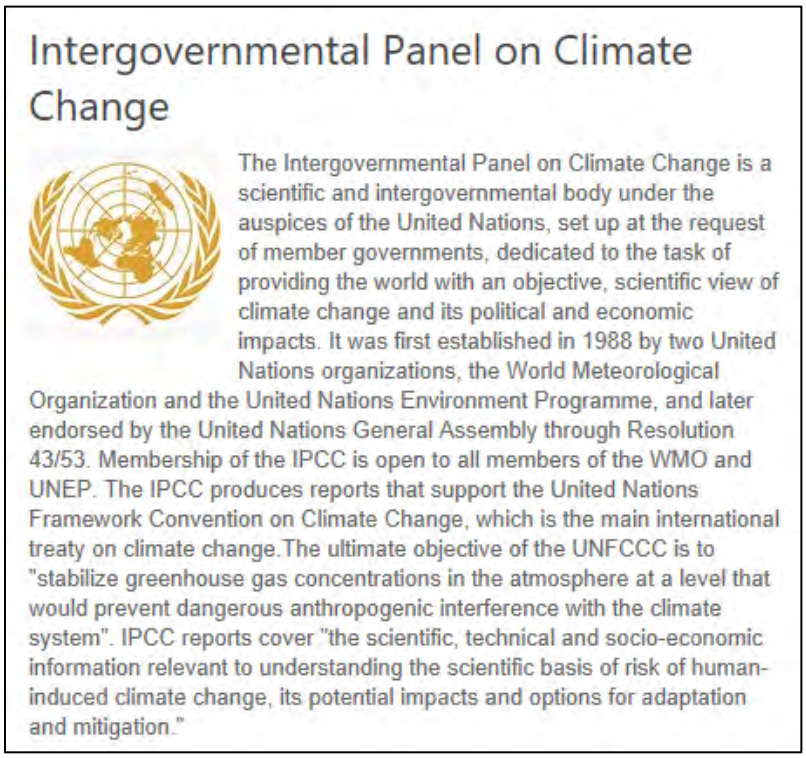
Source: www.theenergycollective.com/robertwilson190/257481/why-power-density-matters

Technology	Gagnon / Bertani 2005 (Geothermal)		Fthenakis		McDonald (2030)		Smil		Mac Kay	Selected values
	Land use as m^2/kWh	W/m^2	Land use as m^2/kWh	W/m^2	Land use as km^2/TWh/y	W/m^2	min (W/m2) (MW/km2)	max (W/m2) (MW/km2)	W/m^2	W/m^2
Biomass Crops	5,33E-01	2,08E-01	1,25E-02	8,89E+00	5,43E+02	2,05E-01	5,00E-01	6,00E-01	5,00E-01	5,00E-01
Geothermal	5,00E-02	2,22E+00			7,50E+00	1,48E+01				2,22E+00
Hydro	1,52E-01	7,31E-01	4,00E-03	2,78E+01	5,40E+01	2,06E+00			2,40E-01	2,40E-01
Wind	7,20E-02	1,54E+00	1,50E-03	7,41E+01	7,21E+01	1,54E+00	5,00E-01	1,50E+00	2,00E+00	2,00E+00
Photovoltaic	4,50E-02	2,47E+00	3,00E-04	3,70E+02	3,69E+01	3,01E+00	4,00E+00	9,00E+00	1,00E+01	1,00E+01
Coal	4,00E-03	2,78E+01	4,00E-04	2,78E+02	9,70E+00	1,15E+01	1,00E+02	1,00E+03		2,78E+02
Gas			3,00E-04	3,70E+02	1,86E+01	5,97E+00	2,00E+02	2,00E+03		3,70E+02
Nuclear	5,00E-04	2,22E+02	1,15E-04	9,66E+02	2,40E+00	4,63E+01				9,66E+02

Source: www.afs.enea.it/buceti/Texts/SustainablePowerDensityInElectricityGeneration_OpenVersion.pdf

Apart from requiring huge areas of land, the traditional energy sources (coal, gas, etc.) are still required as backup for when the wind doesn't blow and/or the sun doesn't shine. Bottomline, two power generation systems are required when one (coal, natural gas, nuclear) would have been sufficient. The huge amount of capital required to put in unrequired power generation and the associated distribution

systems is extremely detrimental to the economy. That money is wasted and could have been used to deal directly with real problems (real pollution, poverty (domestically and internationally), etc.). The overzealous green policies have put a damper on the global economy and that leaves less capital to address real environmental issues. As polls have shown, environmental concerns (especially "Climate Change") go to the bottom of the priority list when the economy is not performing well. In fact, they're at the bottom of the public's priority list now despite the economic boom occurring in the US right now. If you really believe in reducing greenhouse gas emissions, we should be following the US lead and converting to more natural gas power generation. We should also be pushing for more LNG capacity to export to the Far East. Reducing China's reliance on coal would have a much more profound effect on local and global air quality. The benefits would extend well beyond the perceived need to fix an unnecessary CO_2 emission problem and actually address some of the real pollution problems faced by third world areas. We should also be exporting our cleaner coal combustion technologies. The third world can't afford solar and wind technologies (which isn't surprising given that the technologies are not economic here without significant subsidies). Cheap energy (coal and natural gas) would save millions of lives in the third world and reduce overall poverty levels.



The "Climate Change" agenda has been extremely detrimental to the advancement of science and technology. The IPCC has focused almost exclusively on the anthropogenic contribution to climate change. As a result government funding has also been focussed on human related mechanisms rather than the natural mechanisms (i.e.: solar activity, ocean cycles, cloud and other albedo effects, etc.). Let's remember that the IPCC is the "Intergovernmental" Panel on Climate Change. The make-up of the panel is more about politics than about science. If they were serious about understanding climate change they would actually promote study of the natural mechanisms. They don't because their mandate doesn't allow them that path. Restricting research to one path is a very unscientific approach to any problem. However that premise is understandable given the UN's ultimate goal (forced wealth transfer from the developed nations to the Third World). Here are a couple of quotes from UN officials that sum up the rationale. You can also research Maurice Strong (sadly a Canadian), who kick started this whole process at the UN.

Ottmar Edenhofer: United Nations Climate Official (Co-chaired the UN's Intergovernmental Panel on Climate Change working group on Mitigation of Climate Change from 2008 to 2015)

"One has to free oneself from the illusion that international climate policy is environmental policy. This has almost nothing to do with the environmental policy anymore, with problems such as deforestation or the ozone hole"

"We redistribute de facto the world's wealth by climate policy"

Five years earlier he also said that **"the next world climate summit in Cancun is actually an economy summit during which the distribution of the world's resources will be negotiated."**

Christiana Figueres: Executive Secretary of United Nations Framework Convention on Climate Change

"This is the first time in the history of mankind that we are setting ourselves the task of intentionally, within a defined period of time, to change the economic development model that has been reigning for at least 150 years, since the Industrial Revolution," she said in anticipation of last year's Paris climate summit.

"This is probably the most difficult task we have ever given ourselves, which is to intentionally transform the economic development model for the first time in human history."

