A Look at Solar Influences

Fourier Spectrum Analysis, Gravitational and Electromagnetic Entanglement, Complex Cycles

Mainstream 'climate science' has traditionally marginalized solar influences and focused on the simplistic, unscientific notion that anthropogenic forcings (dominated by humanity's CO_2 emissions) are the primary climate driver. That concept is childish, and you must look no further than the IPCC's own computer modeling "best estimates" output to confirm that concept.

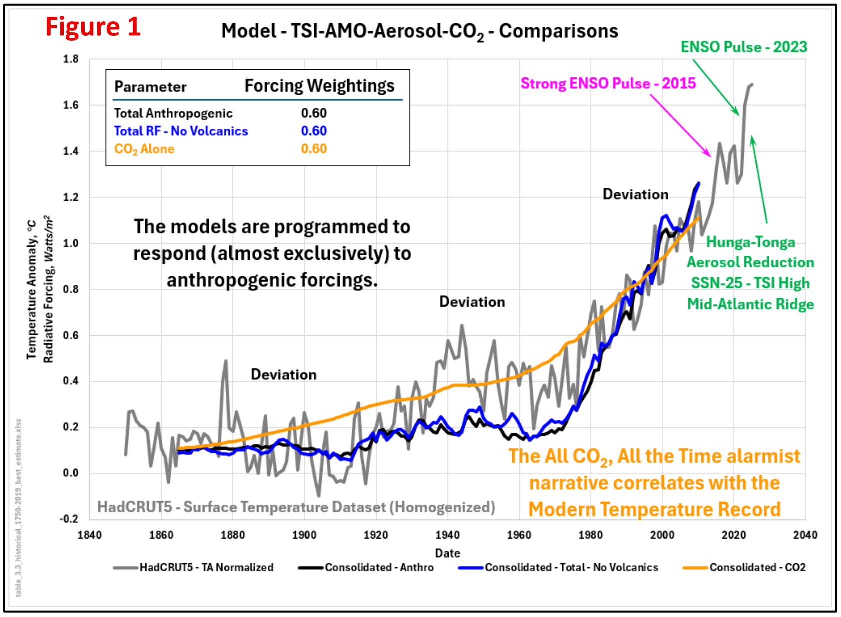
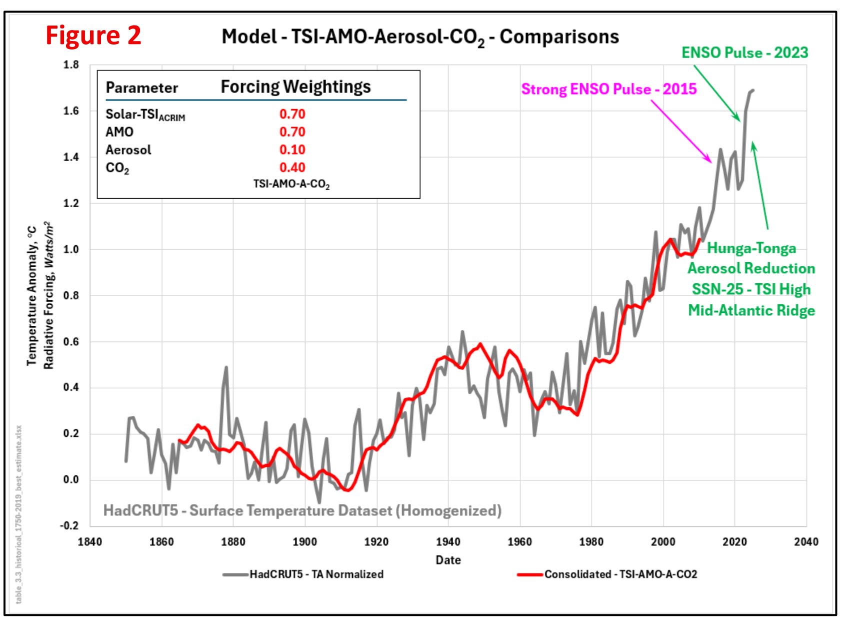


Figure 1 (to the left) contains 3 history matches to the HadCRUT5 "over-homogenized" surface temperature data set (1850 to 2025). The Total Radiative Forcing (RF, no volcanic forcing (no VF)) is shown in blue. There is a general correlation between the HadCRUT5 temperatures and the IPCC's Total RF "best estimates", but there are certainly some significant deviations. The black curve is the IPCC's Total Anthropogenic RF. Obviously, the models are programmed to respond almost exclusively to anthropogenic RF. The gold curve is CO_2 on its own, a slightly better history match than the IPCC's Total RF. No wonder the climate alarmist community has latched on to the All CO_2, All the Time narrative. One might ask, why is the IPCC's Total RF (no VF) not really a great history match? The answer is simple. The IPCC has chosen to ignore ocean cycles in the belief that over long periods the ocean cycles cancel out. That is not true, the oceans cyclically warm and cool on a variety of time frames.



The ±60-year Atlantic Multi-decadal Oscillation (AMO) cycle is readily visible in the HadCRUT5 temperature data. There has also been a general (but minor) ocean temperature rise out of the depths of the Little Ice Age (LIA, the 1645 to 1715 Maunder Minimum). The other examples in the data are the strong El Niño Southern Oscillation (ENSO) pulses visible in 2015 and 2023. The 2023 pulse had some help from a few other forcings, as shown. The far more important mitigating factor is the IPCC's choice of solar forcing. Out of the 40+ Total Solar Irradiance (TSI) reconstructions available, the IPCC has chosen to use just one, the Matthes et al 2017 version. That could be considered cherry picking given that many of the other TSI options available provide a close history match on their own (with no contribution from CO_2). Most (if not all) of the 40+ TSI reconstructions can be used to closely history match the Modern Temperature Record (MTR, 1850 to the present) if the TSI reconstruction is used as a proxy. A much more detailed discussion is available in my recent [CSS-71 – IPCC Model/Theory Shortcomings]() post.

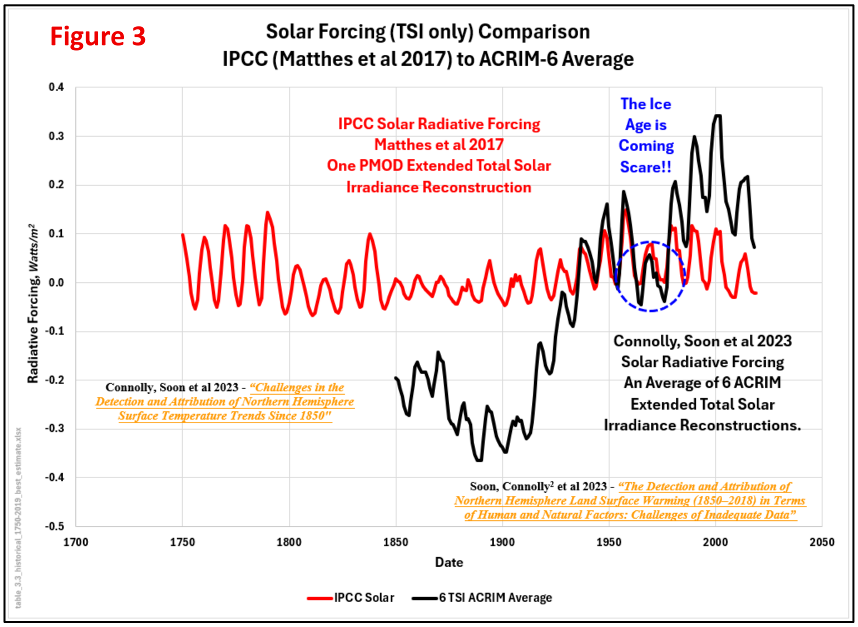
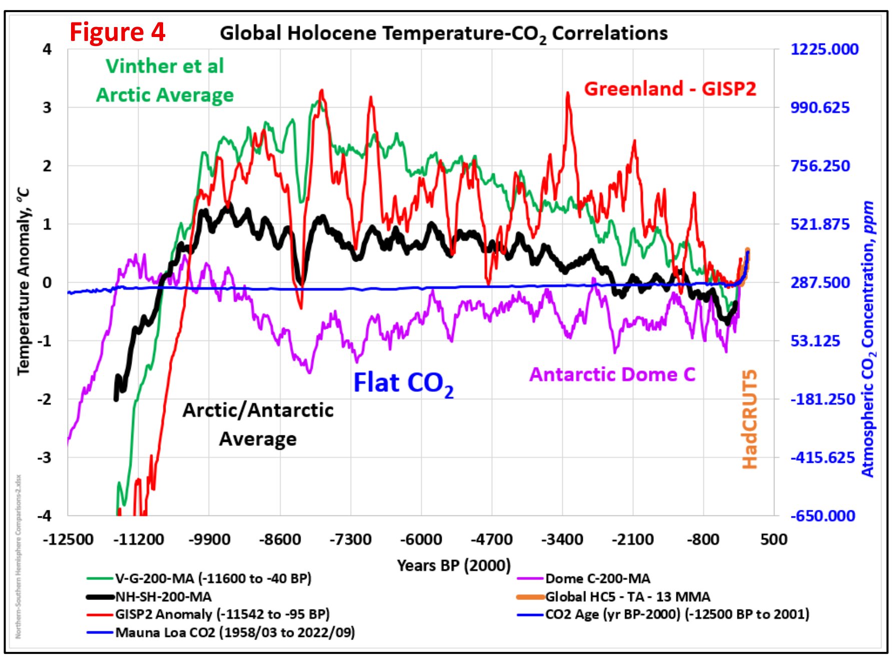


Figure 2 (on the previous page) shows a far superior history match than the IPCC's Total RF "best estimate". The difference between the two history matches simply adds in the AMO and replaces the IPCC's Matthes et al 2017 Solar RF with an alternative Solar RF (an average of 6 Active Cavity Radiometer Irradiance Monitor Satellite (ACRIM) extended TSI reconstructions). Both TSI options are shown in Figure 3 above. Total Solar Radiative forcings are obviously not settled science and any discussion should not be limited to just one "best estimate". There are both natural and anthropogenic RF acting on our climate. A natural forcing weighted model (i.e.: solar, directly and indirectly) produces a better history match than the IPCC's anthropogenically focused version. That model is useless for history matching any period outside the MTR. Figure 4 (to the left) shows representative temperatures for the Arctic (Vinther et al), Greenland (Alley – GISP2) and Antarctica (EPICA Dome C) plotted against CO_2 concentrations. CO_2 is scaled on the premise that the alarmist community is correct and virtually all the warming (1.07 °C according to the IPCC's August 2021 AR6 report) is due to the 140-ppm increase in CO_2 concentration since the pre-industrial era (pre-1850). Somehow temperatures managed to fluctuate

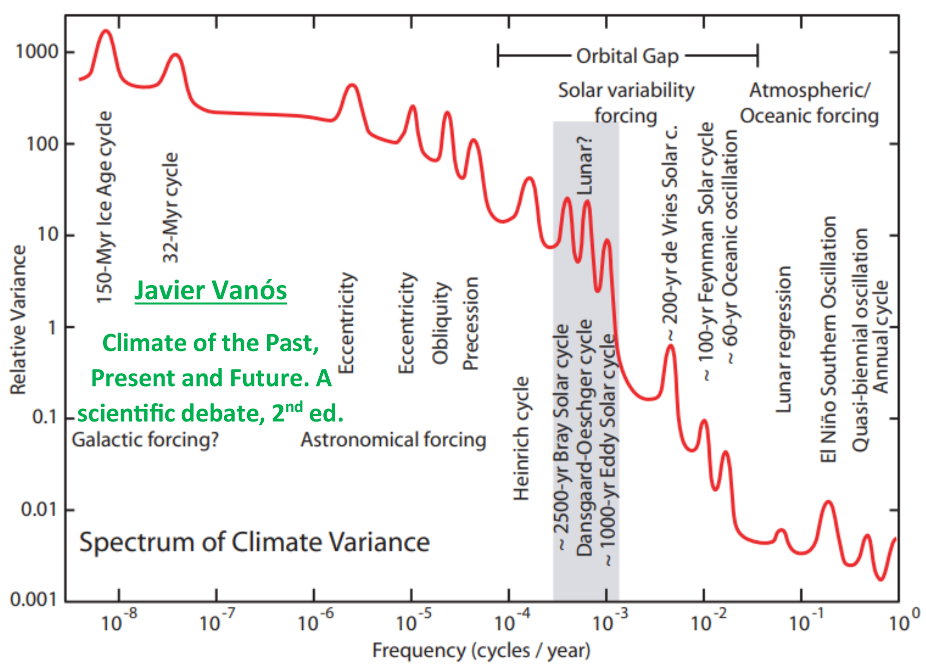


significantly despite a virtually flat CO_2 concentration throughout the entire pre-MTR Holocene. The natural forcings that were obviously active pre-MTR, were still active during the MTR and will still be active in the future (just not in the IPCC climate models). CO_2 can affect temperatures, but the natural forcings are far stronger and dominate the much weaker CO_2 forcing. There are simply NO empirical CO_2/Temperature datasets that show CO_2 driving the climate on any statistically significant historical time scale. Correlations like the MTR (statistically insignificant given that 175 years is less than 6 data points in a climate discussion) and the ice core data Al Gore infamously used in his discredited movie (which shows temperatures were obviously driving CO_2) do not show CO_2 causation. The Milankovitch Cycles (solar related) drive the temperatures which then drive CO_2 concentrations.

So, if CO_2 is not the primary driver (it is NOT), how do the natural forcings drive the climate? Most are due to solar influences. The chart below was pulled from Javier Vinós' 2022 book. Figure 5, below reflects the results of many Fourier analyses. A Fourier analysis recognizes cycles in random data sets. There are a variety of forcings at play here that are ultimately solar related (i.e.: the position of the solar system within the galaxy, the orbital configuration of the solar system, the electromagnetic and gravitational interactions of the sun, moon and planets, the sun's energy influence on oceanic/atmospheric/tectonic processes, etc.). There are other recognized cycles that that are summarized on the following page.

Figure 5

Fig. 4.19 Climate cycles and periodicities dominate climate change at all temporal scales
Spectrum of climate variance showing the better studied climatic cycles and their proposed forcings, although some are not widely accepted. Cycles, quasicycles, and periodic oscillations are found over the entire temporal range, indicating they are a salient property of climatic variability. As a general rule, the lower the frequency, the more intense the climatic variance produced. The 150-Myr Ice Age cycle has produced three ice ages and a cold age in the last 450 million years. It is proposed to be caused by the crossing of the galactic arms by the Solar system. The 32-Myr cycle has produced two cycles during the Cenozoic era, the first ending in the glaciation of Antarctica and the second in the current Quaternary Ice Age. It is proposed to be caused by the vertical displacement of the Solar system with respect to the galactic plane. The orbital or Milankovitch cycles are the best studied, and between them and the Lunar nodal regression cycle of 18.6 years lies the orbital gap, where no astronomical cycle is known to affect climate. Our knowledge of this range is very insufficient, despite millennial climate cycles (grey band) determining most of Holocene climatic variability. Short term climate variability is dominated by the El Niño/Southern Oscillation. After Maslin et al. (2001).



https://www.researchgate.net/publication/363669186_Climate_of_the_Past_Present_and_Future_A_scientific_debate_2nd_ed

The discussion will take us from the shorter cycle times to the longer cycles. The most obvious cycles affecting global temperatures start at the daily level. Days are generally warmer than nights. Local weather patterns can disrupt that cycle, but in general the previous statement holds true. The other temperature cycle we routinely experience is the annual cycle. Temperatures are obviously colder during the winter and warmer in the summer, with more moderate temperatures during the fall and winter. Daily and yearly changes are not 'climate change' regardless of how extreme the weather might be. A larger list of solar

Cycles from the previous slide
Other Cycles

Cycle Name	Duration	Comments
Daily Cycle	1 day/24 hours	Day and Night (Earth's Rotation)
Seasonal Cycle	1 year/365 days	Spring, Summer, Fall, Winter (Earth's Revolution Around the Sun)
Annual Cycle	1 year	Atmospheric/Ocean Forcing
Quasi-biennial Oscillation	±2 years	Atmospheric/Ocean Forcing
El Niño Southern Oscillation	3 -7 years	Ocean Cycle, Atmospheric/Ocean Forcing
Schwabe (Sunspot) Cycle	10.7 years	Solar/Orbital Dynamics
Lunar Regression	18.6 years	Lunar/Orbital
Hale Cycle	22 years	2 Schwabe Cycles (The sun's Magnetic Polarity flips every 11 years)
Oceanic Oscillations	60 years	Atlantic Multi-decadal (AMO), Pacific Decadal (PDO), etc.
Gleissberg Cycle	22 years	2 Schwabe Cycles (The sun's Magnetic Polarity flips every 11 years)
Feynman Solar Cycle	100 years	Orbital Dynamics
Suess-de Vries Solar Cycle	210 years	Orbital Dynamics
Lunar Cycle (David Dilley)	220 years	Lunar/Solar Gravitational Forcings (also 9-, 72- & 1200-year cycles)
Grand Solar Minimum Cycle	363 years	Orbital Dynamics
Bond Solar Cycle	1,000 years	Orbital Dynamics
Eddy Solar Cycle	1,000 years	Orbital Dynamics
Dansgaard-Oeschger Events	1,200 years	Orbital Dynamics
Zharkova (?) Solar Cycle	2,000 years	Distance of the Earth from the Sun
Hallstatt Solar Cycle	2,300 years	Astronomical Forcing
Bray Solar Cycle	2,500 years	Astronomical Forcing
Heinrich Cycle	6,000 years	Astronomical Forcing
Sanchez-Sesma (?)	9,700 years	Planetary Gravitational Forcing (PGF)
Precession	23,000 years	Astronomical Forcing, Milankovitch Cycle
Obliquity	41,000 years	Astronomical Forcing, Milankovitch Cycle
Eccentricity	100,000 years	Astronomical Forcing, Milankovitch Cycle
Eccentricity	±405,000 years	Astronomical Forcing
Earth Ice Age Inflection	32,000,000 years	Vertical Displacement of the Solar System & the Galactic Plane
Deep Ice Age Events	150,000,000 years	Solar System Position in the Milky Way Galactic Arms

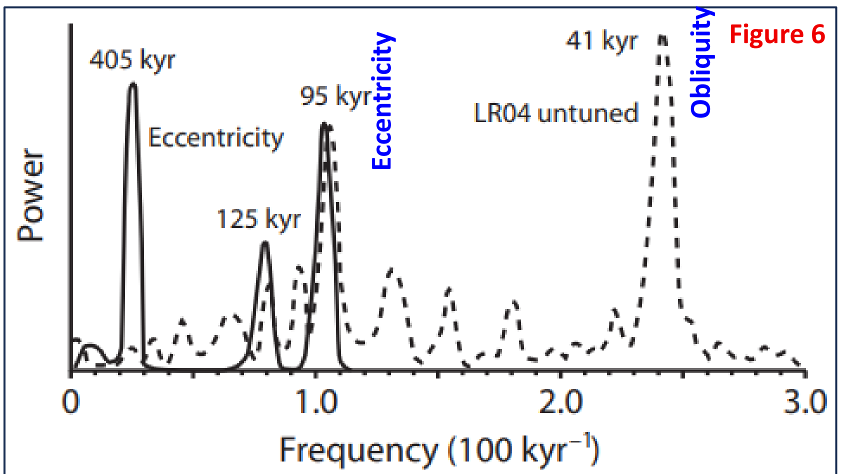
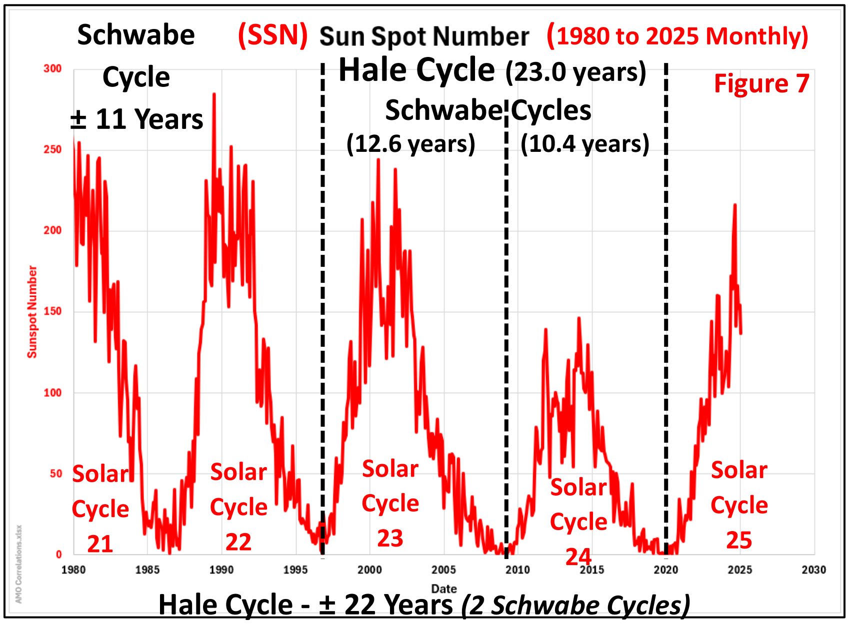
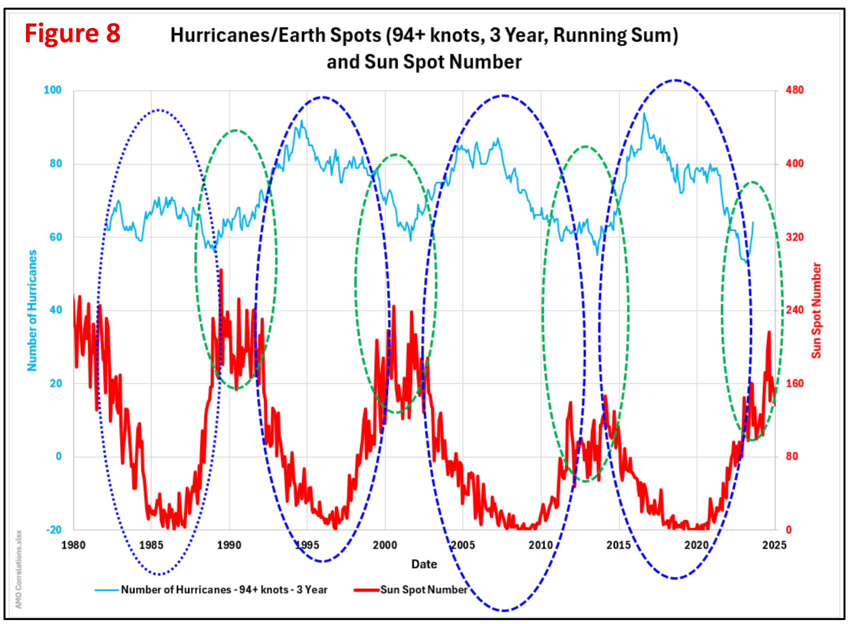
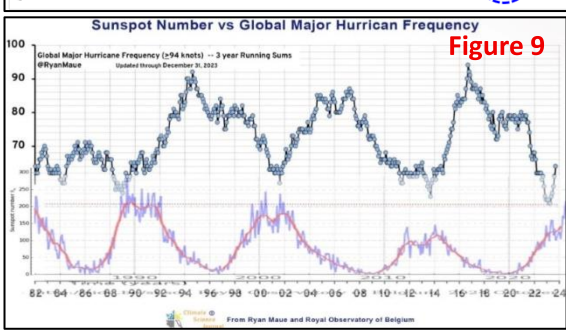


Fig. 2.3 Spectral differences between eccentricity and global ice-volume

cycles is included above. The discussion will cover most of these cycles and a bit more. Figure 6 shows an example Fourier analysis related to the astronomical forcing (i.e.: the Milankovitch cycles). The eccentricity has helped to produce a warm interglacial period every ±100,000-years over the last 1.2 million years. Every eccentricity high was associated with an interglacial







https://climatechangeandmusic.com/are-hurricanes-just-earthspots/

warm period, and every eccentricity low was associated with a deep ice age. The Obliquity was the most powerful driver of ice ages and warm periods. The ice age/interglacial cycle averaged ±40,000 years through the previous 1.4 million years of the Pleistocene Ice Age we are currently living through. More discussion later.

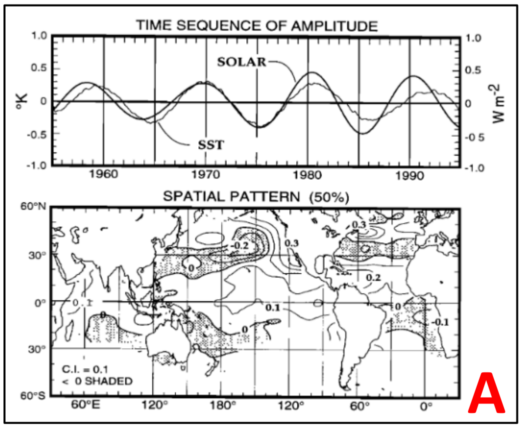
The solar cycle most people are familiar with is the Schwabe Cycle. A roughly 11-year cycle that corresponds to the sun's sunspot count (Figure 7 to the top left). The higher the sunspot number (SSN), the more active the sun. Sunspots are a qualitative indication of solar activity. Total Solar Irradiance (TSI) follows the same time track and is more quantitative. The data is presented on longer time scales further into the discussion.

This time scale was chosen to correspond to an example of solar influence on climate (shown in Figure 8 to the left). Based on this data, is hurricane activity being driven by solar activity or the slow steady rise of CO_2 concentrations? The original data/correlation was put forward by Ryan Maue (Figure 9, below to the left). The SSN highs and lows certainly counter correlate quite nicely with the Global Major Hurricane Frequency lows and highs.

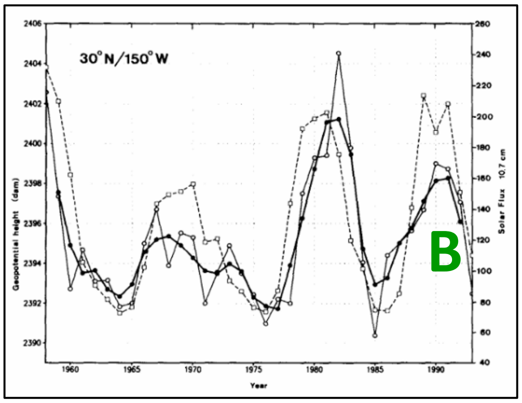
The solar-hurricane connection is likely related to the electromagnetic connection between the sun and the earth. There are some interesting, shared characteristics between sunspots and hurricanes. Could they be earthspots? That discussion can be found in my CSS-66 – Are Hurricanes Just Earthspots? post.

A few other shorter term solar/climate connections are laid out below. And for some additional research,

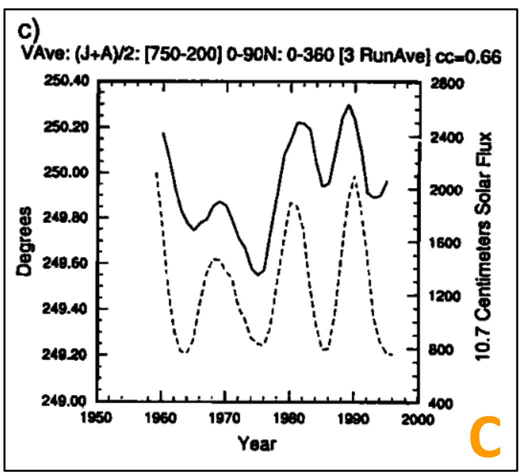
Figure 10



White et al (1997)



Laitzke et al (1994)



van Loon et al (1999)

Neff et al (2001)

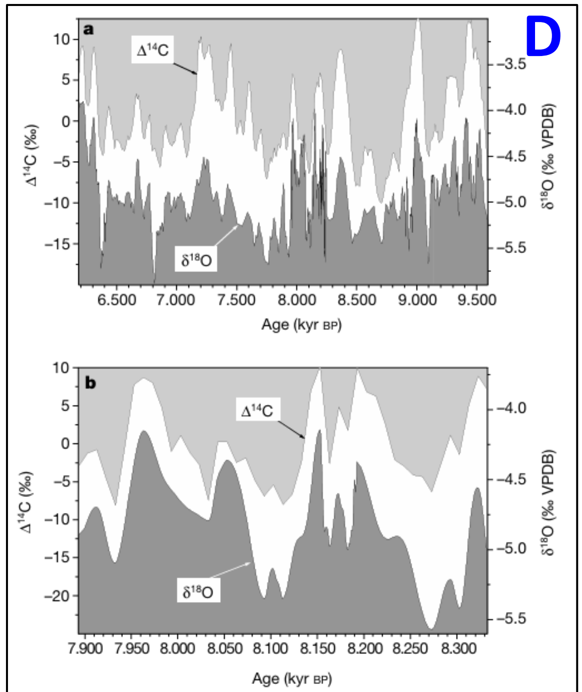


Figure 2 Profiles of H5 $\delta^{18}O$ values and atmospheric $\Delta^{14}C$. **a**, The entire H5 record (826 samples); **b**, the high-resolution interval. Both profiles in **a** were smoothed with 5-point adjacent averaging for better visual comparison. The $\delta^{18}O$ profile in **b** was filtered with 7-point fast Fourier transform smoothing (cut-off frequency, 0.1 yr^{-1}). The correlation coefficient of the unsmoothed data is $r = 0.60$, $P(>|r|) < 10^{-8}$ in **a**, and $r = 0.55$, $P(>|r|) = 1.1\times10^{-4}$ in **b**. Because of the apparent good relationship between the two profiles, we fine-tuned the peaks of the $\delta^{18}O$ age profile to the peaks of the $\Delta^{14}C$ record. The corrections of the Th–U timescale are shown in Fig. 3.

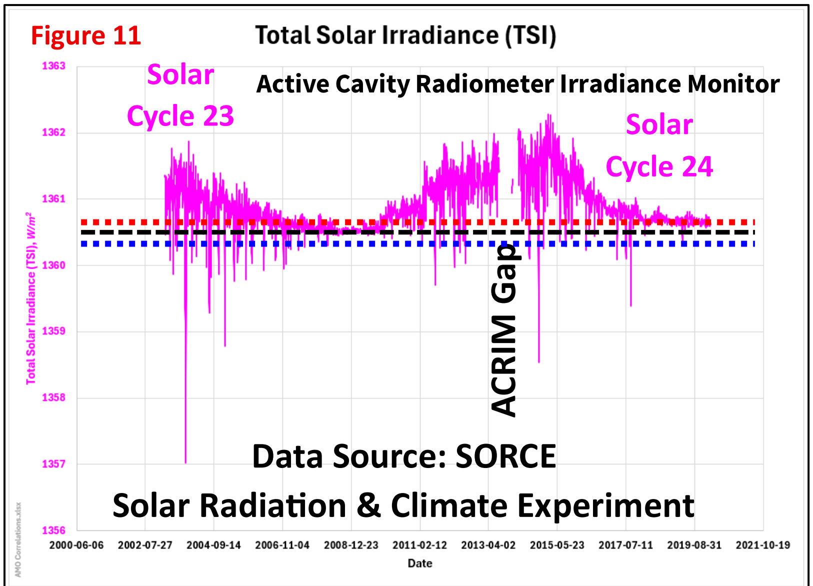
A – "Response of global upper ocean temperature to changing solar irradiance"
https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/96JC03549

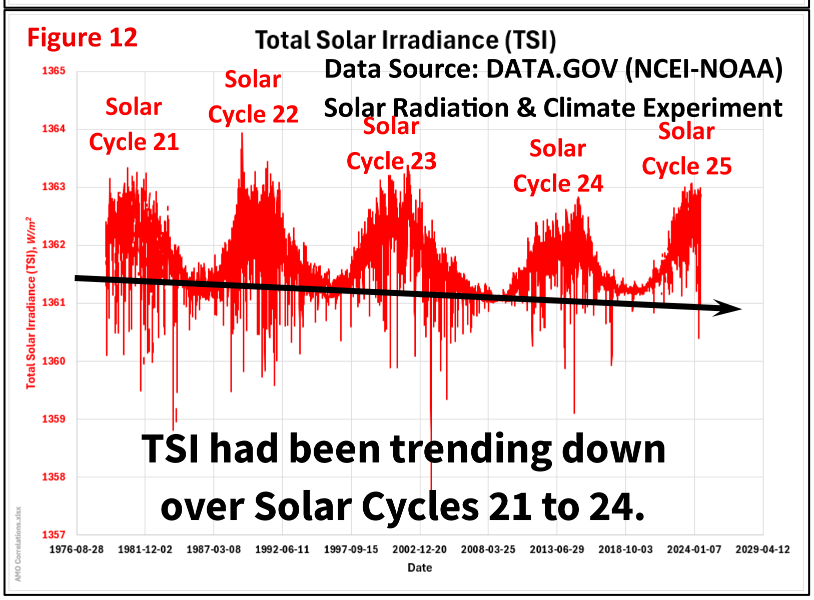
B – "Connection between the troposphere and stratosphere on a decadal scale"
https://www.researchgate.net/publication/312394397_Connection_between_the_troposphere_and_stratosphere_on_a_decadal_scale

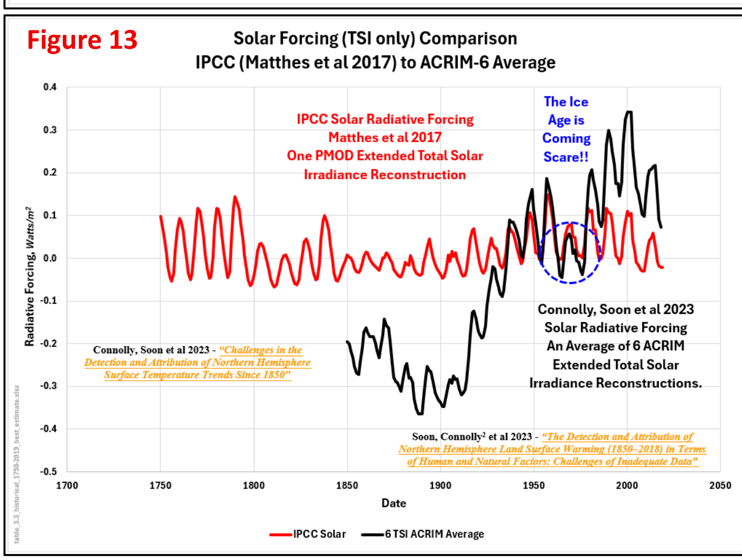
C – "A probable signal of the 11-year solar cycle in the troposphere of the northern hemisphere"
https://agupubs.onlinelibrary.wiley.com/doi/epdf/10.1029/1999GL900596

D – "Strong coherence between solar variability and the monsoon in Oman between 9 and 6 kyr ago"
https://www.researchgate.net/publication/11981110_Strong_coherence_between_solar_variability_and_the_monsoon_in_Oman_between_9_and_6_kyr_ago

here are 239 papers (from just 2016) highlighting connections between various parameters (solar, oceans, ozone, clouds, aerosols, CO_2 (limited sensitivity), etc.) and the climate. Solar Influence On Climate (133) - https://notrickszone.com/skeptic-papers-2016-1/





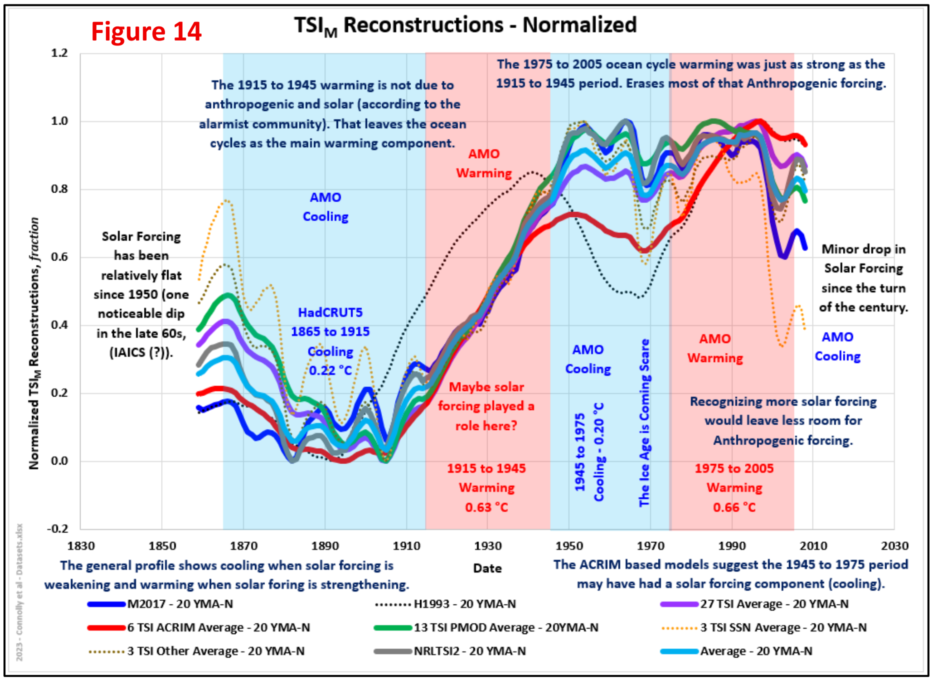


The lack of data during the ACRIM Gap (shown in Figure 11, to the left) has led to calibration question marks (i.e.: the science is not settled).