The Oregon Petition was also correct in stating that "There is no convincing scientific evidence that human release of carbon dioxide, methane, or other greenhouse gases is causing or will, in the foreseeable future, cause catastrophic heating of the Earth's atmosphere and disruption of the Earth's climate.". As I've pointed out earlier in the discussion, there is no empirical data that shows CO_2 is a major driver of climate change. CO_2 concentrations do play a role in determining temperatures but the other natural mechanisms have always been and always will be the dominating factors.

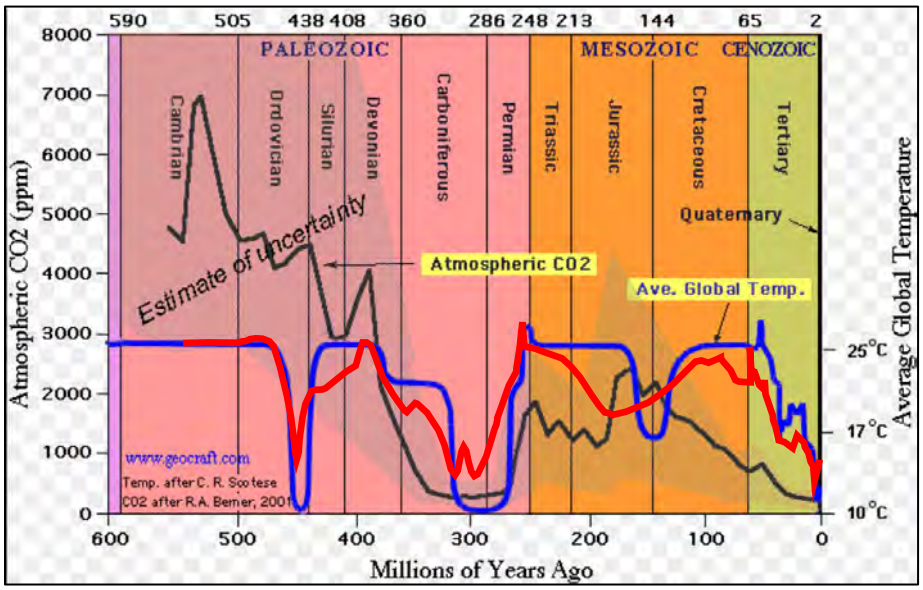
And yes CO_2 increases have been very beneficial to plant life and therefore animal and human life. The earth has greened significantly in the last few decades. NASA's acknowledgement can be found at www.nasa.gov/feature/goddard/2016/carbon-dioxide-fertilization-greening-earth. The greening is not a surprise given that greenhouses routinely increase their CO_2 concentration levels up to the 1200 – 1500 ppm. CO_2 is plant food (i.e.: not a pollutant). In reality, current CO_2 levels (410 ppm) are still close to plant starvation levels. At 150 ppm, virtually all life on this planet would cease to exist. During the last ice age we were down to 185 ppm. Higher CO_2 levels also allow plants to grow in drier climates because they can process water more effeciently. CO_2 levels would actually need to increase substantially for plants to truly thrive.

And I personally would welcome higher temperatures. Especially given 2018's northern hemisphere's prolonged winter. Warming temperatures would benefit the northern hemisphere immensely. Growing seasons would be extended and the area of arable land would be extended further north. Unfortunately, I still believe that the fate of our climate is tied to solar activity and the future laid out by solar/atmospheric physicists (an area that the IPCC has very little experience with) is not very rosy. The degree of cooling is still a question mark, but even NASA has acknowledged that the coming decrease in solar activity will push global temperatures down. NASA is also predicting that the current solar activity low will occur in 2019/2020. So get ready for a couple more winters like 2018 (only worse). NASA still feels that the effects of CO_2 will eventually override the reduction in solar energy. I really hope NASA is right.

11. Musing on the Benefits of CO_2

So what role does CO_2 play in the climate picture? This section is largely my opinion based on a big picture look at the earth's history. I do believe that CO_2 increases do lead to higher temperatures. However, those temperature increases based on CO_2 alone will be moderate (as discussed earlier). Moderate global temperature increases are hugely beneficial. Growing seasons become longer and more arable land becomes available. Remember, during the Medieval Warm Period, the Vikings settled and farmed Greenland (try to do that now). Another obvious benefit of rising CO_2 levels is the greening of the planet. Existing forests are healthier and vegetation has been establishing footholds in previously low vegetation environments (deserts, high steppes, etc.).

CO_2's contribution to global temperature is real. But in general, rising CO_2 will only contribute to the rise in temperature when solar activity increases or will temper the drop in temperature when solar activity decreases. And for that we should be thankful. Any 0.1 °C increase due to CO_2 increases, means the depths of the coming GSM is 0.1 °C warmer than it could have been.