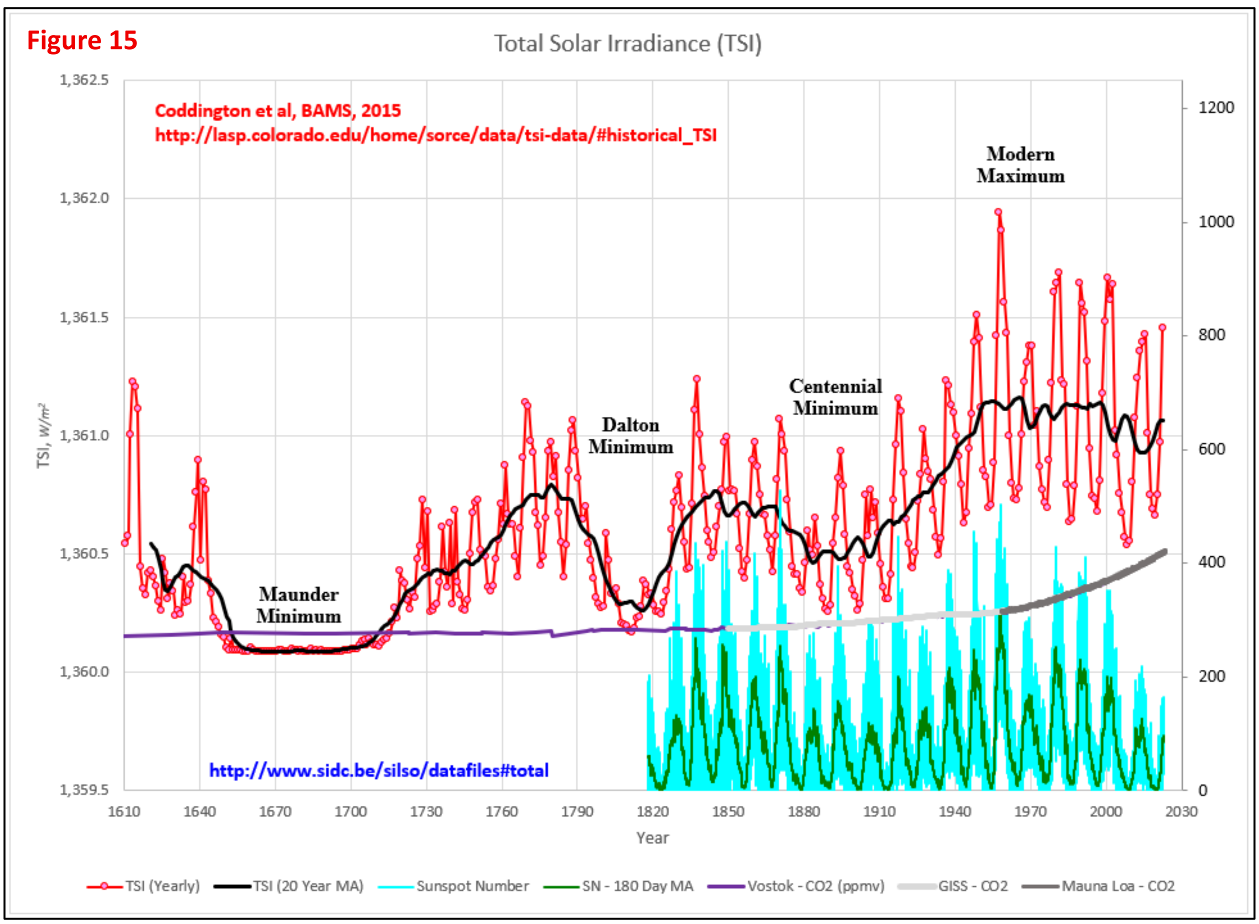
NOAA (and others) have chosen the work of Claus Frohlich and Judith Lean that raised the baseline (Solar Minimum between Solar Cycles 24 and 23) from the **black dashed line** to the **dotted red line**. Valid arguments (Soon, Connolly et al, CERES Science) have been made that show the calibration could just as easily have remained flat (the black dashed line) or continued to drop as represented by the **blue dotted line**. Figure 12 (to the left) shows that the TSI minimum had been declining. There is no definitive reason to say that the TSI decline has not continued. The difference between the three lines is very small, but those differences produce very different TSI reconstructions (as shown in Figure 13). To be true to science, all reasonable options must still be on the table.

The data is sourced from the National Oceanic and Atmospheric Administration's (NOAA) National Centers for Environmental Information (NCEI) group. The data files were pulled from the DATA.GOV website. The Figure 12 TSI reconstruction was compiled by Claus Frohlich and Judith Lean (as mentioned earlier).

The two curves in Figure 13 are the estimated absolute values. One of the many interesting omissions in the alarmist version of "climate science" is



the acknowledgement that virtually all TSI reconstructions have the same general profile (just different absolute values). Figure 14 (to the left) normalizes the 27 Total Solar Irradiance Momentum (TSI_M, the 20 Year Moving Average) profiles discussed in the Connolly/Soon et al papers on the previous page. Any of these curves can be used to produce better history matches than the IPCC's anthropogenic focused

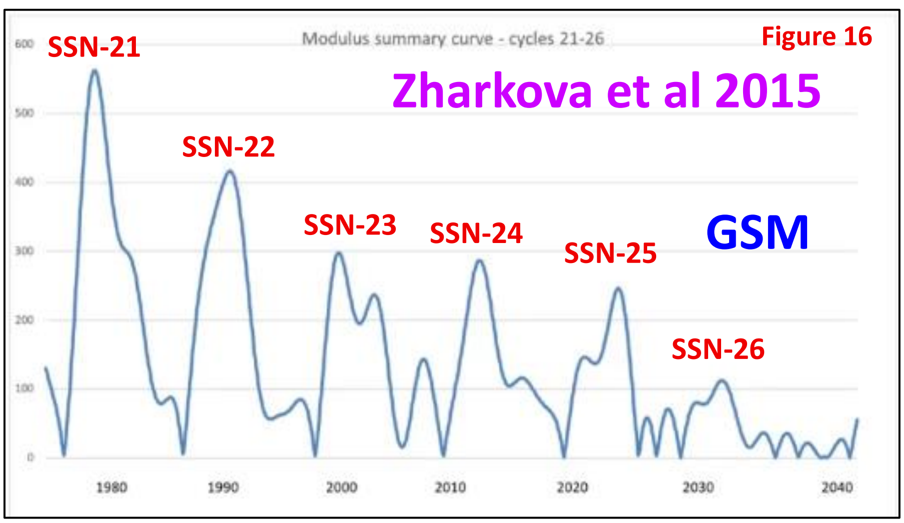


narrative. Remember, the IPCC has chosen to focus on just one TSI reconstruction (the Matthes et al 2017) of the 40+ reconstructions available. Simplistic and Unscientific! More detailed discussion on the TSI reconstructions can be found in my CSS-71 – IPCC Model/Theory Shortcomings post.

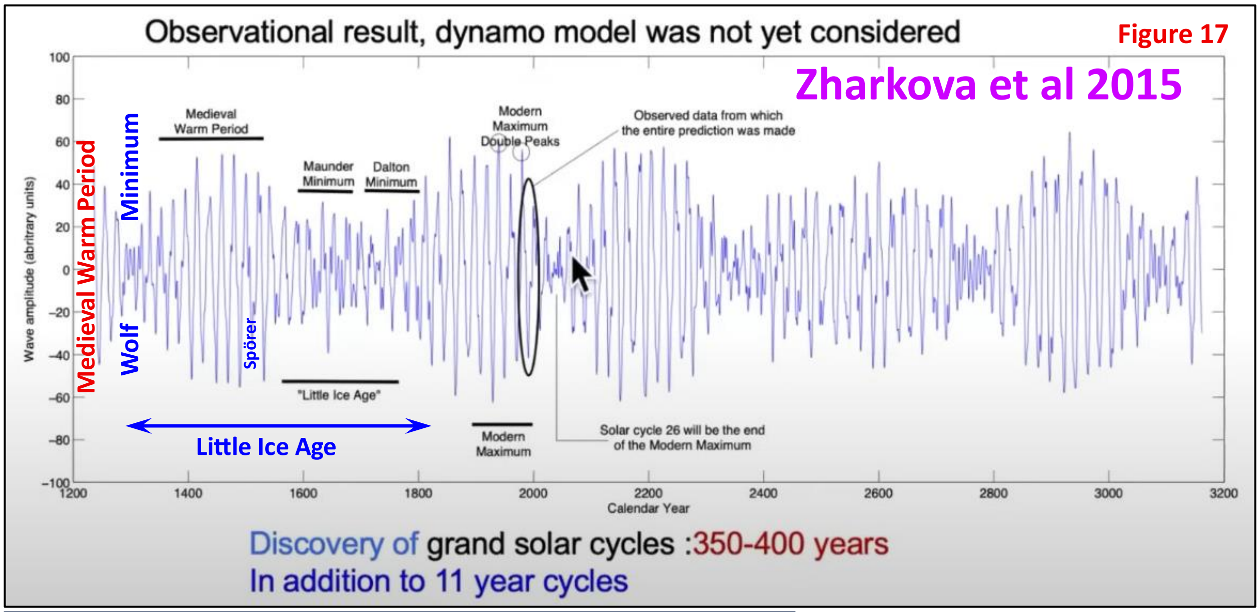
Both SSN and TSI data (through combinations of measured and proxy data) are available further into the past. Figure 15 (on the previous page) shows the TSI reconstruction (and CO_2 concentrations) back to the early 1600s and SSN back to the early 1800s. To provide proper context, this TSI reconstruction comes from the Naval Research Laboratory (NRLTSI2, shown in Figure 14). The NRLTSI2 profile is very similar to the IPCC's Matthes et al 2017 profile. The NRLTSI2 TSI reconstruction (used as a proxy and combined with the AMO, NO CO_2) produces a much better history match than the IPCC's simplistic, unscientific All CO_2, All the Time alarmist approach. A simple model was presented in my OPS-8 – Basic Climate Model and Open Letter Addendum posts.

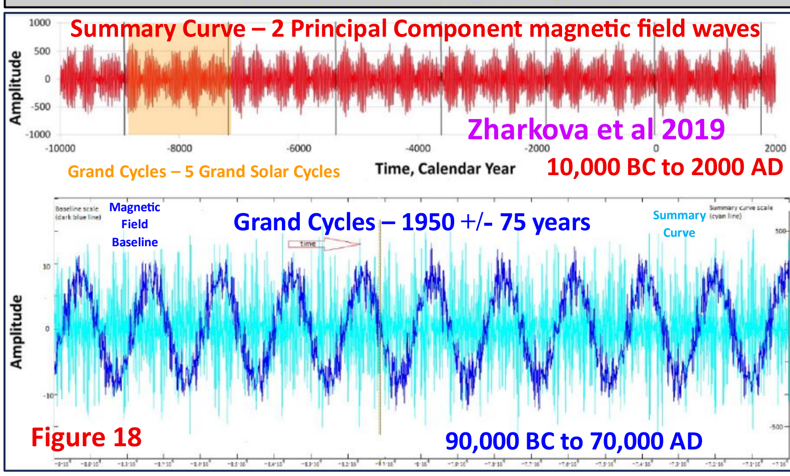
The NRLTSI2 data shows that the absolute TSI value change is small (just 0.079%) and therefore (according to the All CO_2, All the Time alarmist community) are not strong enough to affect the earth's climate significantly. What they do not point out is that the rise in CO_2 is just a 0.014% change in atmospheric concentration. The TSI change is 5.6 times larger than the change in CO_2 concentration. That concept is discussed further in my OPS-78 – The Climate Change and Arsenic Paradox post.

The IPCC makes one further mistake (to be kind) in their handling of solar forcing. They assume (incorrectly) that solar forcing is limited to TSI alone. Again, simplistic and unscientific! TSI is just a qualitative indicator of over all solar activity. There are many other solar forcings that are far more impactful. Two of those forcings (Cosmic Ray Flux (CRF, and its relationship to cloud albedo) and High Energy Particles (HEP)) were included in the IPCC's AR6 CMIP6 programming protocols. Not surprisingly, using just those two solar forcings produced MTR history matches without any CO_2 contribution during beta testing. And just as unsurprisingly, the modelers choose to turn those solar forcings off or way down in the models, producing the same results as in previous years, the models run too hot and are still using unrealistically high emission scenarios.



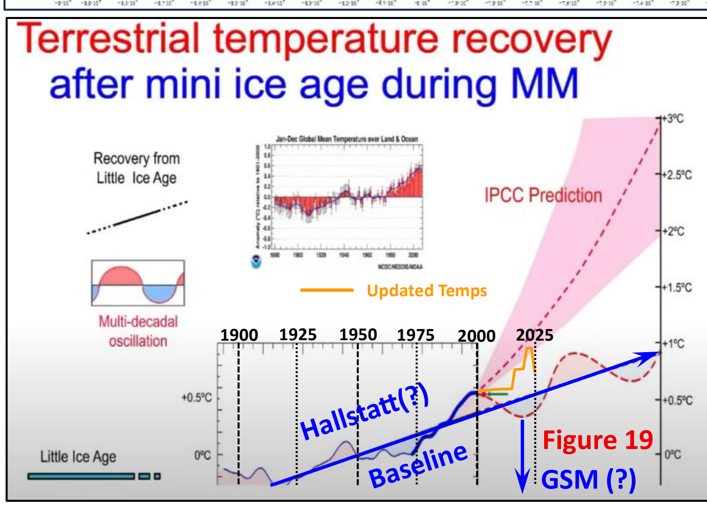
The next step to consider is future solar activity. In the IPCC models this is irrelevant because they have turned down their solar forcing contribution to almost zero. This ultimately makes their models totally useless outside the MTR (1850 to the present), since they cannot history match the pre-MTR temperature fluctuations over the Holocene (refer to Figure 4) and are therefore useless for future projections of "climate change". The following discussion will focus on four solar activity projections starting with Zharkova et al's 2015 paper, *"Heartbeat of the Sun from Principal Component Analysis and prediction of solar activity on a millennium timescale"*. Cycles 21 to 26 are shown in Figure 16 above. Their forecast was a bit low for Cycle 25 given that the observed activity has been higher than Cycle 24. Their solar dynamic model can produce the major climate events back to the Medieval Warm Period (Figure 17, on the following page). As an aside, the chart has mislabelled the Medieval Warm Period and the Little Ice Age My corrections have been added in red and blue. What the model does show is the 350 to 400-year Grand Solar Cycles. The Spörer Minimum is less definitive and still subject to some discrepancies in the data set. My [CSS-58 – More Solar Cycles]() post (my first in depth dive) provides more discussion on the subject.



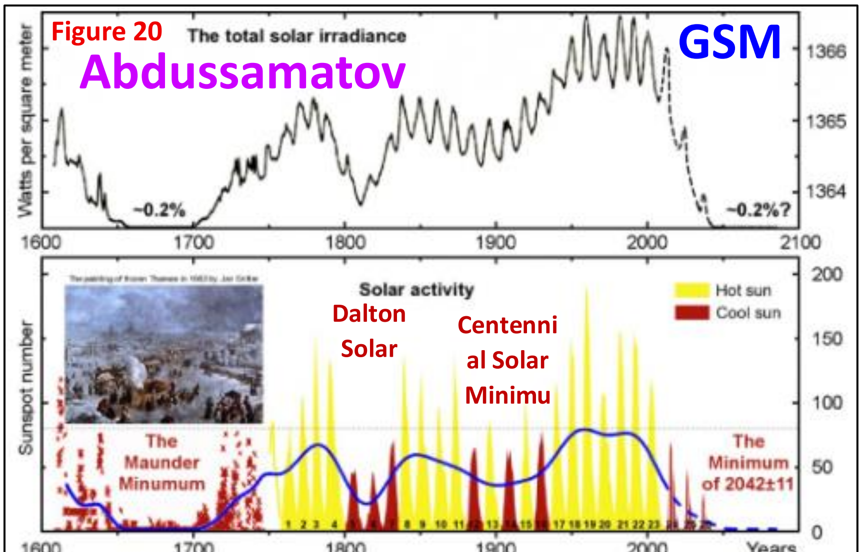


Zharkova et al 2019
https://www.nature.com/articles/srep15689

The Little Ice Age began in the late 1200s (the Wolf Minimum) and lasted into the early 1800s. Zharkova et al ran their model out on longer time scales and found that there was also a longer cycle present (±2,000 years). This Grand Cycle consists of five of the Grand Solar Cycles. (a similar pattern that appears to repeat regularly). The much longer scale (Figure 18) highlights the highs and lows that occur on a ±2,000-year cycle, which could be the manifestation of the Hallstatt Cycle (±2,300 year, visible in historical proxies). What does that mean for our planet's climate? The schematic to the left (Figure 19) provides a visual. Temperatures will drop over the next several decades as we move through Zharkova's forecasted Grand Solar Minimum. The depth of that cold is open for discussion, but similar



conditions to the Maunder Minimum are possible. Temperatures will likely continue to rise independent of the CO_2 concentration built into the IPCC Prediction (based on their models which have been self-acknowledged to run too hot and use unrealistically high emission scenarios). The natural temperature rise began in the depths of the Maunder Minimum (mid 1600s), long before CO_2 began rising or humanity's emissions were significant. 87%+ of humanity's emissions have occurred post-1950. The baseline temperature rise (highlighted in blue on Figure 19) will continue to around 2700 with temperature fluctuations above and below the baseline due to shorter solar cycles. The multi-decadal oscillations shown in the schematic are likely related to the ocean cycles (AMO, PDO, ENSO, etc.) and are solar related. The Grand Solar Minimum forecasted by Zharkova (and others) over the same period (2020-2055) will accentuate that multi-decadal oscillation. The schematic does need to be updated. The AMO has only just started into its cooling phase. The multidecadal oscillation cooling in the schematic was (in my opinion) initiated too early. The orange curve is a general representation of temperatures post-2000. Temperatures were virtually flat from 2000 to 2014. A strong ENSO warming pulse drove temperatures up sharply in 2015 with a generally gradual decline until 2023 when another ENSO warming pulse (likely helped by the Hunga Tonga eruption, SSN Cycle 25 solar maximum, aerosol restrictions on shipping, and increased seismic/volcanic activity along the tectonic plate edges). The solar minimum appears to have been delayed a bit. TSI_M has been declining slightly since the turn of the century, but that decline has stalled a bit with a stronger than expected Cycle 25. The solar impact is very likely to accelerate as we come off Cycle 25 and move into what looks like a very weak Cycle 26. Like CO_2's climate sensitivity, solar activity is not settled science (despite the importance of both those parameters).



TSI variations and sunspot activity since 1611 and our forecast (dashed lines) (Abdussamatov H. I. The Sun Dictates the Climate of the Earth. 2009, St. Petersburg, "Logos", – 197 p.; The Sun Dictates the Climate. 4th International Conference on Climate Change in Chicago, May 2010.

Another longstanding solar forecast was put forward by Russia's H. I. Abdussamatov (Figure 20, to the left). Like Zharkova, his projection for Cycle 25 was too low, but that does not mean the Grand Solar Minimum is not in our future. Time will tell. I do have some thoughts on why these forecasts may be off, but I will leave that for later in the discussion. There are two other groups that have put forward solar activity forecasts that show a decline in solar activity over the next few decades. The first group is Cionco, Soon et al. The other group is NOAA. Cionco, Soon et al (Figure 21, on the following page) projects that summer insolation at 65°N will drop more than 2 Watts/m^2 over the next few decades, recovering to just over our current levels (below the recent highs). Winter insolation is dramatically different, staying virtually flat. The combined result is declining insolation (i.e.: temperatures).

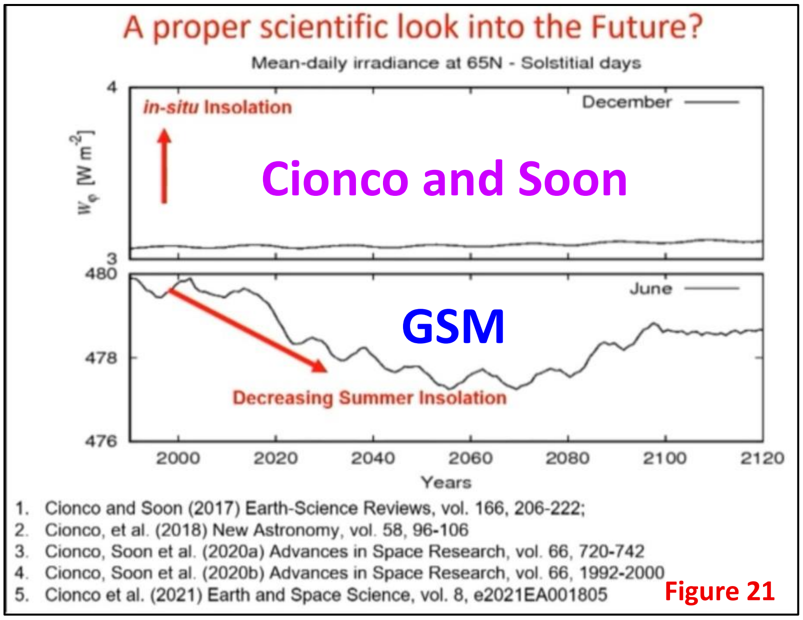


Figure 21

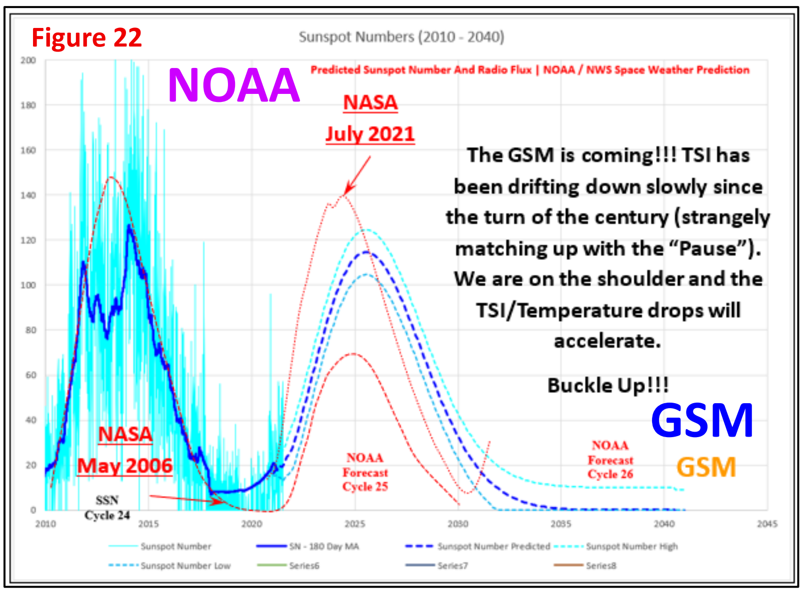


Figure 22

The NOAA forecast is shown in Figure 22 (blue curves, below, left). Their Cycle 25 forecast was like the Cycle 24 observations. That forecast was an underestimation. Cycle 25 SSN and TSI (to date) have been a bit higher than Cycle 24 (as shown in Figures 7 and 12). The forecast for Cycle 26 is far more interesting. NOAA is saying that solar activity will be very low, with minimal sunspot activity (i.e.: Maunder Minimum levels).

Note, this chart was prepared in November 2022. Since that time NOAA has pulled their Cycle 26 forecast. I suspect that Cycle 26 did not fit the alarmist narrative.

The chart also shows the NASA forecasts (red) for Cycle 2025. The May 2006 forecast was close to the Cycle 24 observations but was well below the Cycle 25 observations (to date). The adjusted NASA forecast (July 2021) was closer to reality but was still too low.

These four solar activity profiles were consolidated schematically and used to produce a potential forecast (shown later in the discussion).

The 'climate change' discussion is complicated. Far more complicated than the simplistic, unscientific alarmist narrative that anthropogenic (primarily CO_2) forcings are the primary (virtually only) climate driver. Figure 23 (on the following page) lays out just three of the many forcing parameters (solar (Total Solar Irradiance Momentum (TSI_M)), ocean (Atlantic Multi-decadal Oscillation (AMO)), and Carbon Dioxide (CO_2)) and plots them against global temperatures (HadCRUT5 surface and UAH satellite temperatures (normalized)). Which of these three parameters produces the best correlation with global temperatures? Hint, it is not CO_2. And to be fair, it is also not TSI_M and AMO. The AMO reflects the general warming and cooling cycle in the global temperature, but its long-term rise is small. The TSI_M correlates very well with the early data (1850s to 1950). Post-1950, TSI_M leveled off with minor declines since 2000. Those declines conveniently line up with the 2000 to 2014 "PAUSE". Coincidence? CO_2 on the other hand, only really correlates from 1975 to 2005. Not exactly statistically significant. Given that most of humanity's emissions have occurred post-1950 (87%+), the pre-1950 temperature increases would have to be primarily natural. Obviously, CO_2 was being overpowered by other parameters from the mid 1940s to 1975. The alarmist community focuses on aerosols (without acknowledging the wide error range and the intrinsic effect ocean and solar activity have on aerosols). They totally ignore ocean cycles which would be responsible for much of the 1940s to 1975 decline and would have also contributed significantly to the 1975 to 2000 warming. The AMO was also relatively flat during the 'PAUSE'.

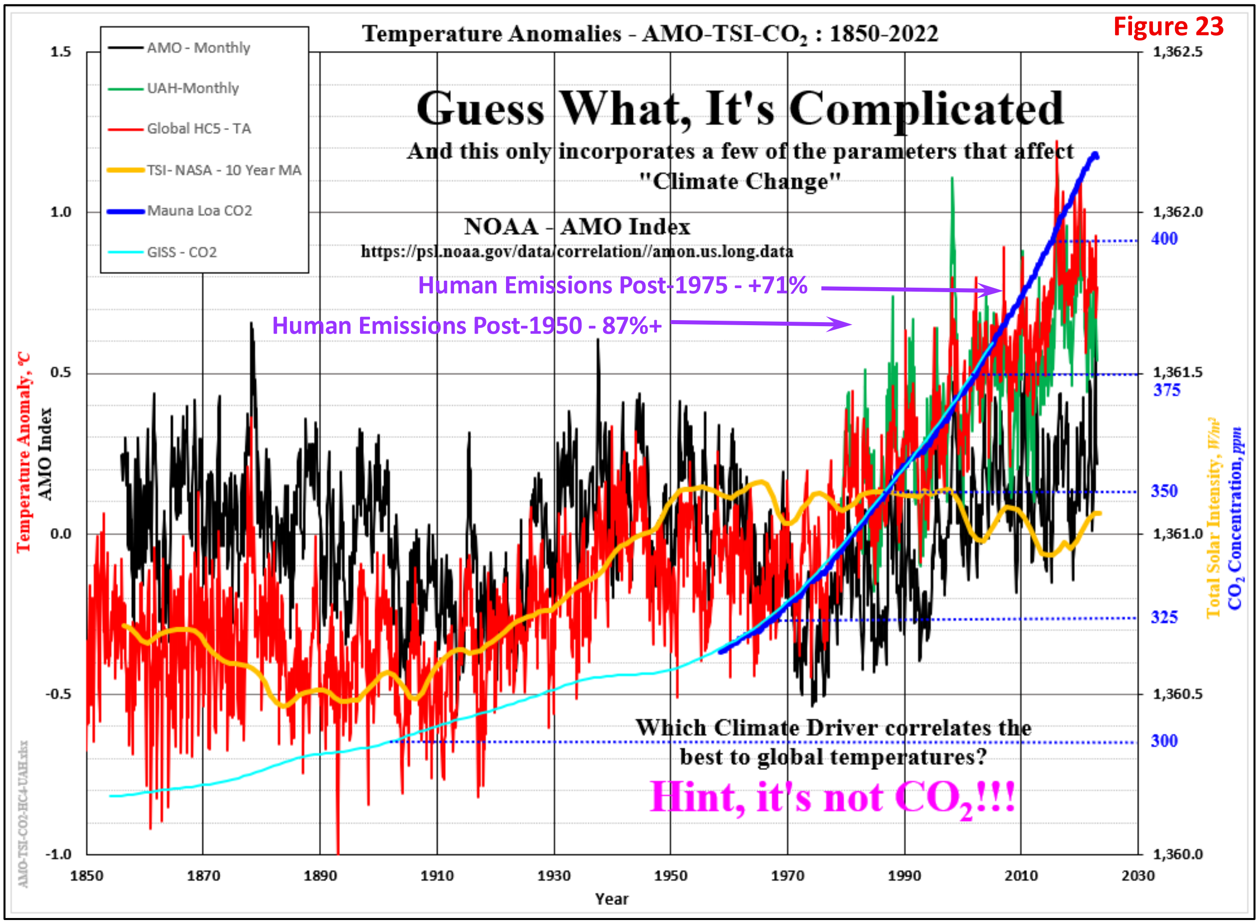


Figure 23

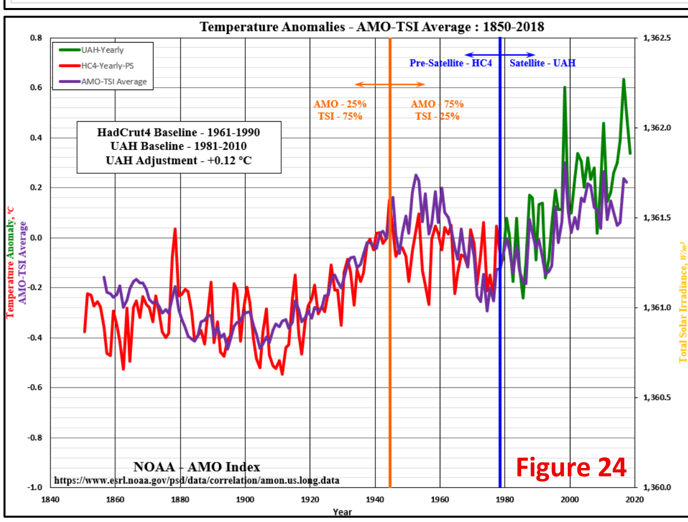
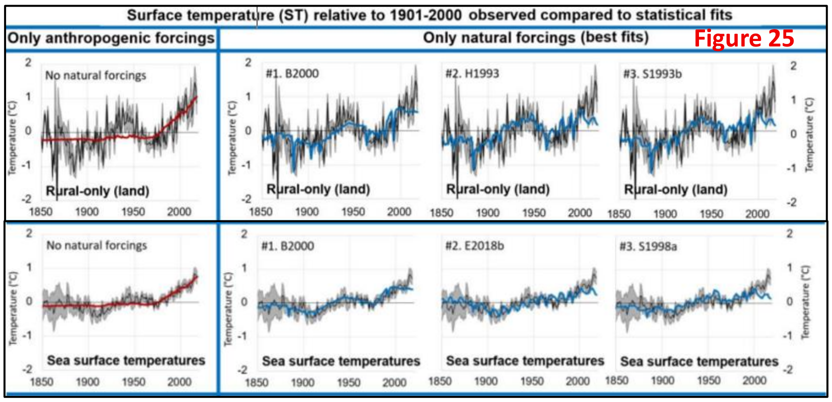
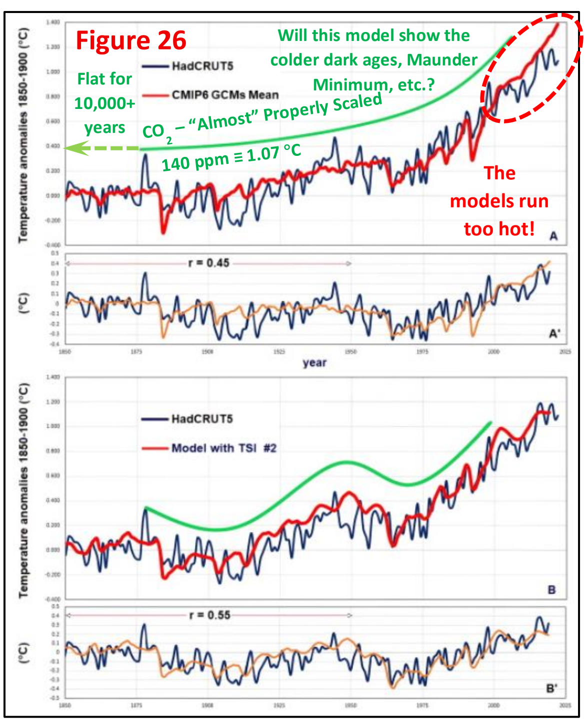


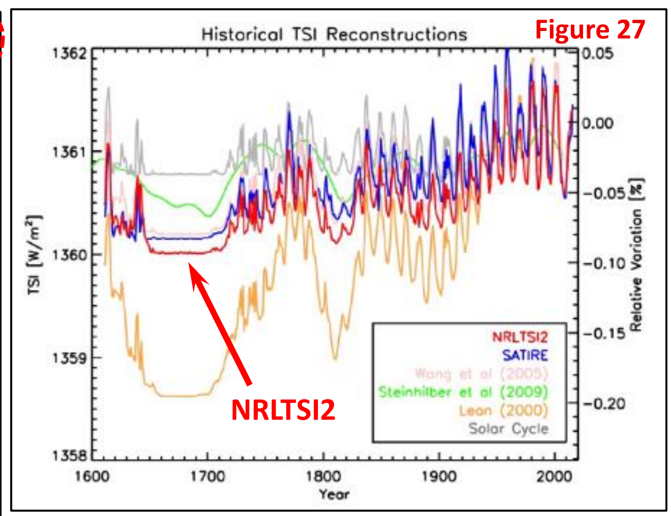
Figure 24

A commonsense approach would assume that all these parameters would be playing a role, since none of them on their own can totally history match the Modern Temperature Record. Refer to Figure 2). There are of course other parameters (like the El Niño Southern Oscillation (ENSO)) and aerosols. The strong ENSO warming pulse in 2015 was responsible for the post-2015 warming. A similar strong pulse (helped by some other parameters, not shown here) occurred in 2023/24. CO_2 played minor roles in the post-2014 temperatures. Figure 24 (to the left) is a simple model (2 parameters, TSI (as a proxy) and AMO) that produces a much better history match than CO_2 on its own. The model weights TSI higher pre-1950, AMO higher post-1950 (when the sun has a much more minor role). The UAH temperature data is used during the satellite period to limit the effects of “over-homogenization”. The model is definitely not all encompassing, but it should provide some food for thought. There is more discussion in my OPS-8 – Basic Climate Model and Open Letter Addendum posts.



For those that need peer reviewed published validation, the same general results were achieved by Soon-Connolly[2] et al in their 2023 *“Challenges in the Detection and Attribution of Northern Hemisphere Surface Temperature Trends Since 1850”* paper. The natural fits (i.e.: history matches) are stronger than the IPCC anthropogenic forcing options. The examples shown above (Figure 25) are just a few of the many possibilities laid out by Soon-Connolly[2] et al. The plots below (Figure 26) were pulled from Nicola Scafetta’s 2023 paper *“Empirical assessment of the role of the Sun in climate change using balanced multi-proxy solar records”*. Note, although any of the 27 TSI reconstructions laid out by Soon-Connolly[2] et al can be used as a proxy, there are some TSI constructions that can be used directly. There is much more discussion available in my CSS-42 – The Role of the Sun – Scafetta 2023 and CSS-51 – Soon-Connolly – Solar Forcings posts.





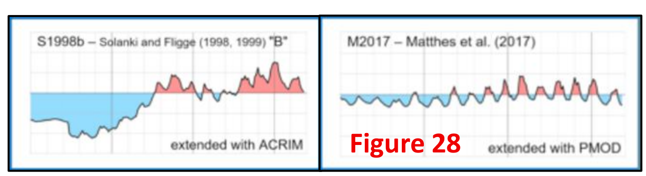


Figure 27 (above) shows a variety of TSI reconstructions (including my NRLTSI2 choice). Figure 28 compares the IPCC’s single choice (Matthes et al 2017) and the Solanki/Fligge 1998b option (which can be used directly for history matching).

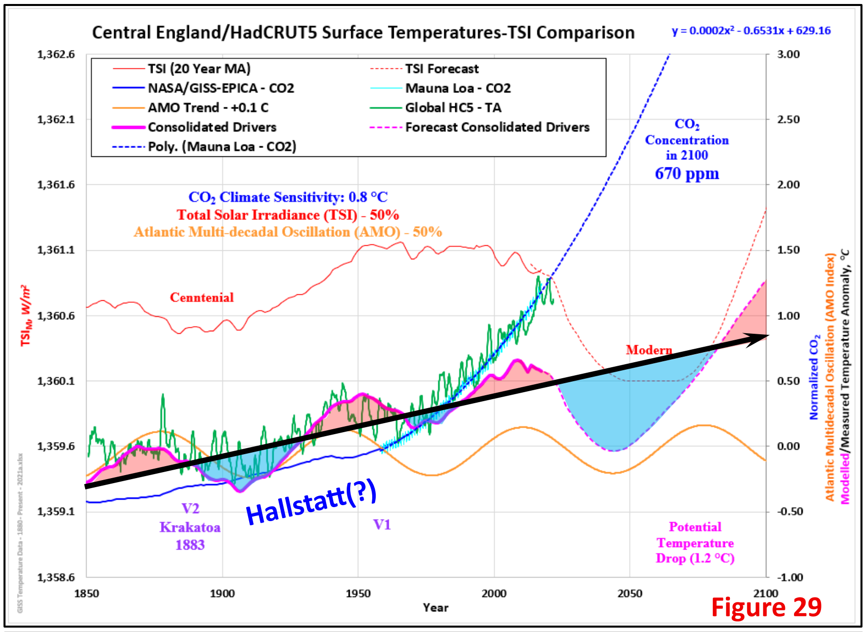


Figure 29

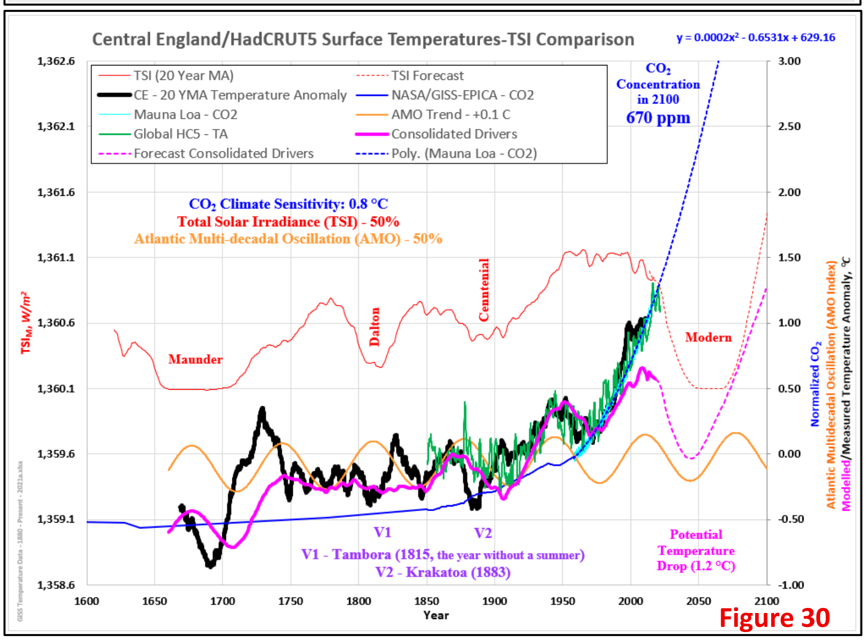
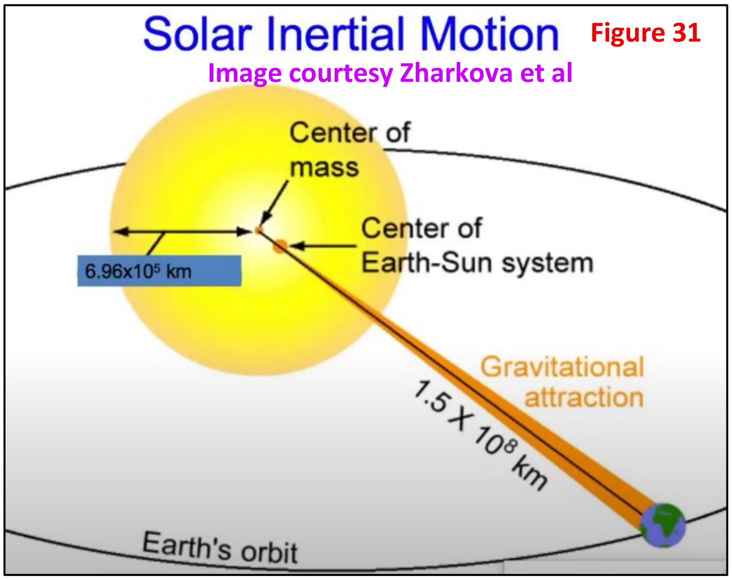


Figure 30

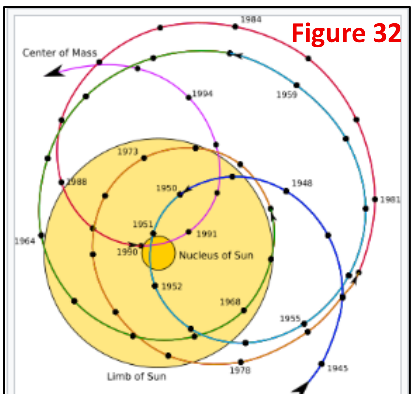
The Basic Model discussed earlier has been upgraded to include CO_2. Still a simple model (Figure 29, to the left) with just TSI, AMO and CO_2, but it is a little more comprehensive. Including the ENSO warming pulses since the last century would tighten up the recent deviations. Highlighting the warming and cooling cycles produces a schematic profile similar to the Zharkova plot from Figure 19. CO_2's climate sensitivity was set at 0.8 °C based on discussion in my OPS-80 – CO_2 Affects Temperature but Does CO_2 Drive Climate? post. TSI and AMO were given equal weighting with an assumption that TSI would reach Maunder Minimum levels. The chart (Figure 30, directly to the left) just adds in the Central England Temperature (CET), extending the model back to 1659. Does the global temperature parallel the CET back to 1659 (as it has over the MTR, 1850 to the present)? Certainly open for debate. Are the pre-1850 temperature fluctuations due to CO_2? No need for debate there, the answer is NO. The sharp temperature rise through the early 1700s is eerily like the 1975+ temperature rise. Increased seismic/volcanic activity along the Mid-Atlantic Ridge and the Pacific Ring of Fire correlates with recent temperatures. Similar processes may have been in play back in the 1700s as well. The details are open for debate, but there are obviously natural forcings acting on the planet and they did not suddenly disappear over the MTR, and they will continue to be active in the future (just not in the IPCC models that run too hot and use unrealistically high emission scenarios).