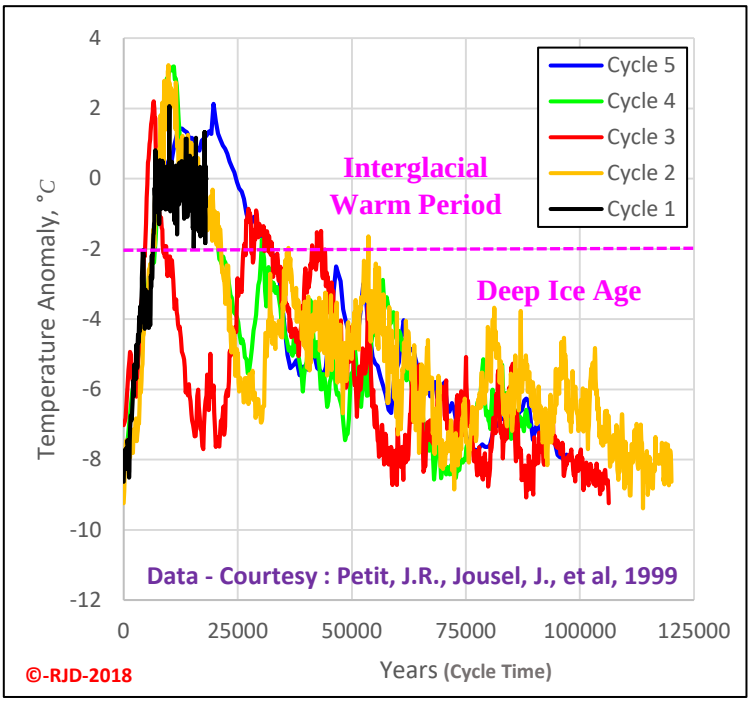


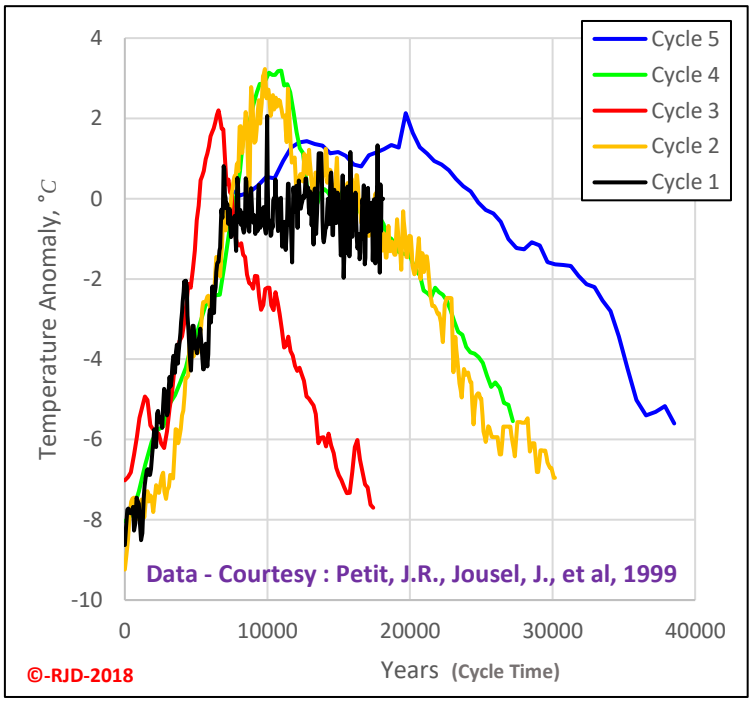
As mentioned earlier, CO_2 may play a role in moderating the lengths and the depths of the deep ice ages. At 450 million years ago, the CO_2 levels were very high with a short ice age. At 300 million years ago, CO_2 levels were low (similar to today's levels) with the longest recorded ice age. At 150 million years ago, CO_2 levels had increased substantially and the resulting ice age was shallow and short. The ice age we are currently living through is once again characterized by longer durations and low CO_2 levels. Obviously CO_2 is not the only factor affecting the climate on this time scale but there is a qualitative correlation present (i.e.: low CO_2, longer and/or deeper ice ages and vice versa). The red dataset is the updated temperature from the same researcher (C.R. Scotese) who generated the original blue data. I included the new data after coming across some discussion suggesting the blue temperatures were out of date. The new temperature plot doesn't change the discussion points.

CO_2 has played an important role in regulating temperatures over the last 800,000 years. As discussed earlier (re: the Milankovitch cycle discussion), the low CO_2 levels in the depths of the ice age lead to severely stressed plant life and widespread desertification. The atmosphere becomes loaded with dust particles that eventually settle on the ice. Over time these dust particles darken the ice, making it easier to melt. The planet goes through an interglacial warm period roughly every 100,000 years. We are currently living through the Holocene Interglacial. A number of factors go into initiating these interglacial warm periods but they always occur when the planet's orbit is at a maximum in its orbital eccentricity

cycle. The low CO_2 concentration induced dust helps the melting process (leading to rapid temperature increases). As the temperature rises there is some positive feedback from the rising CO_2 levels but there is no evidence of the runaway temperature effect promoted by the "Global Warming" crowd.

Another example of CO_2's potential benefit can be seen by focussing in on the deep ice age/interglacial warm period cycle.The Holocene temperature profile is considerably different than any previous interglacial warm period. In general, temperatures rise quickly out of the deep ice age, peak (often higher than the Holocene peak) and then drop quickly back into the deep ice age. The Holocene deviated from that pattern. The temperatures peaked but instead of dropping quickly, they have declined at very moderate rates. Around 7,000 years ago, atmospheric CO_2 concentration rises accelerated. Although the increase was relatively small, it may have been enough to keep the planet above whatever tipping point drops the temperature to ice age levels.



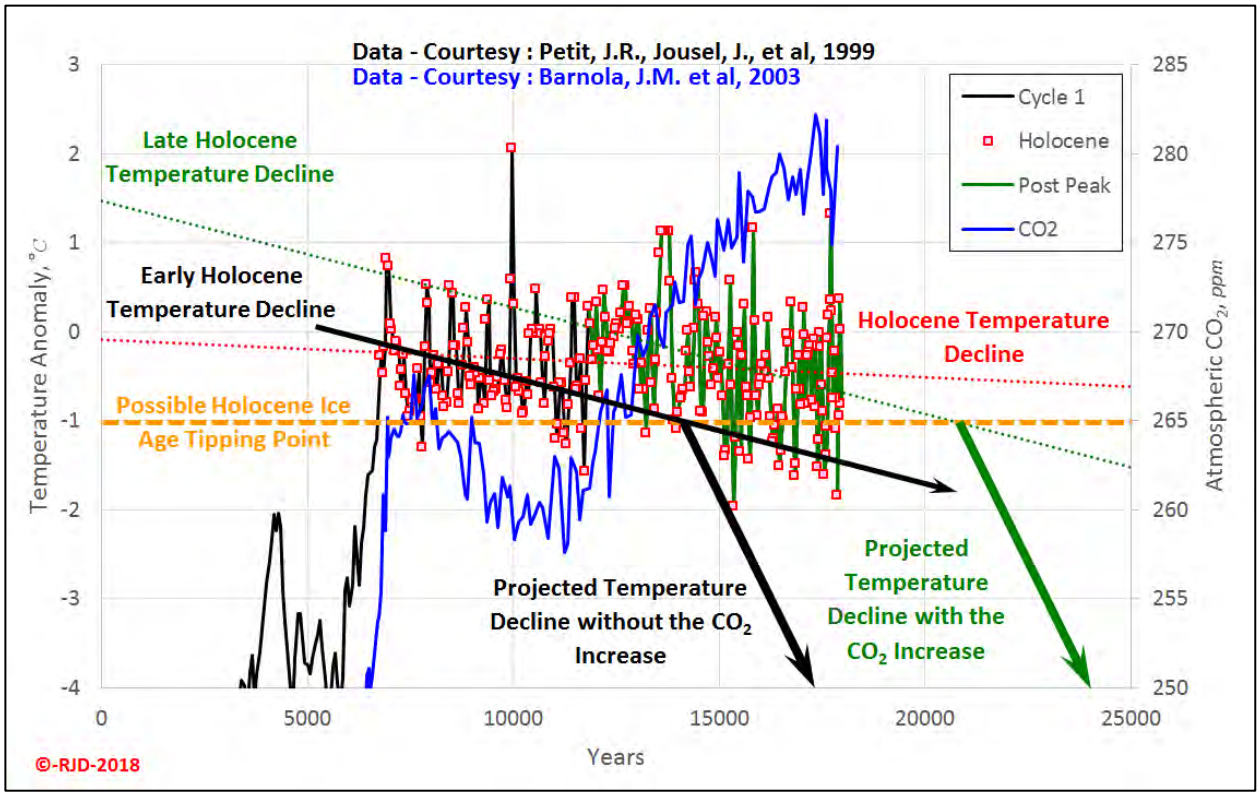


The historical temperature data (Vostok ice cores) in these charts has been normalized to the point where the temperatures begin rising out of the deep ice age. The first chart includes the entire cycle (covering the last 420,000 years). The second chart focusses in on just the interglacial warm periods.

Cycles 2, 3 and 4 have very similar profiles (especially 2 and 4). Cycle 3 had an exceptionally short interglacial warm period but followed the same general pattern through the deep ice age period. Cycle 1 (the Holocene, the current interglacial we are living through) did not peak and decline immediately. The Cycle 1 profile looks a bit more like Cycle 5 (the oldest cycle) which does not have a sharp peak and a quick decline. All of the previous cycles peaked at more than 2 °C above the Holocene maximum which occurred around 5,000 – 6,000 years ago. And guess what, CO_2 played no role in those higher temperatures and the planet had no problem surviving those temperatures. So if we are lucky, we may be in a cycle that continues to mirror Cycle 5 (but at a lower temperature). If you go back to the discussion on the Milankovitch cycles, you can see that the insolation at 65° north actually stops dropping and rises slightly before dropping again into another insolation low that is associated with an eccentricity low (which has

always resulted in a deep ice age). Given that we have not already dropped into a deep ice age, we may have another 20,000 years of generally warm climate with the same ups and downs that have characterized the Holocene to date.