The general temperature cycles are hinting at a very basic underlying 60-year cycle that appears in many climate indicators. The AMO has a very well developed 60-year cycle as shown in the models above. The AMO, like all the other cycles that will be discussed here are solar related. The sun provides the vast majority of the energy that drives our atmospheric and oceanic circulations. But seismic/volcanic contribution may be more significant than previously thought. But these are likely also solar related given the gravitational and electromagnetic interactions with the rest of the solar system.



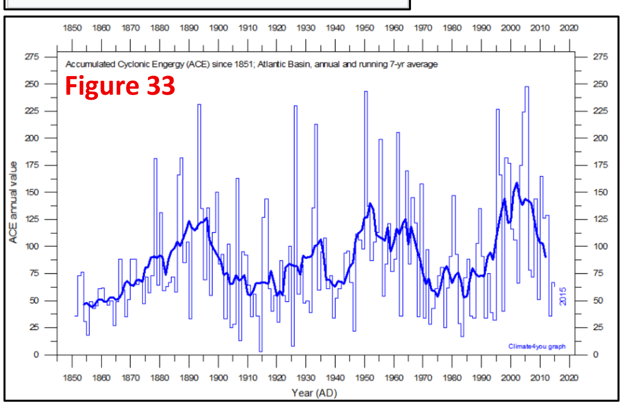
The 60-year cycle is intrinsic to the orbital mechanics of our solar system. The earth and other planets do not revolve around the centre of the sun. They revolve around the barycentre. The earth's distance from the sun varies depending on the barycentre's position, producing changes in our climate.

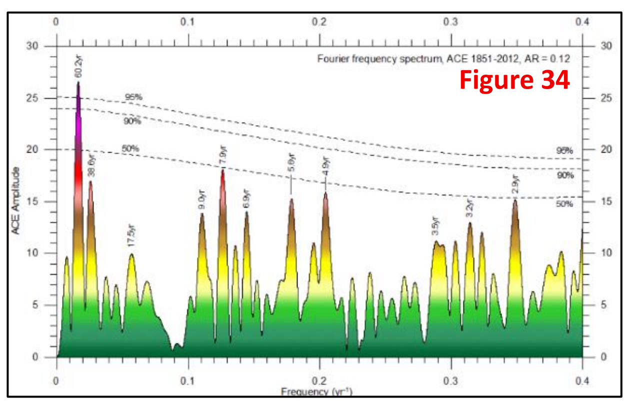
The detailed movements are complex (Figure 32, below left, courtesy Wikipedia), but they play out on a roughly 60-year cycle that has visible effects throughout our biosphere. CO_2 has nothing to do with any of the cycles shown in the following discussion.



Motion of the Solar System's barycenter relative to the Sun

The first example (Figure 33, shown below) is Accumulated Cyclonic Energy (ACE) for the Atlantic Basin. Given that the Atlantic Multi-decadal Oscillation has a 60-year cycle, the 60-year Atlantic Basin ACE cycle should not be surprising, since they are obviously connected. A Fourier Frequency Spectrum analysis on the Atlantic Basin ACE data (Figure 34, below) indicates that there is a very prominent cycle at 60.2 years. There are many other less prominent cycles in the data, but the confidence levels are much lower. The 9.0- and 17.5-year cycles could be lunar related. Some of the shorter cycles do show up in other data sets but they could also be noise within the data. There are always local, erratic events that can be affecting the data in

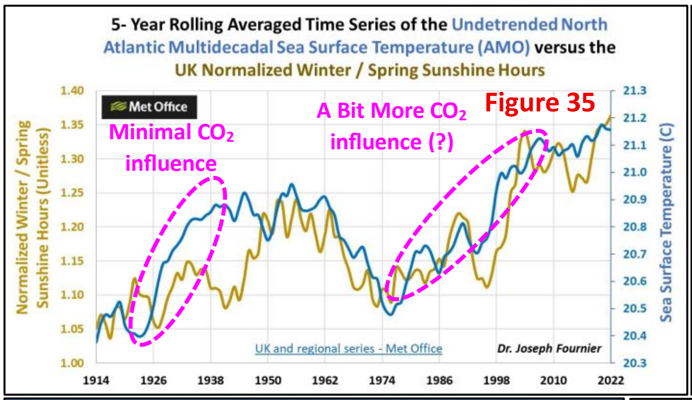


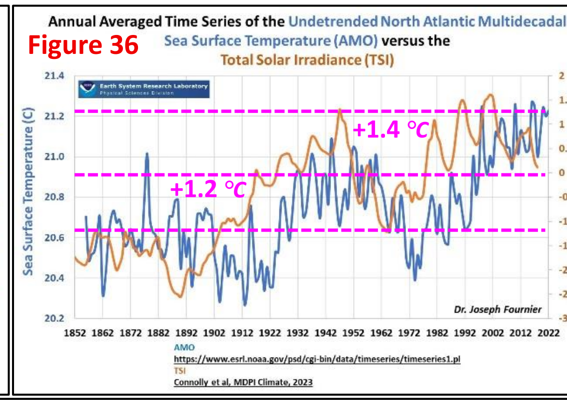


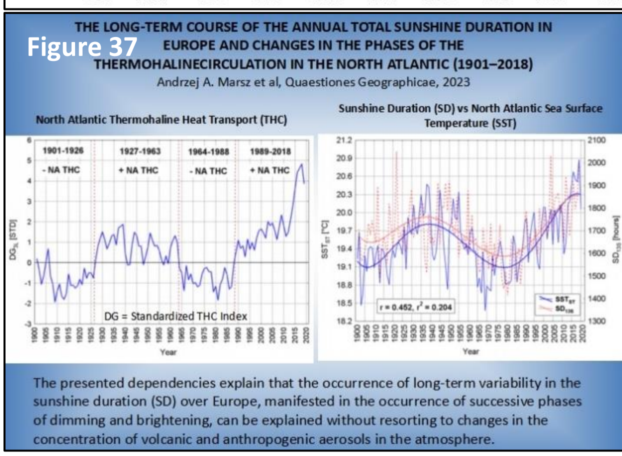
unexpected ways for short periods of time. The underlying 60-year cycle is the focus for this section of the discussion.

The next four figures look at climate parameters that correlate with the Atlantic Multi-decadal Oscillation (AMO) or its close derivatives. Figure 35 (on the following page) shows the un-detrended North Atlantic

Multidecadal Sea Surface Temperature plotted against the UK Normalized Winter/Spring Sunshine Hours (all data plotted based on the 5-year Rolling Average). Note that the 2005 to 2022 NAMSST high is ±0.3 °C higher than the 1938 to 1962 NAMSST high. Direct sunshine warms the ocean far more effectively than CO_2. From [ScienceDirect's Earth and Planetary Sciences Text](), *"Water is nearly opaque to longwave radiation. The incoming longwave radiation from the atmosphere is absorbed in the top millimeters, unlike incoming shortwave radiation that penetrates much deeper."* Do sunshine hours drive the North Atlantic sea surface temperatures or vice versa? Both scenarios are likely in play with the solar influence (the 60-year barycentre cycle (distance from the sun)) being the primary driver. CO_2 is not playing any role in the cyclical nature of these parameters. Could CO_2 be responsible for some of the extra warming in the North Atlantic Sea Surface Temperature? Sure, but how much?







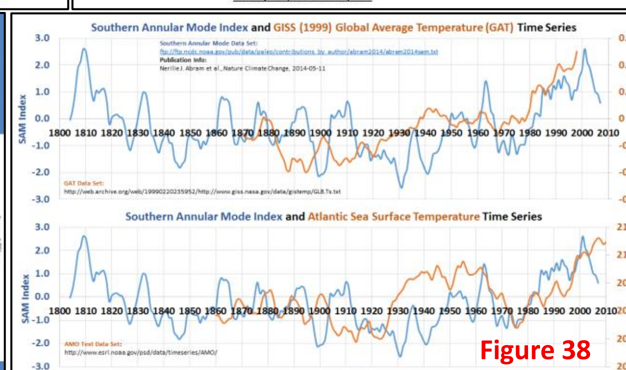


Figure 36 (above right) plots the NAMSST against the Total Solar Irradiance (TSI). Strange how the TSI and the NAMSST move up and down together with the TSI moving first, followed by the NAMSST. Almost as if there is both correlation and causation. Also, strange that the NAMSST increase pre-1950 (1.2 °C) is almost as high as the post-1950 NAMSST increase (1.4 °C). Given that less than 13% of humanity's emissions occurred pre-1950 and 87%+ of humanity's emissions have been post-1950, there appears to be more going on than just CO_2. In reality, neither of these two statements are strange. Solar activity through a variety of processes is our climate's primary driver with some minor CO_2 influence.

Figure 37 provides some confirmation of Figure 35. [Maertz et al]() have plotted the Total Annual Sunshine Duration in Europe against the North Atlantic SST showing a correlation that CO_2 would be envious of. They also include a plot of the North Atlantic Thermohaline Circulation (THC, Heat Transport). Note the 2015 sharp increase in both the North Atlantic SST and THC. This is not due to CO_2 or humanity's emissions. Maertz et al point out that the variability in sunshine duration *"can be explained without resorting to* *changes in volcanic and anthropogenic aerosols in the atmosphere"*. Calls in to question aerosol's radiative forcing potential.

Figure 38 (on the previous page) shows the Southern Annular Mode (SAM) Index plotted against GISS Global Average Temperature Anomalies and the Atlantic Sea Surface Temperatures. *"The Southern Annular Mode (SAM) index measures the variability of atmospheric pressure between the mid-latitudes and high latitudes of the Southern Hemisphere, significantly influencing climate patterns."* The SAM Index is also called the Antarctic Circulation. The 60-year cycles are not as pronounced in the southern hemisphere, but they are there.

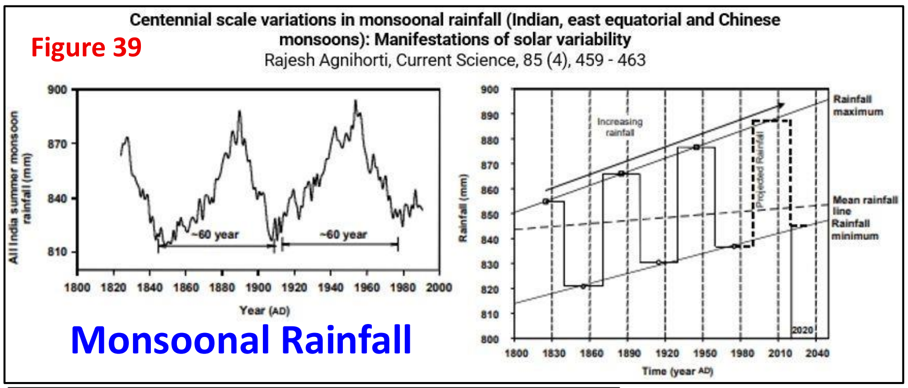


Figure 39
Monsoonal Rainfall

The 60-year cycle presents itself in major precipitation data as well (Figures 39 and 40). The chart to the immediate left ([Figure 39](#)) shows monsoonal rainfall in the India, China, and east equatorial regions. In addition to the 60-year cycle, there is also a general rise in rainfall totals. That is consistent with the rising temperature we have experienced as we recovered out of the Little Ice Age. As already shown, that temperature rise could be based on natural forcings, anthropogenic forcings, or a combination of natural and anthropogenic forcings. Common sense calls for the combination scenario. Unbiased comprehensive analysis weights the analysis to the natural side.

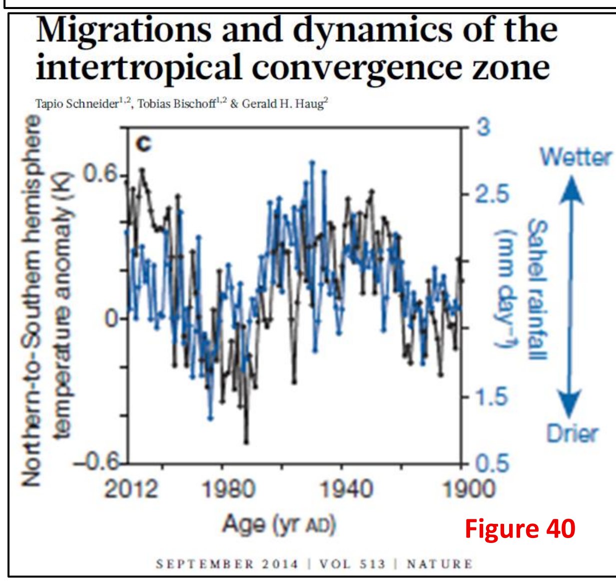


Figure 40
Intertropical Convergence Zone

[Figure 40](#) showcases the Inter-Tropical Convergence Zone (ITCZ). The Northern to Southern Hemisphere temperature anomaly is plotted against rainfall in Africa's Sahel, both on a 60-year cycle. The ITCZ also shifts on both shorter- and longer-term time scales. The cycle fluctuates seasonably, but more importantly for a climate discussion, the ITCZ also fluctuates on millennial scales. Even Wikipedia (no bastion of climate skepticism) acknowledges that fact. *"The ITCZ shifted north during the mid-Holocene but migrated south following changes in insolation during the late-Holocene towards its current position."* This northward ITCZ shift (the Holocene Climate Optimum) produced a much lusher northern Africa. Begs the question (once again), how is the climate changing when CO_2 concentrations remained virtually flat throughout the pre-MTR Holocene (Figure 4)? The answer to that question is in their quote, *"changes in insolation"* (i.e.: solar activity).

Interestingly, Fish Productivity also displays the 60-year cycle at many places around the planet. The first study ([Figure 41](#), at the top of the following page) looked at a wide variety of ocean (PDO) and atmospheric

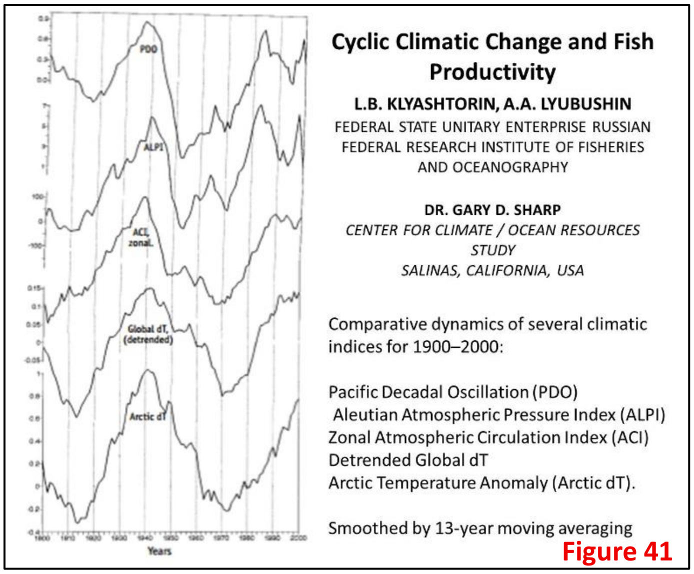


Figure 41

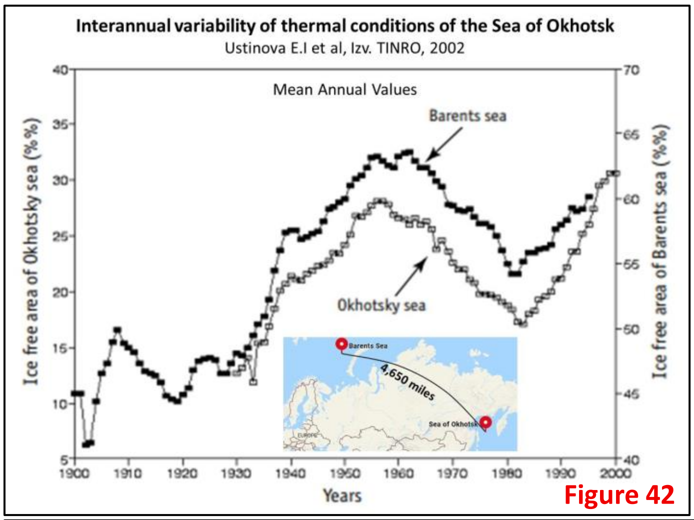


Figure 42

(ALPI, ACI, Global dT, and Arctic dT) cycles and their effects on Fish Productivity. Strange how similar all the cycles appear and none of them correlate with CO_2.

Figure 42, lower left, just provides additional confirmation that the 60-year cycle is present on both sides of the massive Eurasian land mass, the Atlantic (Barents Sea) and the Pacific (Okhotsk Sea). CO_2's slow, steady, slightly accelerating atmospheric concentration has little to do with the climate oscillations. And may or may not have much to do with the general ice-free area rising trend in both seas. Again, solar activity cannot be ruled out as the major contributor to the temperature changes over the MTR. Conversely, CO_2 can be totally ruled out as a contributor to the very obvious climate change present throughout the pre-MTR Holocene. But sure, CO_2 was, is, and always will be the planet's primary climate driver. NOT!

Even parameters as esoteric as Meteorite Fall Frequency (related to Jupiter's eccentricity) and the earth's Inner-Core Rotation characteristics show up on 60-year cycles Figure 43 (below). Another indication that the ultimate driver of climate change is tied to the many gravitational and electromagnetic interactions present throughout our solar system and beyond.