So is it possible that the CO_2 increases over the last 7,000 years kept us from dropping into a deep ice age? That scenario is illustrated on this graph:



The early Holocene temperature decline may have been headed towards that time in the cycle where the drop into a deep ice age is accelerated. That tipping point is different in every cycle so we don't know exactly where it resides. We do know the tipping point was higher in all of the previous cycles and we know we're still above the Holocene tipping point (thankfully). If the tipping point is the -1 °C temperature anomaly level (purely speculative), we could have already been headed for that deep ice age and today's society may not have come into existence. The CO_2 increases in the mid-Holocene may have been enough to boost the temperature slightly and keep us above the tipping point. And that is definitely a possibility since a 20 ppm increase beginning at 260 ppm is much more effective in raising global temperatures than a 20 ppm increase beginning at today's 410 ppm. Especially if you believe the current IPCC computer models (which I don't). The late Holocene temperature decline would intersect that 1 °C level around 4,000 years from now. Combined with some additional heating from the current levels of CO_2 and our position in the Milankovitch Cycles, we should be able to avoid a deep ice age for an extended period of time.

This last portion of this CO_2 benefit discussion does contain some speculation. But it is not out of the realm of possibility. And you don't have to take my word for it. Here's a quote from Bill Nye's interview with Tucker Carlson on February 27th, 2017 that expresses that same sentiment. In response to a question

about how long it would have taken to reach our current temperatures without human influence (i.e.: CO_2), Bill stated:

"It's not clear that it would have happened. In other words humans have changed the climate so drastically that we've almost certainly avoided another ice age. There would have been another ice age, ain't gonna happen, 'cause of you and me.".

I wouldn't have used the word drastically but whatever. Overall, I would think that Bill should be grateful that CO_2 kept us out of an ice age (which would have been and could still be devastating). His answer is a bit strange given that ***"It's not clear that it*** (referring to the temperature rise over the last century) ***would have happened"*** is not that representative of so called settled science.

To summarize, CO_2 is not a pollutant and CO_2 is absolutely essential to life on this planet. We should be thankful for the benefits CO_2 provides us.

12. General Comments on the Hypocrisy of CO_2 Demonization

The hypocrisy that exists in this debate always continues to amaze me, so I'm going to lay out a few of the worst examples for your contemplation.

1. Tankers are banned on the West Coast of Canada to prevent the export of Canadian oil and LNG. Yet tankers bring in more than 600,000 bbls of oil per day along the East Coast of Canada. A lot of that oil is shipped through the St. Lawrence Seaway. The same river system that our government officials have no problem dumping incredibly huge volumes of raw sewage into. The same government officials that opposed the Energy East Pipeline which would have offset a portion of those tanker deliveries. Eastern Canada should be pushing to buy Canadian oil rather than have it delivered by tankers from countries that have significantly poorer societal and environmental standards than Canada. We should move away from having our oil delivered by tankers from halfway around the world (Note: shipping is one of the largest sources of pollution (real and CO_2)). We should be delivering our oil by pipeline (the safest (remember Lac Magentic) and lowest CO_2 emission (for those concerned about CO_2) option for moving our hydrocarbon resources) rather than rail.
2. Our Canadian Federal and Provincial (although not all of them) Governments have decided to go all in on fighting Greenhouse Gas Emissions. Even if you believe CO_2 is a problem, Canada leading the charge is ridiculous for a variety of reasons. Our number one trading partner and major competitor (the USA) does not have a carbon tax and has reduced other taxes across the board. Capital is fleeing Canada because our financial climate is not competitive with other jurisdictions around the world. And it's not just the hydrocarbon industry. And as discussed earlier, Canada is already at a minimum, CO_2 neutral (the country absorbs more CO_2 than it emits). Removing every industry and every person from Canada would have an unmeasurable effect on the planet's temperature. So until every other major CO_2 emitter on this planet (USA, Russia, China, India, Saudi Arabia (OPEC in general), Japan, Australia, etc.) puts in carbon taxes there is no rationale for Canada to be there. The demand for oil is going to continue to rise for an extended period of time. And every barrel of oil that stays in the ground in Canada is a barrel of oil that will be produced elsewhere in countries that don't have the same stringent emission standards associated with Canada. We are simply exporting and actually increasing global emissions.
3. The British Columbia Government has decided to fight the Trans Mountain Pipeline by any means possible. The major concerns are environmental. They're worried about an oil spill along the coast. A valid concern, but the risks have been assessed and determined to be very low. Using the same logic, every large ship (container, cruise, etc.) should be banned from our coastal waters because they also represent an oil spill risk. The current oil export operation has been in place for more than 60 years without a major incident and the technologies have improved significantly over those 60+ years. Of more concern is the emission argument. If you believe the CO_2 hype, you should be protesting the huge volumes of coal that are shipped to China and India through Canadian ports (primarily Vancouver). A lot of which is first imported from the US (and is a lower quality, higher emission source than Canadian coal). That coal is burned in inefficient coal power plants that do not use the same cleaner burning technologies that we have developed leading to real pollution (and I'm not talking about CO_2). BC and the Federal Government have also put in place huge roadblocks to LNG exports. Exporting LNG would actually be far more effective at

reducing greenhouse gas and particulate emissions than many of the uneconomic renewable options by lowering the Far East dependence on coal. US emissions have been dropping and that drop is due primarily to the conversion from coal to natural gas power generation.

4. The pipeline industry has been unfairly demonized in Canada. Despite being the lowest greenhouse gas emission (and safest) option for moving hydrocarbons around the country, future pipelines will have to factor in both upstream and downstream emissions into their application process. The cement industry in Quebec (a very large emitter) is not required to factor in their emissions. The automobile industry in Ontario is not required to factor in the considerable downstream emissions associated with their product. This is a serious double standard that is fueling anti-Canada sentiment in the West. The oil industry is one of the main drivers (if not the main driver) of the Canadian economy. All the provinces have benefitted significantly from the industry. And a strong hydrocarbon industry is still required in Canada like it or not. There will be no significant equalization payments from western Canada without a strong oil industry. Quite frankly, Alberta is getting fed up with being treated as second class citizens in our own country. We have sadly, willingly exported our future through equalization payments and are now receiving no meaningful help when it's required. The hundreds of billions of dollars that have been transferred out of Alberta would have gone a long way to setting up a wealth fund like Norway.
5. Hypocrisy also exists within our governments. Catherine McKenna (Canada's Environment and Climate Change Minister) has a problem with being called Climate Barbie (a derogatory reference) but has no problem calling anyone who disagrees with her position on Climate Change a "Denier" (an obvious reference that is designed to paint a Climate Change Denier with the same brush as a Holocaust Denier). More recently she has stated that she doesn't have time for anyone that doesn't agree with her opinions. Last time I checked, it is the job of elected representatives in Canada to enact 'good government' for all Canadians whether they agree with you or not. And I have a simple challenge for Minister McKenna (also Prime Minister Trudeau, Premier Notley and Minister Phillips). **Please provide the Canadian public with any actual measured data that shows CO_2 is driving the climate and a detailed cost benefit analysis to justify your Climate Change policies.** Neither of those challenges can be met since there is no actual data showing that CO_2 is a significant climate driver and an official cost benefit analysis hasn't been laid out to the voters for either the Federal or Alberta Provincial Plans. A crucial part of 'good government' is that of proper cost benefit analysis of major policies like the Climate Plans. To fail to do so leaves us in the same, sad situation as Ireland, which went into wind power, intending to cut GHG emissions and costs because 'wind is free'. Only they found themselves with almost no reduction in CO_2, significant cost increases and at risk of 600 million euros in fines for missing EU GHG reduction targets. No cost benefit analysis had been done, as required by law until it was far too late to turn back. (http://blog.friendsofscience.org/2017/12/09/the-costs-of-wind-energy-in-ireland-new-report/) You might also want to quickly review the cost and benefits of the climate plans laid out by Ontario (escalating power costs), Germany (moving back to coal), Australia (scrapped their carbon tax), Europe in general (excessively high power costs), etc.
6. To be clear, I am actually in favour of renewable energy. There are situations where it makes sense. But the full steam ahead approach is not the way to go. Solar works well in equatorial countries with lots of sun. Solar is not economic for large scale power generation in our northern climates (without huge government subsidies). And as discussed before, both wind and solar are

intermittent, expensive and highly unpredictable. Huge amounts of taxpayer money are being wasted on commercial projects that are uneconomic and are not (or at best minimally) actually reducing greenhouse gas emissions when the full life cycle of equipment manufacturing, transportation, etc. are factored in. More research into increasing the efficiencies of renewable energy and clean burning technologies would be money better spent. Our Canadian oil industry (through existing royalties and taxes) would actually be a great source for those research funds. And it is ludicrous to supply government subsidies for electric cars. Anyone who can afford an electric car can afford to buy them without the subsidy. Electric cars also have significant issues in colder climates. Cold weather seriously reduces the distance an EV can travel on a single charge (based on reduced efficiencies and the energy required to heat the car). And in the end, we will only have a marginal effect on the earth's temperature. The 2015 Paris Accord in total will only reduce temperatures in 2100 by 0.048 °C assuming that all nations adhere to their 2030 pledges and that the IPCC "science" is correct. So when we actually get to 2100, we still won't be able to confirm that the IPCC science was correct because the temperature difference is well below the potential error estimates built into the computer models. Canada's contribution to that temperature reduction is a whopping 0.00072 – 0.00096 °C based on our 1.5 - 2.0% contribution to manmade greenhouse gas emissions. Even if the emission reductions are continued past 2030 through the rest of the century, total temperature reductions would still only be 0.17 °C (again less than the margin of error associated with the computer models (that I will once again remind you are unproven)). The cost of that temperature reduction is estimated to be a trillion dollars per year (assuming the UN and the world governments spend those tax dollars efficiently). Adapting to the climate changes and dealing with real world problems would be a much more effective use of those dollars. Destroying one of Canada's major industries is not worth that expense. We would be much better off by following the US example and pull out of the Paris Accord (at least until the rest of the world decides to participate meaningfully). The US backed out due to the harm the Paris Accord will inflict on their economy. If the US is not participating in the Paris Accord, Canada's participation is ludicrous. And chances are we won't need to worry about those temperature increases. When the GSM effects really kick in, "Global Warming" will be something we will wish was happening. We also don't have to wait until the end of the century to prove or disprove that scenario. We'll have that proof within the next few years (versus decades, maybe centuries to prove up the computer models). Temporarily delaying these stupid carbon taxes for a few years would be the prudent approach (which I don't expect from our governments). If temperatures begin to rise in conjunction with the model projections, then I'll be the first to admit that there's a problem with my view. If the temperatures start decreasing, then maybe we can finally scrap this whole "Global Warming" Fraud. The source of the Paris Accord numbers can be accessed at the link below.

http://www.lomborg.com/press-release-research-reveals-negligible-impact-of-paris-climate-promises

7. And if you want to talk about hypocrisy, you don't have to look any further than the main figures (Al Gore, David Suzuki, Bill Nye, Leonardo DiCaprio, Neil Young, etc., etc.) pushing "Global Warming" using the "Climate Change" nomenclature. They are all fond of telling us to save the planet by doing as they say and not as they do (despite their lack of climate science credentials). Their extravagant lifestyles and "carbon footprints" are an order of magnitude higher than the

typical North American citizen. So, they have no problem paying for the rapidly increasing costs associated with the largely unnecessary greenhouse gas green policies. I actually have been heartened by the public outrage being directed towards the University of Alberta over the honorary degree about to be bestowed on David Suzuki. The general public is obviously becoming more and more aware of the damage the environmental movement's singular focus on CO_2 has been doing to our economy without any actual meaningful reduction in greenhouse gas emissions (assuming those reductions are even required). I actually don't have any issues with David Suzuki preaching on any subject he desires. I do have a problem with him pretending to be a knowledgeable voice on climate change (at least until someone challenges him) and I have a problem with government policy based on the questionable science and unfounded propaganda disseminated by his and other internationally funded environmental groups. I also have a problem with any institution that is willing to bring in a speaker like Suzuki (to discuss climate change) without bringing in a qualified speaker to address the potential inaccuracies and omissions that he tends to leave the audience with.

13. Final Recap

So, if you've read to this point, I am appreciative whether you agree with my opinions or not. Reading through the entire document shows that you were serious. If you skipped to the end your opinion just doesn't count. Ultimately you have the right to ignore my opinions, but you can't ignore the data. And the data just doesn't back up the premise of catastrophic anthropogenic global warming.

Solar activity is dropping and will take global temperatures down over the next decade. The magnitude of the drop is still an open question but it will happen. Ignoring that data is putting our children and grandchildren at great risk. Carbon taxes, cap and trade, etc. will have no significant effect (if any) on the global temperatures. However, the rampant unnecessary spending on uneconomic, taxpayer funded, renewable projects will only exaggerate the problems because fewer funds will be available to actually adapt to climate change (warming or cooling).

Generally, the only proof ever offered by "Global Warming" proponents is based on model studies. Those same model studies that are based on computer simulations that have not been able to predict the climate we've experienced over the last 30 years. The same models that can not accurately model the significant climate flucuations the globe has experienced over the Holocene warm period (i.e.: the last 12,000 years). Simply, the models don't work because they focus primarily on CO_2 and hypothesized feedbacks that have never been proven with real world data. They (based on their IPCC mandate) dismiss a wide variety of natural cycles (solar activity (directly and indirectly), ocean cycles, cloud coverage, etc.) that have much more significant effects on the climate than CO_2.

Just look back on the data that was presented. CO_2 had virtually no direct role in the earth's temperature flucuations and now it's supposed to be responsible for all the warming going forward. Not likely. The natural flucuations will continue and they will continue to be dominant.

And don't be fooled by media reports and localized current weather events. Climate is a global discussion that needs to be looked at over decades. As laid out, weather related events (hurricanes, tornados, fires, droughts, etc.) are not becoming more extreme despite media reports to the contrary. With the exception of extreme precipitation. During solar minimums (based on historical data) cloud cover overall increases, global temperatures fall and precipitation levels rise (area specific) as a result. A small change in CO_2 (i.e.: going from 3 molecules per 10,000, to 4 molecules per 10,000) is not responsible for more rain.