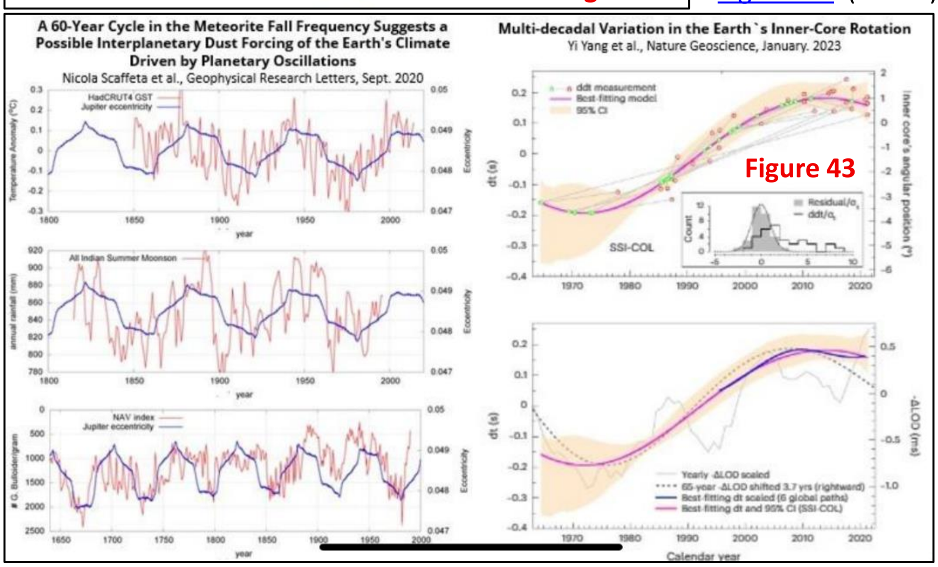
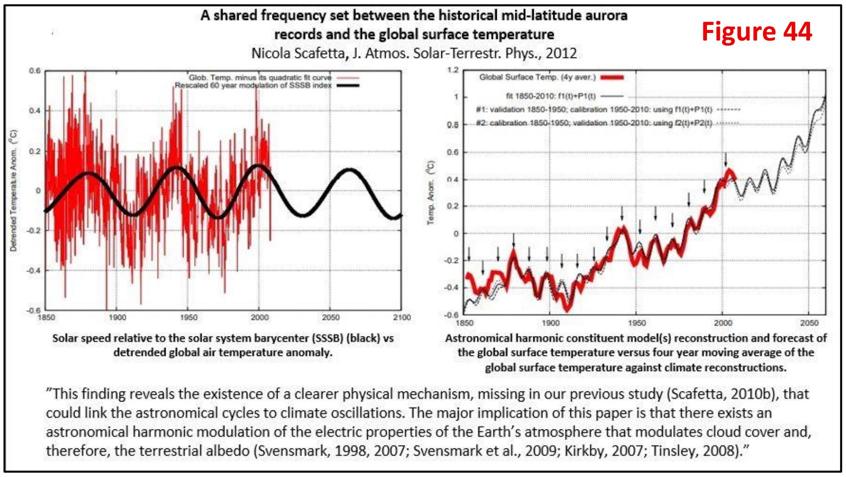


Figure 43

One more 60-year cycle is provided to wrap up this section of the discussion. Figure 44, on the following page, ties us back to the Barycentre's 60-year cycle. Scafetta has plotted the Solar Speed relative to the Solar System Barycenter (SSSB) against detrended Global Air Temperature (GAT) Anomaly and shown a very good correlation. The figure also shows a



comparison between the GAT and three astronomical harmonic model reconstructions. The 60-year cycle is evident in the model. The forecast profile is similar to the two forecasts presented earlier. Scafetta summarized the paper succinctly. *"This finding reveals the existence of a clearer physical mechanism, missing in our previous study (Scafetta, 2010b) that could link the astronomical cycles to climate oscillations. The major implication is that there exists an astronomical harmonic modulation of the electric properties of the Earth's atmosphere that modulates cloud cover and, therefore, the terrestrial albedo."* The paper itself, *"A shared frequency set between the historical mid-latitude aurora records and the global surface temperature"*, hints at the connection between space weather and our planet's climate (more on that later).

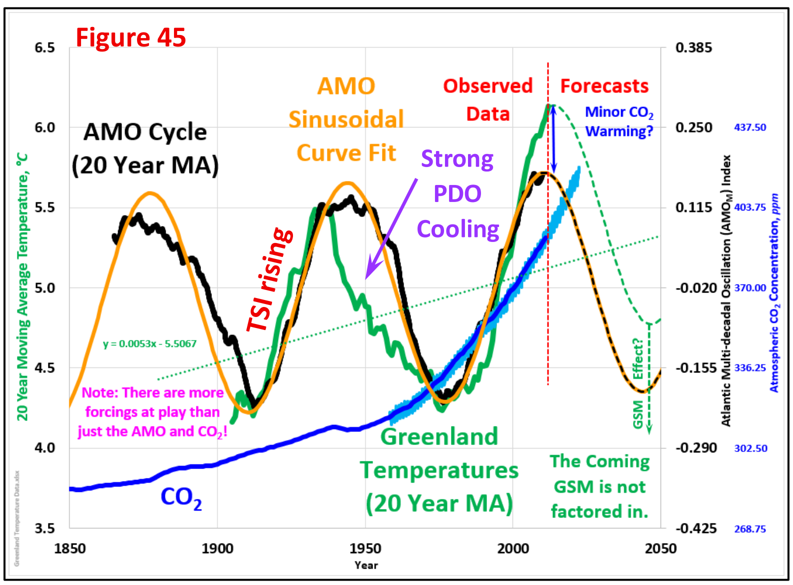


Figure 45 focuses in on the relationship between Greenland temperatures (the 20-year Moving Average), CO_2 and the 60-year Atlantic Multi-decadal Oscillation Momentum (AMO_M, 20-Year Moving Average). Both the empirical AMO data and a rising sinusoidal fit are shown on the chart. Given that Greenland is located in the North Atlantic, there should be no surprise that the AMO is the primary Greenland temperature driver. Could CO_2 be contributing to the general rise? Yes, but its contribution is dependent on its ECS (which is not settled science). Note, this correlation assumes that the AMO is responsible for most of the early 20th century Greenland warming (which would mean that most of the post-1975 warming is also AMO related). In the real world, the early 20th century warming would have some minor CO_2 contributions, but the rising solar activity (TSI) was likely a significant contributor. That would suggest that CO_2 has a larger contribution than shown in Figure 45. The relative contributions of TSI, AMO, and CO_2 will ultimately determine the best correlation. As shown in the earlier IPCC's "best estimates" discussion, the reality is likely a solar related weighting (split between direct and indirect solar (ocean cycles)) with some minor anthropogenic contributions (GHGs (primarily CO_2) and aerosols).

Putting together the solar cycles is a complex task. Lüdecke and Weiss, in their 2017 paper, *"Harmonic Analysis of Worldwide Temperature Proxies for 2000 Years"*, consolidated a few of the more prominent solar cycles. The table below (Figure 46) highlights the seven data sets used and their resulting Fourier Spectrum Analysis. G7 values are the averages. Figure 47 below is an example Fourier Spectrum Analysis.

Table 2. Strongest spectral peaks for the records Chr, Bün, McK, Vill-N, Vill-S, Pet, G7, and Stei for periods > 700 years, from 700 to 300 years, from 300 to 100 years, and < 100 years.

Figure 46

Record	> 700 years	700 to 300 years	300 to 100 years	< 100 years
Chr	998	467	189	48
Bün	1250	608	186	53
McK	964	491	193	72
Vill-N	/	/	177	/
Vill-S	/	/	189	51
Pet	948	499	188	/
G7	1003	463	188	65
Stei	991	508	203	/

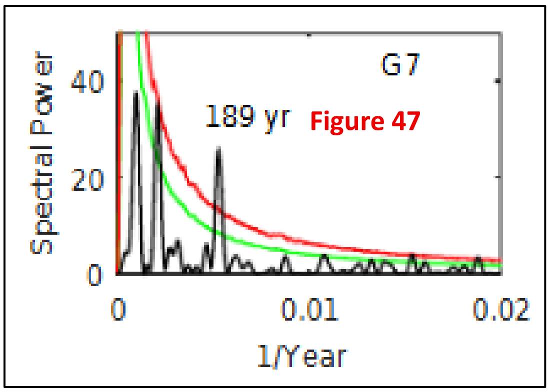


Figure 47

The G7 averages (65-, 188-, 463-, and 1003-year frequencies) were consolidated and used to generate the sinusoidal curves (Figure 48, below) that were then compared to historical temperatures. The upper image (Figure 48a), shows the rather interesting correlation between their sinusoidal model and the average of the seven temperature anomaly data sets used for this evaluation. The lower image (Figure 48b) plots the detailed G7 temperature anomaly data against three of the four sinusoidal curves used in the model. The 60-year curve was not used to avoid overcomplicating the image. The seven temperature anomaly curves used and the G7 consolidation are included as Figure 48c.

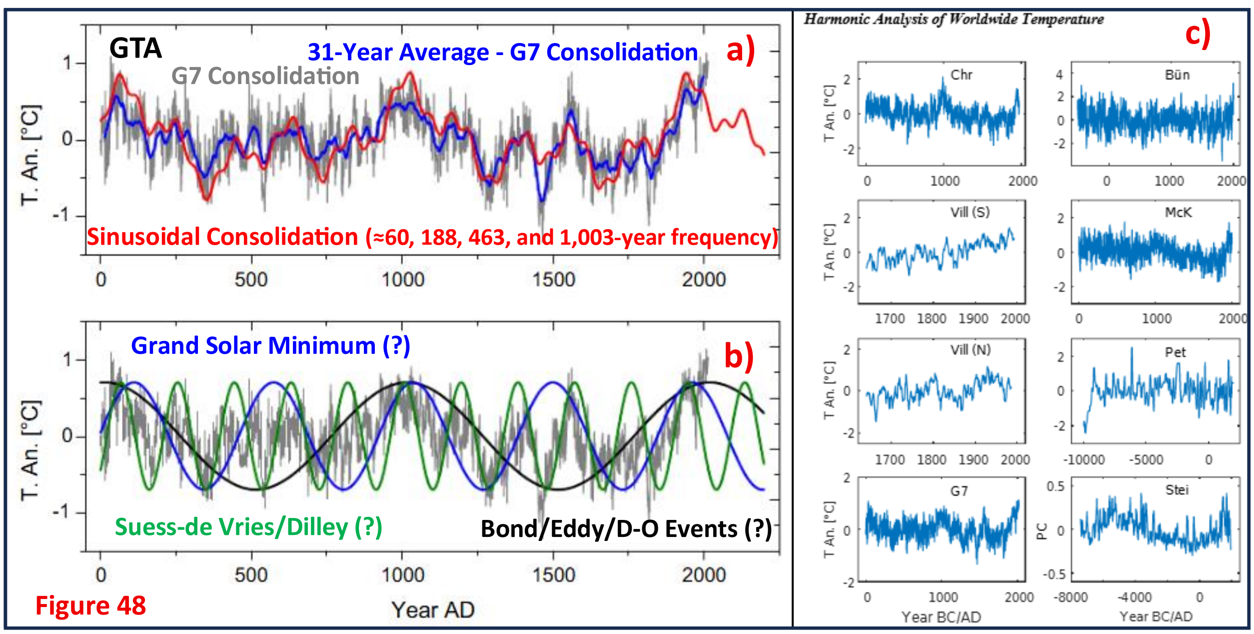
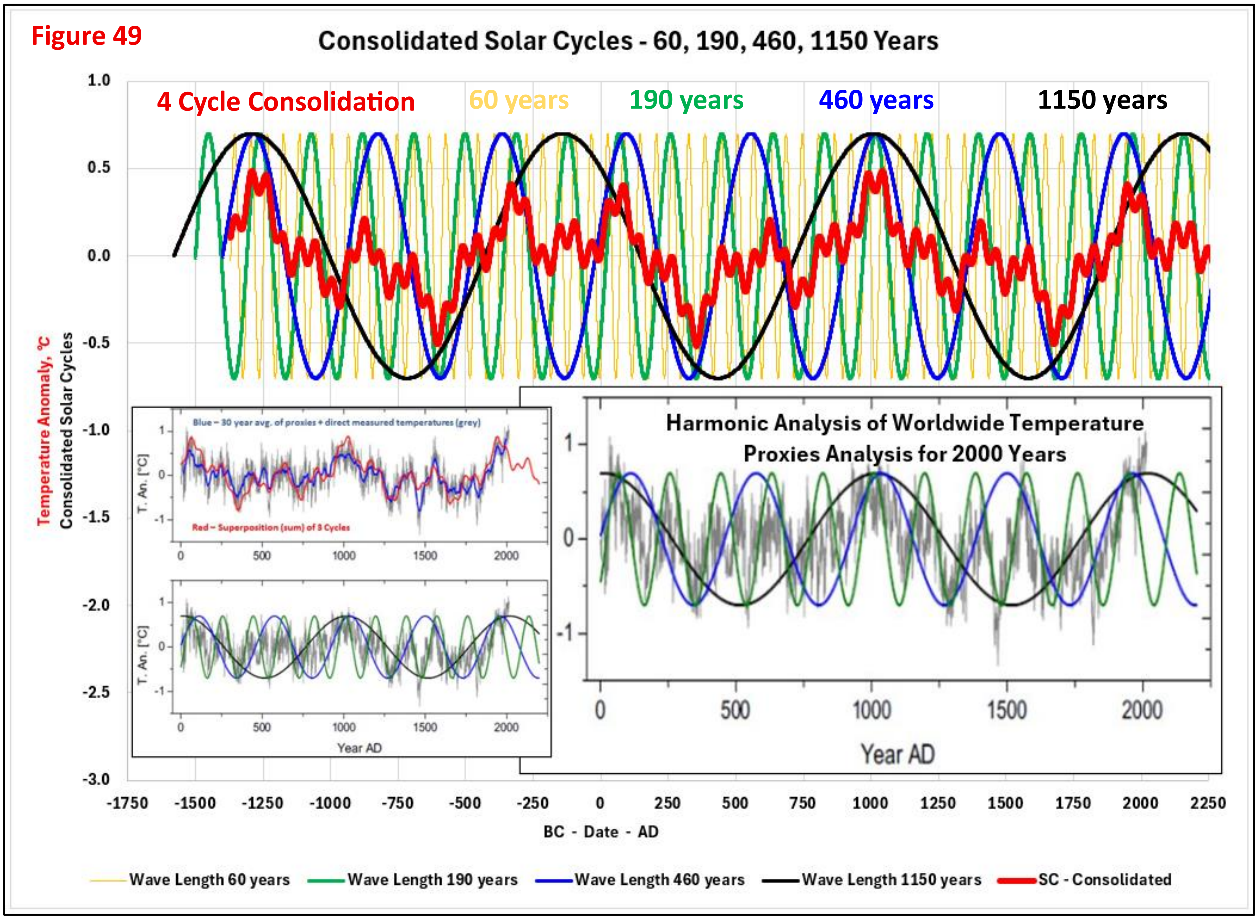
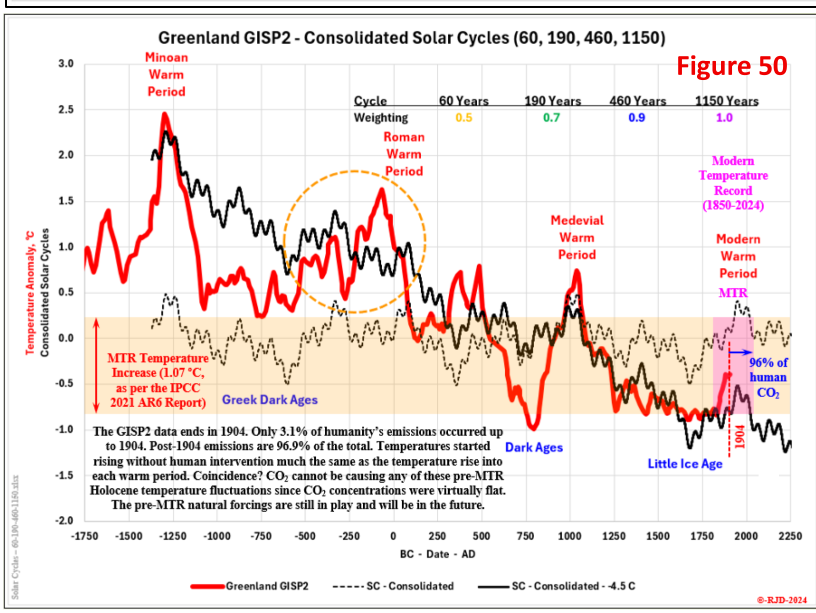


Figure 48

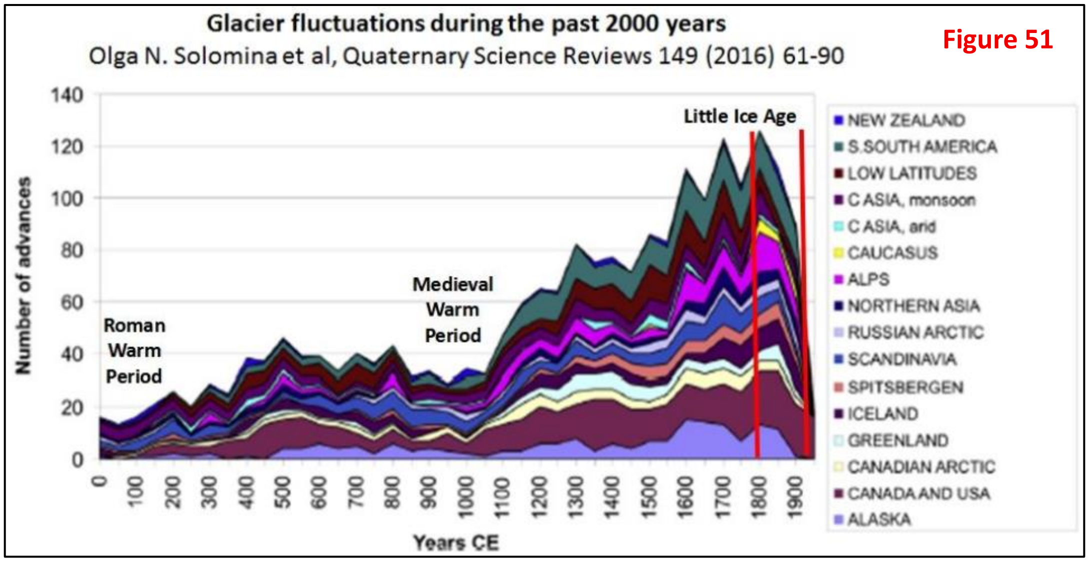
Figure 49 (on the following page) compares my own sinusoidal model (which shows the 60-year cycle) with the Lüdecke and Weiss model. The model was also extended back in time to 1750 BC. The model now covers the 1750 to 2250 AD period.