Social Media Contact Options

Email - ccmusic150@gmail.com
LinkedIn
Facebook
Instagram

Temperature/CO_2/Solar Data Sites

Information Data Sheet

CO_2 Data

Mauna Loa CO_2 Levels (1959 – Present) – https://www.esrl.noaa.gov/gmd/ccgg/trends/data.html

Temperature

GISS (1880 – Present) – https://data.giss.nasa.gov/gistemp/graphs - NASA

HadCRUT4 (1850 – Present) – https://crudata.uea.ac.uk/cru/data/temperature/

Ice Core Data (800,000 – Present) – https://www.ncdc.noaa.gov/paleo-search/ - NOAA

Greenland GISP2 Temperature Anomalies – Alley, R.B., 2004

Vostok Temperature Anomalies - Petit, J.R., Jousel, J., et al, 1999

Vostok CO2 - Barnola, J.M. et al, 2003

Individual Weather Station Data – https://www.ncdc.noaa.gov/data-access - NOAA

RSS Satellite (1978 – Present) – www.remss.com/measurements/

UAH Satellite (1978 – Present) – www.drroyspencer.com

Solar Activity

SORCE Total Irradiance Monitor (TIM) - http://lasp.colorado.edu/home/sorce/data/

Coddington et al, BAMS, 2015

http://lasp.colorado.edu/home/sorce/data/tsi-data/#historical_TSI

http://lasp.colorado.edu/home/sorce/data/tsi-data/#historical_TSI

Sunspot Index and Long Term Solar Observations (SILS) - http://www.sidc.be/silso/datafiles#total

Long term solar activity (TSI) - Dr. Sebastian Lüning and Fritz Vahrenholt

Information Sites

Anthony Watts – https://wattsupwiththat.com/

Dr. Judith Curry – Climate Etc. - https://judithcurry.com

Dr. Roy Spencer - www.drroyspencer.com

Forest Fires – https://realclimatescience.com/wp-content/uploads/2018/07/2018-07-26045926_shadow.png

https://realclimatescience.com/wp-content/uploads/2017/01/figure16-1-2-1.jpg

https://realclimatescience.com/wp-content/uploads/2018/07/115228-1.png

Global Cryosphere Watch – globalcryospherewatch.org/state_of_cryo/snow/

Friends of Science – https://www.friendsofscience.org/

Ice Extent/Volumes - https://nsidc.org/arcticseaicenews/charctic-interactive-sea-ice-graph/

http://ocean.dmi.dk/arctic/icethickness/thk.uk.php, http://nsidc.org/arcticseaicenews/

www.dmi.dk/en/groenland/maalinger/greenland-ice-sheet-surface-mass-budget/

http://ocean.dmi.dk/arctic/meant80n.uk.php, http://iceweb1.cis.ec.gc.ca/30Atlas/page1.xhtml?lang=en

http://ice-glaces.ec.gc.ca/cgi-bin/getprod.pl?prodid=WIS54DPTCT&wrap=1&lang=en

Sea Level Data – https://climate.nasa.gov/vital-signs/sea-level/ & https://tidesandcurrents.noaa.gov/sltrends/

Tony Heller - https://stevengoddard.wordpress.com/

Weather Underground - Hurricane and Tropical Cyclones - https://www.wunderground.com/hurricane/

Youtube Channels

Adapt 2030 Global Cooling and Grand Solar Minimum

Tony Heller

Referenced Papers/Blogs

Modulation of Ice Ages via Precession and Dust-Albedo Feedbacks

https://www.sciencedirect.com/science/article/pii/S1674987116300305

Union of Concerned Scientists, P. Frumhoff (Director of Science & Policy)

https://blog.ucsusa.org/peter-frumhoff/global-warming-fact-co2-emissions-since-1988-764

AN OPEN LETTER TO THE WORLD ON CLIMATE CHANGE

RONALD DAVISON (P.ENG.) AUGUST 2018 - Addendum

In my original document, I included a chart (Figure 1) on the first page that referenced the complexity of the "Climate Change" discussion. Due to the complexity, I did not want to get into the chart detail at that time. In this discussion, I will elaborate a bit on the data included in that chart.

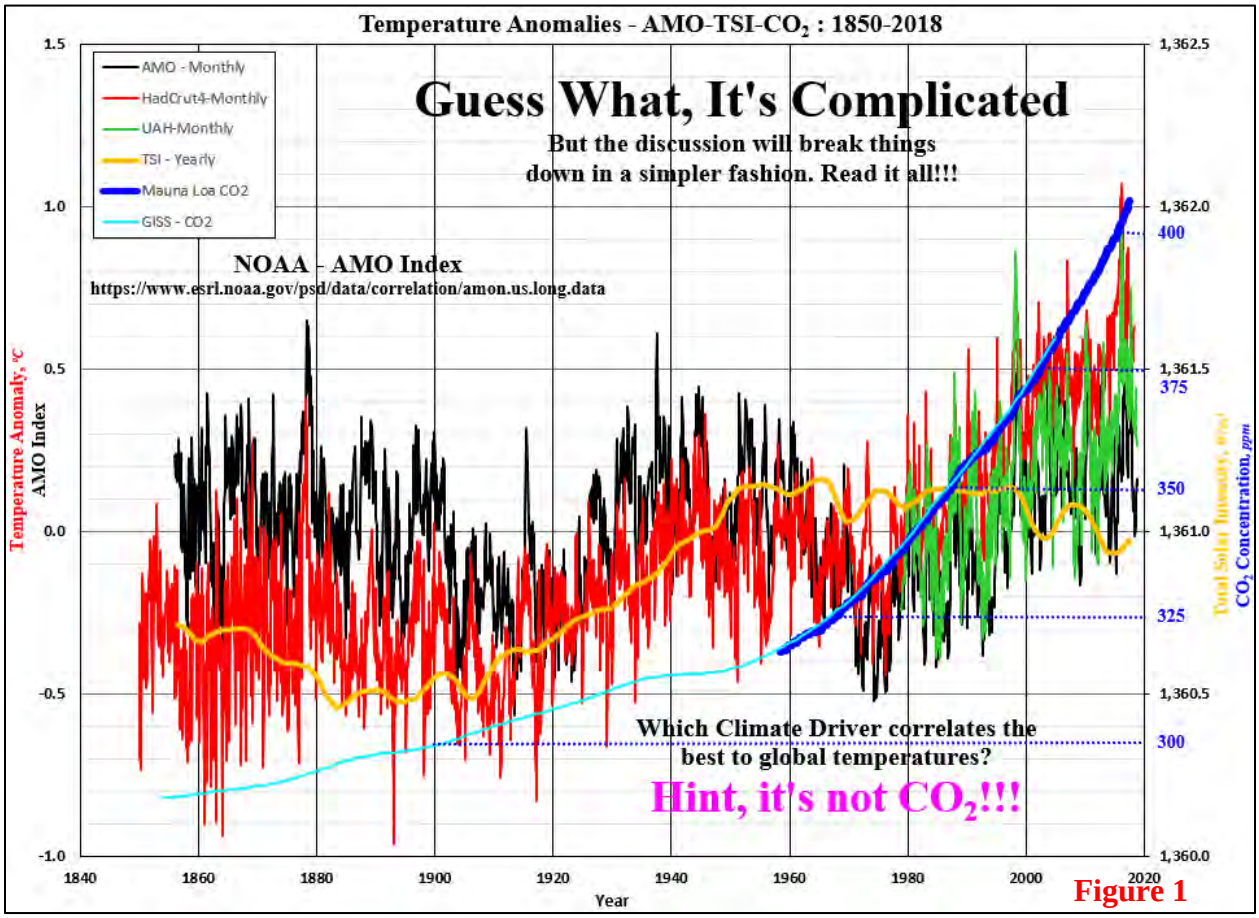


Figure 1

Firstly, I will note some changes I made in the plot that has allowed me to do some additional analysis. The AMO Index (indirect solar activity) I originally plotted was just a cut and paste option. I now have the AMO Index data sets from NOAA (so they look slightly different). I also adjusted the UAH data up by 0.12 ºC to factor in the difference in the temperature baselines (1961-1990 for HadCrut4 and 1981-2010 for UAH).

If you look at each of the data sets individually, NOAA's AMO Index (black curve) is by far the most closely correlated single parameter. The AMO cycles are readily visible in the HadCrut4 temperature anomaly data set (red curve). The AMO Index is hovering above the HadCrut4 data over the early data, very closely lays over the middle data and is below the later data (but the up and down cycles are there). Over this entire time period there appears to be something else influencing the temperature (over and above the AMO Index). The "Global Warming" alarmists will say that CO_2 is the reason for the general temperature increase over this time period. The problem with that hypothesis, is the minimal net temperature increases since 2000 (apart from strong el Nino events) and the temperature rises over the first half of the data period which couldn't have been associated with CO_2 since over 75% of atmospheric CO_2 increase occurred after 1950. Obviously, any significant temperature increases associated with CO_2 would

have to have occurred after 1950. Yet as mentioned earlier temperatures have generally stopped rising since the beginning of the century despite continually rising CO_2 levels. The global temperatures are obviously responding to other parameters than just CO_2.

The remaining climate driver would be direct solar activity (Total Solar Irradiance (TSI)). The TSI correlates well with the first half of the HadCrut4 data set. The TSI over the last half of the data is relatively flat so any fluctuations in the HadCrut4 data post 1950 are not likely related to the TSI.

The discussion so far has focussed solely on the HadCrut4 data set. With that data set alone, you can make an argument that CO_2 has been a significant contributing factor over the 1975 – 2000 time period. But even over that period, the CO_2 is not acting alone. The AMO is also increasing over this time period, along with the Pacific Decadal Oscillation (PDO, not shown). The PDO was discussed in my original paper but does not have a global response as strong as the AMO. Another factor affecting the surface warming magnitude and upward trend is the Urban Heat Island Effect (UHIE). A study by McKitrick and Michaels (2007) showed that half of the warming over land was due to urban development. A significant portion of the weather stations used for estimating surface temperatures are in or near urban settings (in the USA, 69% are within 10 meters of heat sources and only 11% are located in suitable locations). If you look at all the data, CO_2 is probably responsible for 40-50% of the temperature increase from 1850 to the present (my opinion). But that is still open for debate and could be much lower.

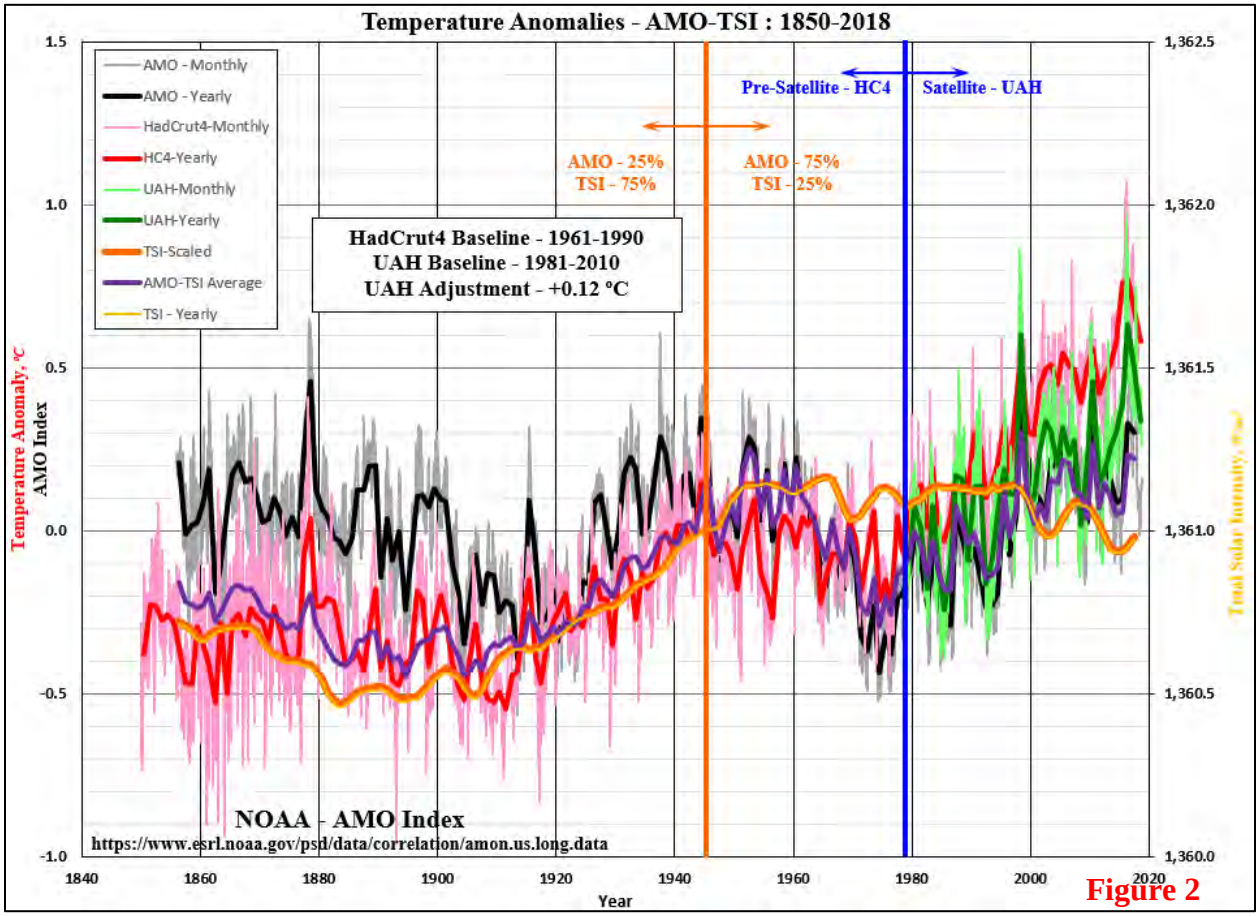


Figure 2

To take some of the intense fluctuation out of the data, the data was condensed into yearly averages. For next portion of the discussion, I will use a data trick that the Climate Alarmists use regularly. I am going to ignore the CO_2 data completely. Climate Alarmists just choose to ignore a large portion of the direct and indirect drivers associated with solar activity. I actually do believe that there is a contribution from CO_2 but

as you'll see, the temperature fluctuations can be closely modeled without factoring in CO_2. The monthly and yearly data are plotted on the previous page (Figure 2). The purple curve was developed to combine the TSI anomaly and the AMO Index. The math is simple. Prior to 1945, the TSI was given a weighting of 75% and the AMO Index was 25%, post 1945 the weighting was adjusted to 25/75 (TSI/AMO). The data was divided into two periods. The early data is characterized by a changing TSI, the later data has a much more stable TSI, and would therefore be affected more by the AMO.