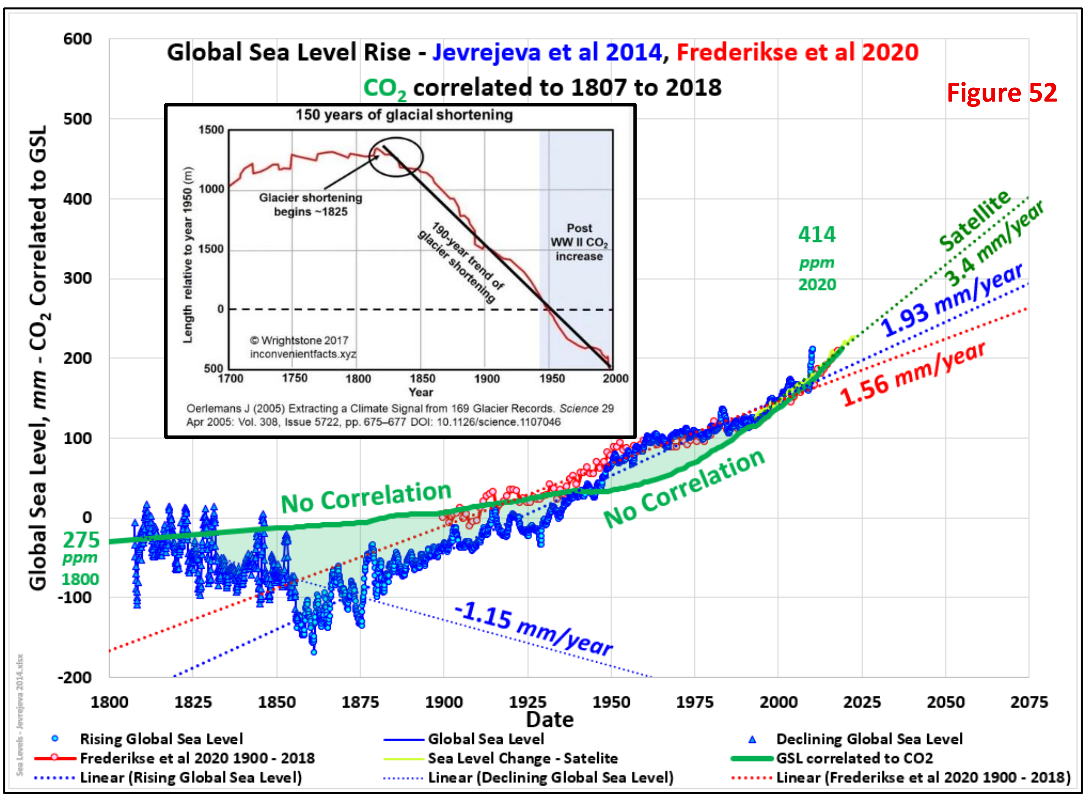




A lot has happened since 1750 BC, and not just in the climate. The new model (above) was laid over the Greenland GISP2 ice core data. 1750 BC to the present covers most of the Holocene Neoglacial period. Temperatures have been generally declining since the Holocene Climate Optimum ended (but with some fluctuations over and below the general decline). That Neoglacial temperature decline is very likely due to Milankovitch's Obliquity cycle. The new model was just pivoted to match the Obliquity decline to produce Figure 50 (above). The IPCC's 2021 AR6 estimate of warming (1.07 °C) out of the Little Ice Age is also highlighted above. The increase in Greenland would be a bit more than 1.07 °C shown here, but not by much. The Vikings were able to inhabit Greenland during the Medieval Warm Period. They could not do so at today's temperatures. A more detailed discussion on temperature distributions and consolidating different datasets can be found in my [CSS-72 – Holocene Stripe Chart – Fact Check](#) post.

Note, glaciers retreated and advanced (Figure 51 and 52, on the following page), as Sea Levels rose and fell (Figure 52), all in unison to the temperature changes of the late Holocene period. That is a lot of 'climate change' going on with no CO_2 contribution. Additional discussion can be found in my [CSS-74 – Climate Tipping Points](#) post.





Overall, the Greenland GISP2 history match is not complete over the Holocene's Neoglacial and still needs work. The same cannot be said for anthropogenic based models, given anthropogenic (primarily CO_2) is virtually flat throughout the pre-MTR Holocene. However, the history match over the Medieval Warm Period to the present correlates very well (Figure 53, below). The model and Greenland temperatures were high during the Medieval warm period, declining steadily into the depths of the Little Ice Age (during the Maunder Minimum), with temperatures rising after the Dalton Minimum. The temperature spikes during the Medieval and Modern Warm Periods are not as prominent as the ice core data indicates. Note, the 1.07 °C increase has been adjusted down by ≈50% to account for the difference in averaging techniques between the ice core data and the modern thermometer temperature measurements. Multiplying the compressed Global Temperature (≈0.5 °C) by three to convert to higher latitude temperatures takes us to roughly 1.5 °C (close to the warmth of the Medieval Warm Period levels and reality).

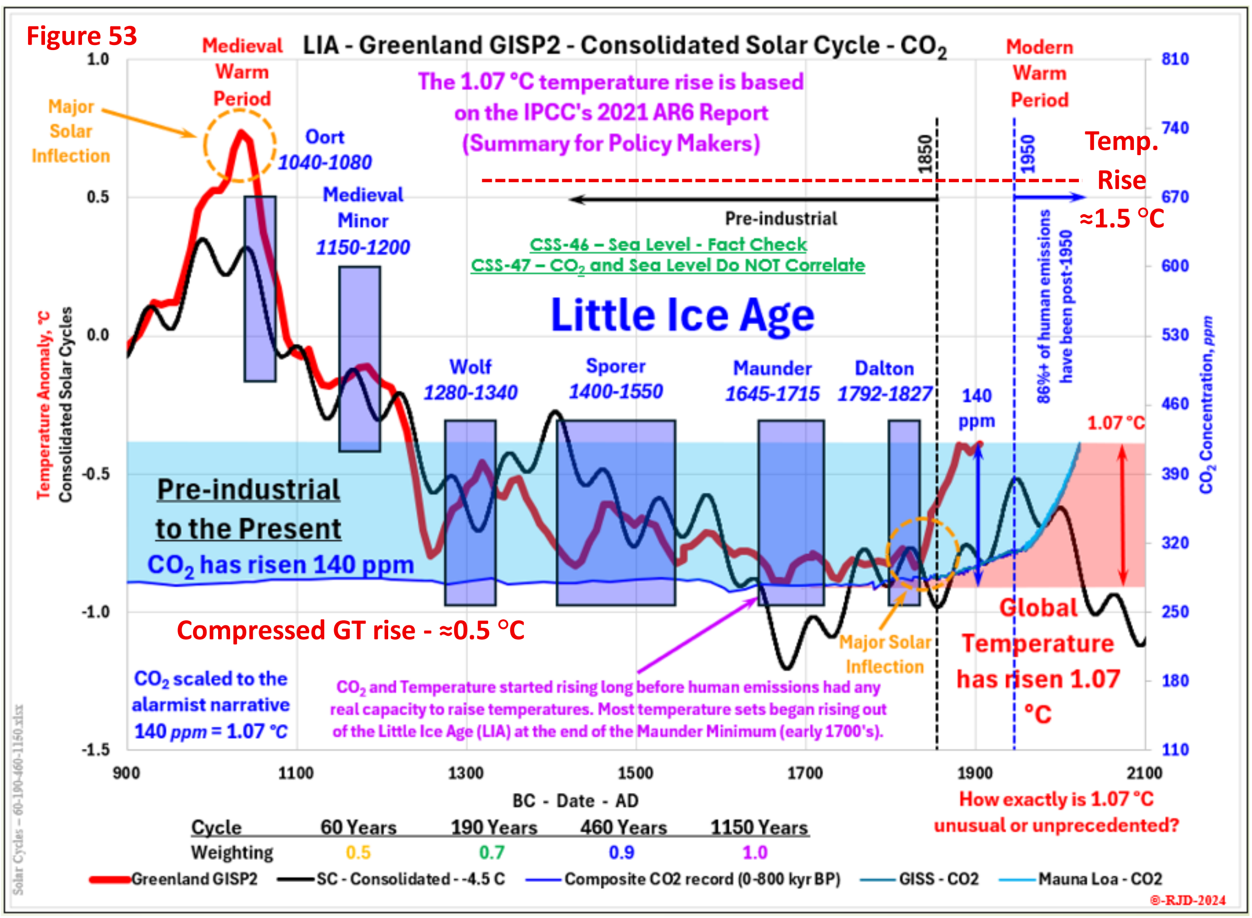
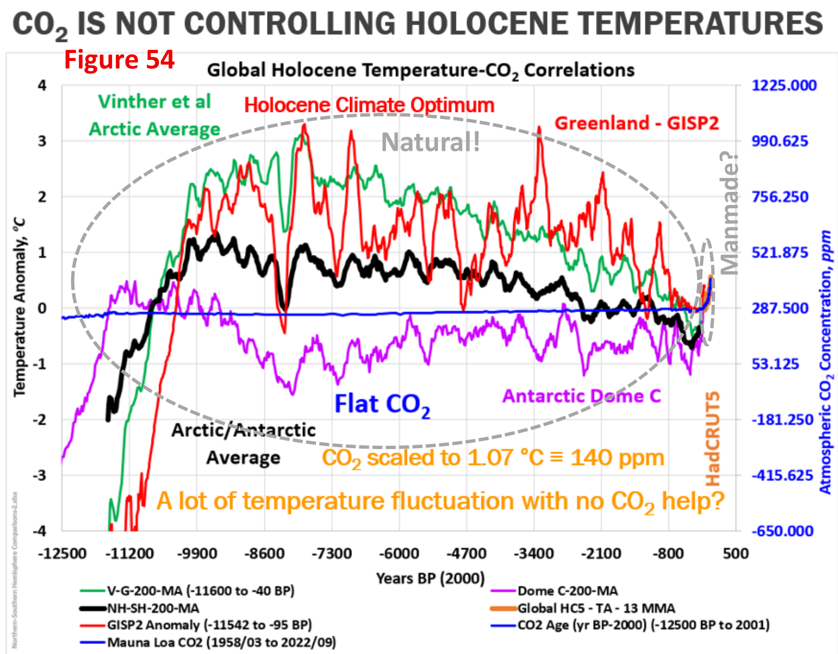


Figure 54 expands the discussion back in time, covering the full Holocene. A similar chart (Figure 4) was presented earlier in the climate model discussion. Note, that all those temperature fluctuations are happening with little to no CO_2 contribution. Those fluctuations are due to natural forcings, NOT CO_2. The natural forcings are virtually all solar related. There are direct influences (TSI (the only IPCC recognised option), CRF, HEP, etc.). And there are also indirect natural forcings. The sun provides virtually all the energy required to drive our oceanic and atmospheric circulations. Seismic and volcanic activity are also contributing some energy to the oceanic and atmospheric circulations. But ultimately, their overall activity levels are often tied to the gravitational and electromagnetic interactions within our solar system, with the sun providing the bulk of those interactions.



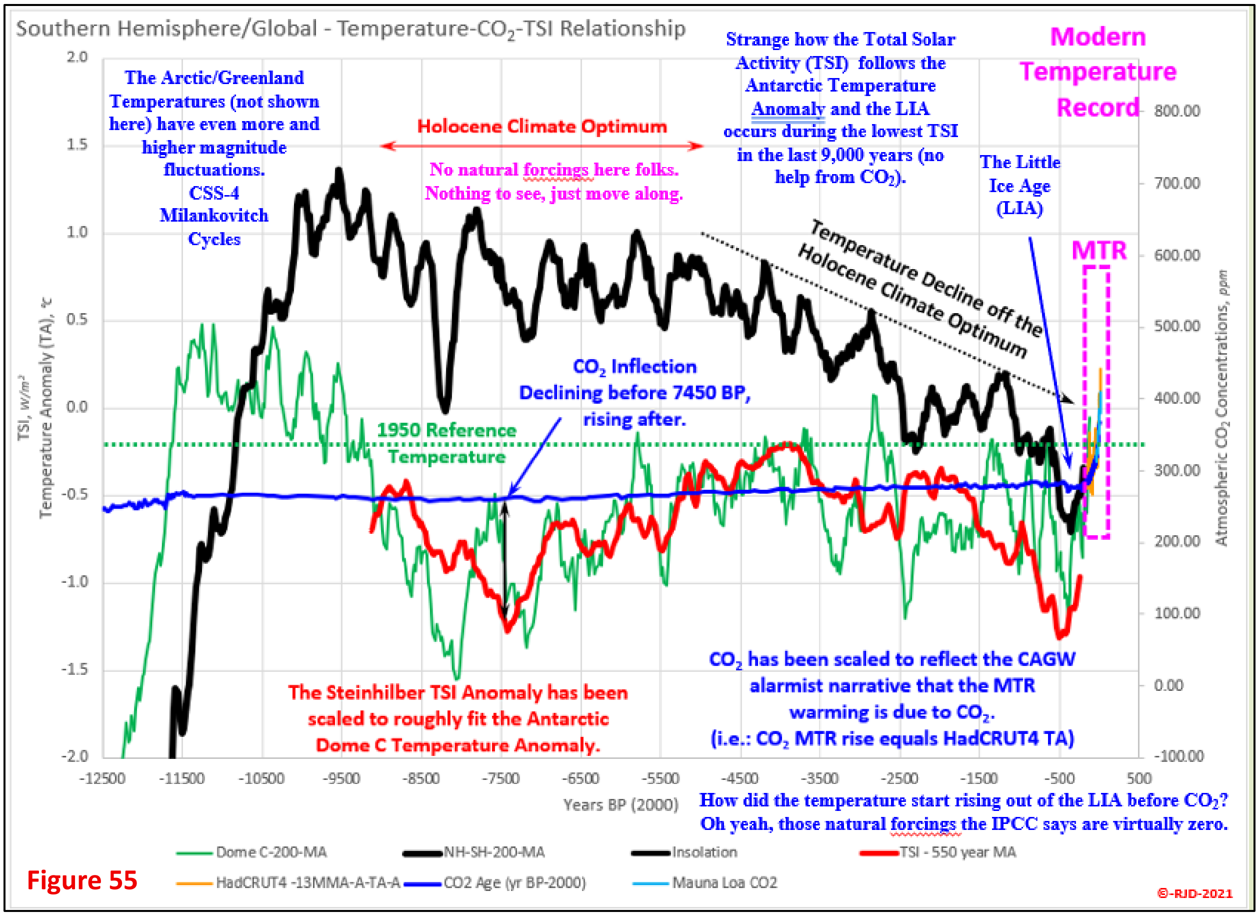
Temperatures fluctuate significantly over the pre-Modern Temperature Record (MTR, 1850 to the present) despite a virtually flat CO_2 concentration.

Those fluctuations are due to natural forcings (solar directly and/or indirectly) that have not stopped acting on our planet just because the alarmists have decreed it so.

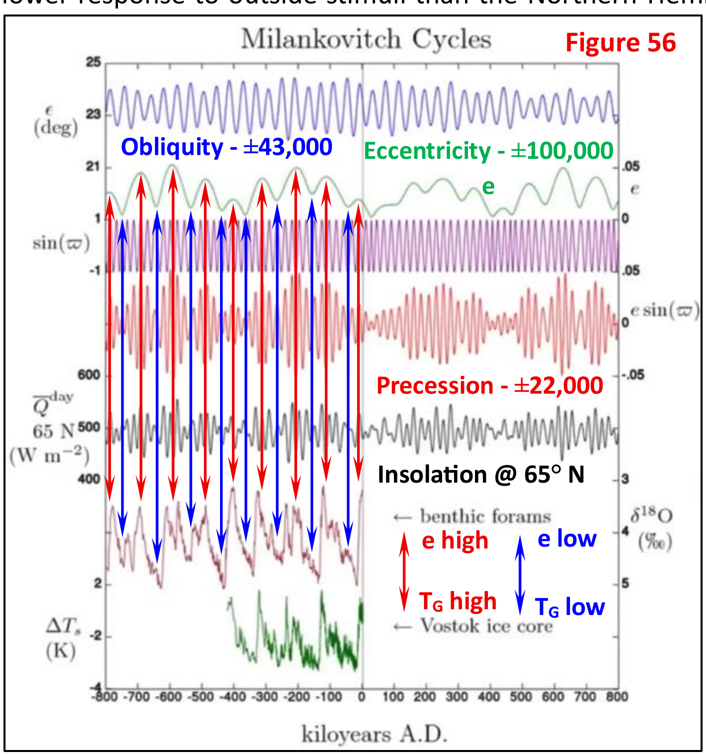
Those natural forcings are set to take temperatures significantly colder!

CO_2 is obviously a non-player throughout the pre-MTR Holocene. Believing that CO_2 has suddenly become the primary driver of 'climate change' is just wrong, simplistic, unscientific, and dangerous. The natural forcings have always dominated and will continue to dominate, just not in the models. Over the Holocene, natural forcings have been the only and therefore dominant climate driver 98.6% of the time. The All CO_2, All the Time alarmist narrative has declared that because CO_2 started rising 175 years ago (1.6% of the Holocene period shown here), CO_2 is now and forever more the dominant climate driver. Ignoring the natural forcings (solar, directly and indirectly) is driving modern society towards economic suicide. The trillions that will be wasted on Net Zero, the Paris Accords, the Energy Transition, etc. will produce only minor temperature rise reductions in the future at a cost of ≈\$10 trillion for every 1/100th of °C of temperature rise averted. That is a dangerous financial gamble for no measurable impact on our climate. A larger more comprehensive discussion is available in my OPPS-32 – Liberal – Net Zero – Cost Benefit, OPPS-33 – What Happens After Net Zero, and PSS-6 – Climate Change – Quick Cost/Benefit Analysis posts.

Figure 55 (on the following page) takes off the northern hemisphere temperatures and adds in the Steinhilber Holocene TSI reconstruction. Southern hemisphere temperatures peaked early in the Holocene, gradually declined, then accelerated to a low around 8000 BP (2000). Temperatures rose steadily from 7450 BP (2000) reaching a general peak during the Minoan Warm Period before transitioning to a steady decline into the depths of the Little Ice Age and finally rising back up over the MTR. Strangely, Steinhilber's TSI reconstruction follows a similar profile. Note, the Steinhilber data shown here is a 550 Year Moving Average. The detailed Steinhilber data (not shown here) confirm that the lowest TSI in the last 7,000+ years occurred during the Little Ice Age and the highest TSI in the last 7,000+ years occurred during the Modern Warm Period we are currently living through. Purely coincidental, I am sure. Although the CO_2 concentrations were virtually flat over the pre-MTR Holocene, the general trend was a very small gradual decline to roughly 7450 BP (2000), followed by a very small gradual rise that transitioned to a much steeper rise around 1850. All three property trends (TSI, Antarctic Temperatures and CO_2) were generally moving in unison. Solar activity appears to be driving Antarctic Temperatures which in turn drive CO_2 concentrations during the pre-MTR Holocene. CO_2 is not a driver option over the pre-MTR Holocene!