If you focus in on the yearly data you get Figure 3 below.

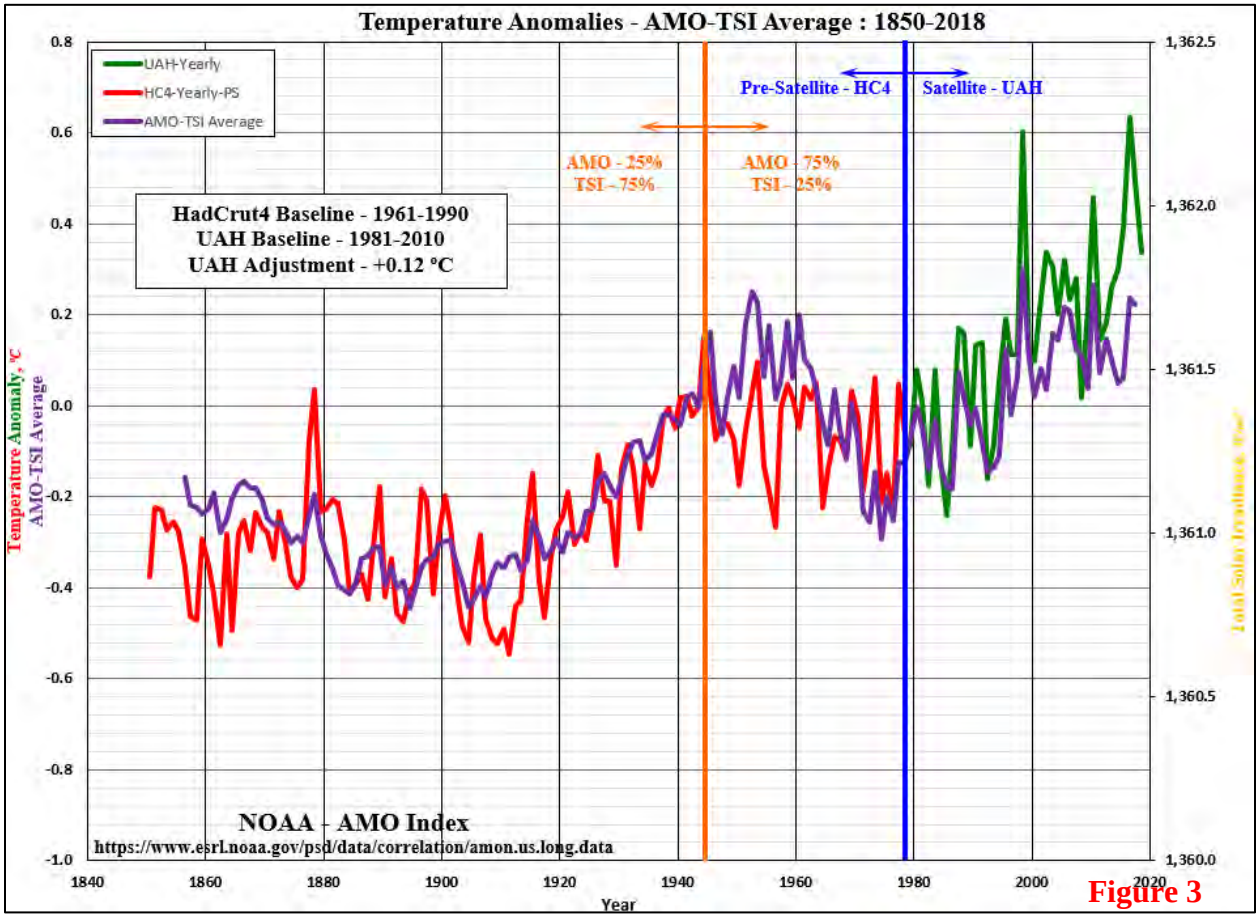


Figure 3

The weighted TSI/AMO curve correlates very well to the consolidated temperature data sets (I'm bringing in the satellite data (UAH) into the discussion at this point). The rationale for ignoring the HadCrut4 data during the satellite period is simple. Satellite temperature estimates are more accurate and sample a much larger portion of the planet's surface and atmosphere. The satellite data has also been correlated with weather balloon temperature datasets. The difference between the HadCrut4 and UAH global temperature estimates is very close to the surface data manipulations associated with the homogenization process. The homogenization process (as discussed in my original paper) does not reflect the actual temperature measurements very well. Including the smaller contributions from the PDO (cyclical), UHIE (steadily increasing) and CO_2 (increasing but declining in strength exponentially) would tighten up the correlation over the satellite period very nicely.

Is this a rigorous proof that CO_2 has no effect on the climate? No. But given that I can model the temperature better than the IPCC climate models with a few straightforward assumptions that don't include CO_2 should be eye opening. The IPCC computer models have failed miserably in predicting the global temperatures for

the first 18 years of this century. And unless they begin recognizing the importance of solar fluctuations those models will continue to deviate further from reality.

Ignoring the coming, widely forecasted Grand Solar Minimum is exposing the entire world's population to extremely severe food shortages that could at least be partially alleviated if the problem was acknowledged. The shorter growing seasons associated with solar minimums is a severe issue for the entire northern hemisphere and we're wasting billions (projected to be trillions) on trying to limit CO_2 emissions (a key component of life on this planet that is close to plant starvation levels). As I discussed in my original paper, we will be grateful for whatever warmth that CO_2 has provided for us, but it won't be enough to offset all of the cold that comes along with a Grand Solar Minimum. The record snowfalls and cold temperature records globally over the last couple of years are just the beginning. We've only just started our descent into the Grand Solar Minimum. If a major volcanic eruption also occurs (and they do tend to occur during GSMs), the result will be absolutely devastating for the whole planet (rich and poor). Large volcanic eruptions/earthquakes are also associated with GSMs due to the planetary alignments (gravitational pulls) and cosmic ray fluctuations. I hope that doesn't happen, but we have no control over that process.

You can ignore my interpretations/opinions, but you won't be able to ignore Mother Nature. Within a few years the effects of the GSM will be very evident. And you won't have to wait another 82 years to confirm that the IPCC forecasts were wrong (assuming you somehow still believe that the model failures to date mean nothing).

If you have not read my original document, I would strongly suggest that you do. The discussion focuses on a large cross-section of the available "Climate Change" data. Nowhere in the available data does CO2 show up as primary driver of "Climate Change". In fact, the only forum where CO2 drives the Climate is within the fantasy world of the IPCC's computer models. Computer models can only give you the answer that is programmed in by the operator. So as usual, I have a simple challenge for everyone (climate scientist or not). My mind can be changed with some real data, not computer models or unsubstantiated theory. But without real data to the contrary, I will continue to promote my position that human CO2 emissions will not be disastrous for the planet and will in fact be very beneficial.

The original discussion can be accessed by either of the links below. The second link accesses the document through the Friends of Science website. Alternatively, just google "ronald davison climate".

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