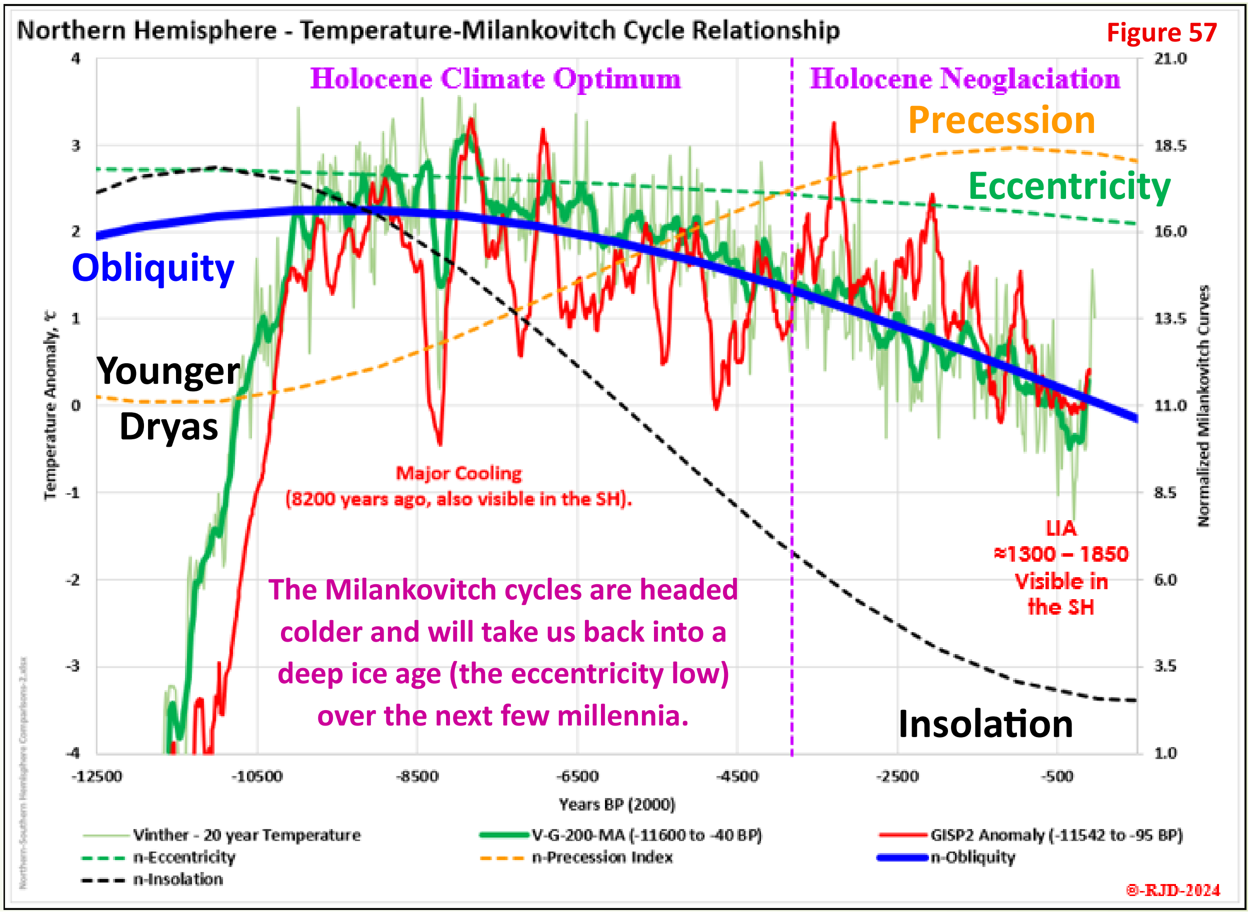


The Southern Hemisphere (which has a very high ocean to land ratio 4.2 (i.e.: only 19.1% land)) has a far lower response to outside stimuli than the Northern Hemisphere (which has a ratio of 1.6 (39% land)).



Solar activity appears to influence the temperatures in Antarctica itself (60°S to 90°S), but the same response is not seen in the mid and equatorial latitudes where the temperatures are much more stable. Those temperature profiles have been reproduced by Kaufman et al and can be accessed from my CSS-44 – Global Temperature Distributions and CSS-72 – Holocene Stripe Chart – Fact Check posts. Just in general, temperatures over land are far more responsive than temperatures over water. Most of the CO_2 response would be coming from these open water, more stable latitudes and would therefore be muted.

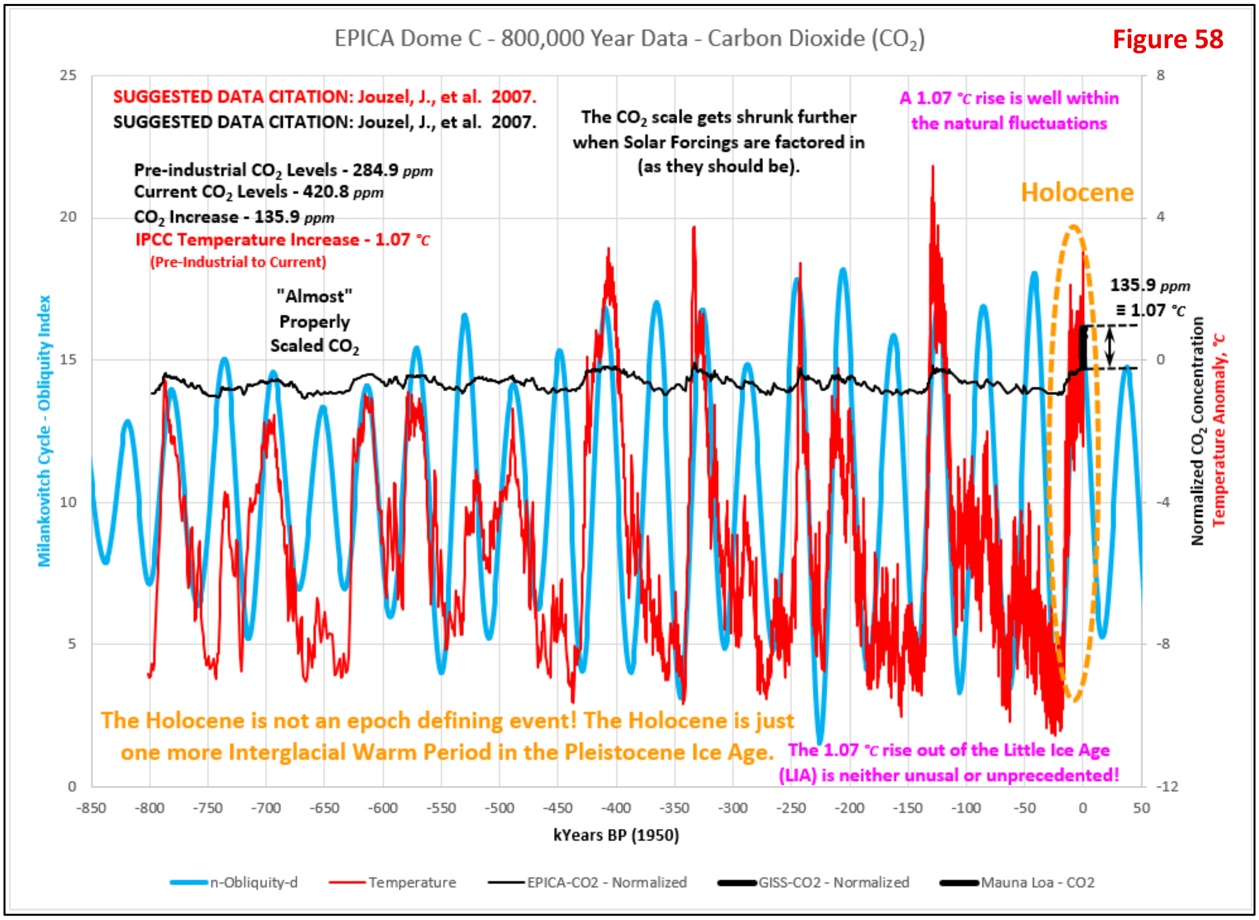
The larger temperature trends are being driven by the Milankovitch cycles (shown in Figure 56, schematically to the left).



The Milankovitch cycles express themselves differently in the two hemispheres. The Northern Hemisphere temperature profiles are dominated by the Obliquity Cycle (the axial tilt). Temperatures began rising sharply out of the Last Glacial Maximum around 15,000 years ago. That rise was interrupted by the events of the Younger Dryas that quickly dropped the planet back into the deep freeze for a few thousand years. Around 12000 years ago, temperatures abruptly rose producing the Holocene Interglacial Warm Period that we are, thankfully, still living through. The Obliquity Curve peaked in the early Holocene and has been on a steady decline. The Eccentricity Curve has been gradually declining throughout the Holocene. The Precession Curve (the shortest cycle) rose through most of the Holocene but transitioned to cooling during the Medieval Warm Period. All three cycles are heading lower (i.e.: cooling). The combined cooling will very likely drive us into a new ice age within the next few thousand years. And CO_2 warming is not going to prevent that scenario.

The Southern Hemisphere appears to reflect the Insolation Curve through the early Holocene and then transitions to a Precession like profile. A delayed Obliquity may also be expressing itself in the mid to late Holocene temperatures. On short time periods, the Milankovitch curves can be affected by some of the other solar cycles. A full picture is complicated and was discussed in more detail in one of my earlier posts, CSS-4 – Holocene and the Milankovitch Cycles.

The Obliquity Curve appears to coincide very well with most of the temperature spikes over the last 800,000 years. Figure 58 (on the following page) has plotted the Obliquity Curve (with a 6500-year delay) against the EPICA Dome C ice core temperature data. The CO_2 concentration was also included, but scaled to reflect the All CO_2, All the Time narrative that 135.9 ppm equates to temperature rise of 1.07 °C (which is well within the natural variability range). The Obliquity delay shows the correlation a bit clearer.



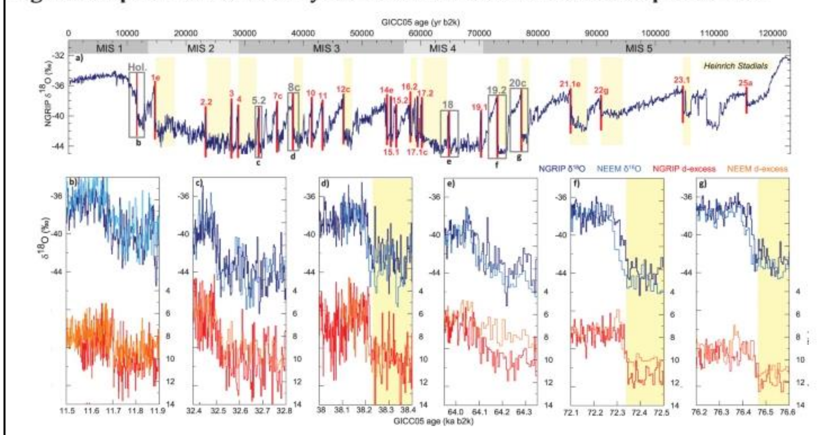
Note, the Eccentricity Cycle also has an interesting correlation (shown back on Figure 56). Every eccentricity high over the last 800,000 years corresponds to an interglacial warm period. And every eccentricity low corresponds to a glacial maximum. We are within a few thousand years of the next eccentricity low. Could we be nearing a tipping point that takes us into the next Little Ice Age or a deep ice age? Maybe earlier than we think? We shall see.

This data set covers the last 800,000 years of the Pleistocene Ice Age that began roughly 2.6 million years ago. Despite the official designation of the Holocene as a new epoch, the Holocene is very likely just one more interglacial warm period within the Pleistocene Ice Age that will likely persist for many more millions of years as we continue to circumnavigate the Sagittarius-Carina arm of the Milky Way galaxy. A more detailed discussion can be found in my [CSS-24 – Is the Holocene Really a New Epoch] post.

The data above shows definitively that the 1.07 °C temperature rise since the pre-industrial era is neither unusual nor unprecedented. Temperatures routinely fluctuated sharply on the same order of magnitude and intensity throughout the Holocene. Further back in time, those temperature change magnitudes were significantly higher. And like the pre-MTR Holocene, those pre-Holocene temperature changes have little to do with CO_2 concentration changes.

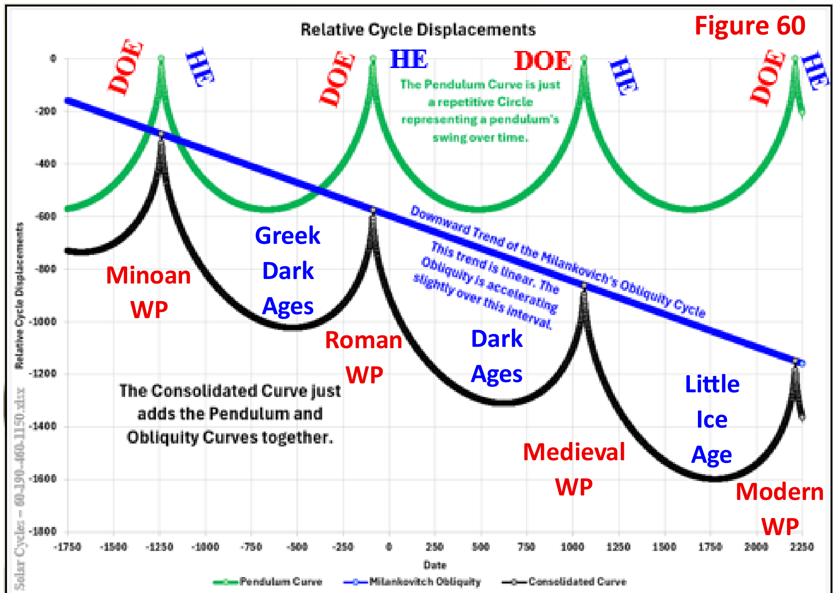
The Milankovitch cycles explain many of the long-term temperature changes/trends. But there are still many shorter-term fluctuations. Figure 59 below shows the 120,000-year temperature profile produced from Greenland's NGRIP ice core record. The temperature data is full of sharp temperature drops (Heinrich events or cold stadials) and rises (Dansgaard-Oeschger (DO) events or warm interstadials). DO events are abrupt temperature increases (warm interstadials, 5 to 10 °C) that have nothing to do with CO_2 and dwarf the minor 1.07 °C temperature rise humanity experienced over the last 170 years (a muted DO event). DO events have occurred regularly over the warm Holocene interglacial warm period. They are just more muted than when they occur during the deep ice age periods.

Fig. 1: Abrupt climate variability recorded in Greenland water isotopic records.



a NGRIP δ18O record[5]. Studied abrupt warming transitions are highlighted with red vertical bars and Greenland Interstadials (GI) are numbered[38]. Gray boxes indicate intervals shown in (**b**–**g**), illustrating the variety of abrupt GS–GI transitions across the Last Glacial; stadials containing Heinrich events are indicated in yellow following refs. [53,85], and Marine Isotope Stages (MIS) are indicated in gray. **b**–**g** High-resolution δ18O from NGRIP (dark blue) and NEEM (light blue) and d-excess from NGRIP (red) and NEEM (orange) over 400 yr time intervals centered on the Holocene abrupt onset (**b**) and the abrupt transitions into GI-5.2 (**c**), GI-8c (**d**), GI-18 (**e**), GI-19.2 (**f**), and GI-20c (**g**). **Figure 59**

DO events are followed by relatively abrupt temperature declines that produce the highlighted, broader cold Heinrich stadials shown here and in the Holocene ice core temperature data shown previously.



Modeling the interstadial and stadial temperature profiles is not sinusoidal in nature. However, they can be modeled closely using a pendulum curve. The period represented in Figure 60 to the left covers the declining temperatures of the Holocene Neoglacial period from the Minoan Warm Period to the Modern Warm Period. The **bold black curve** is a consolidation of the **green Pendulum Curve** and the **blue Obliquity Curve**. The black curve is a model for the natural forcings (definitely not CO_2) that warm the planet to the point where the poles warm enough to send evermore icebergs down into the mid-latitudes (reaching a tipping point that leads to abrupt cooling).

How well does that simple model fit the Greenland GISP data? Remarkably well and infinitely better than the All CO_2, All the Time alarmist narrative. Figure 61 (on the following page) shows that correlation.

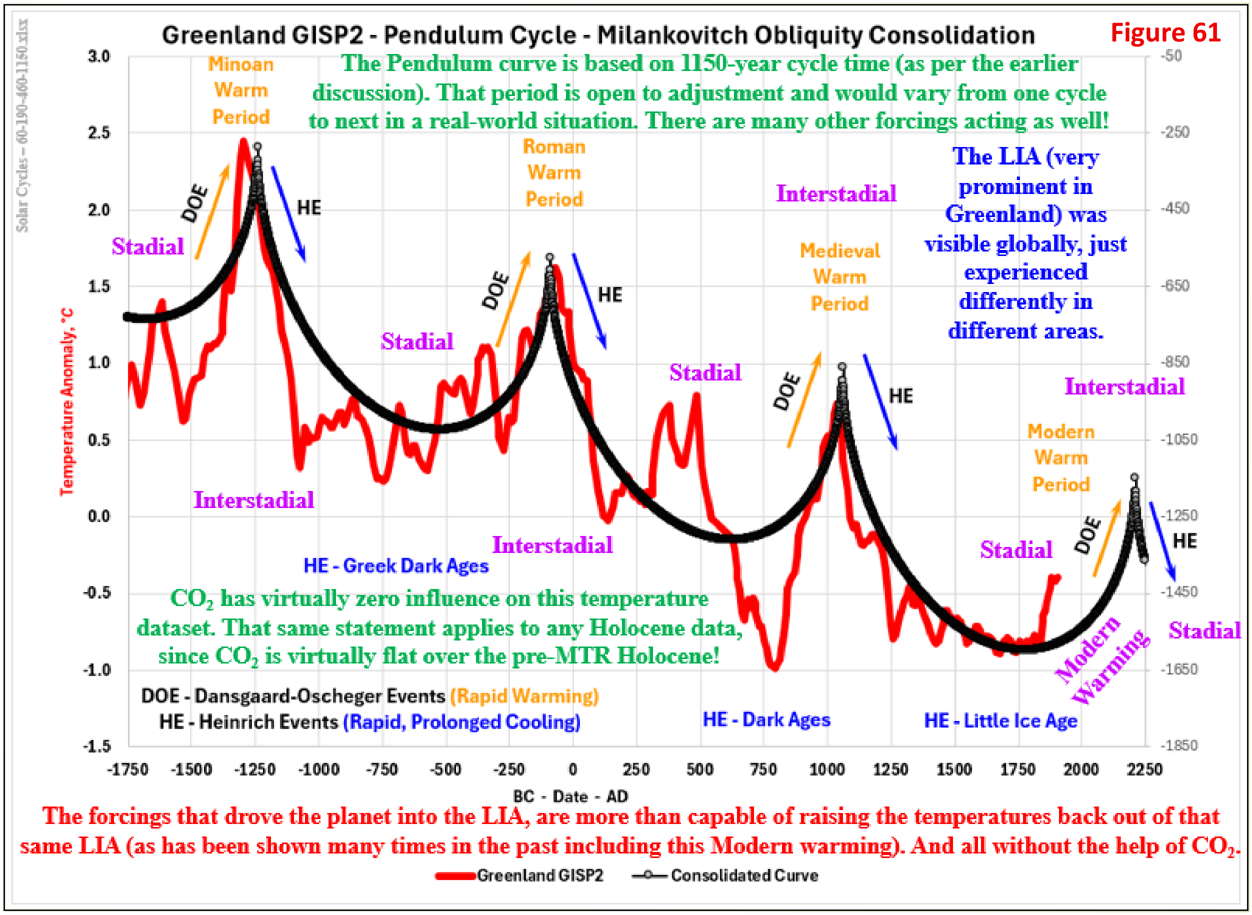


Figure 61

The Pendulum Curve, shown here, cycles on a 1,150-year frequency. There are definitely some deviations that cannot be explained with this simple format. But they are definitely not explainable using anthropogenic forcings. The next step would be a more comprehensive solar activity consolidation that includes the sinusoidal modeling shown in Figure 50. That is not currently on my unpaid, volunteer docket. Remember CO_2 concentrations over this period were virtually flat (with a small uptick at the end). The temperature data began rising prior to 1850 (no help from CO_2) and ends in 1904.

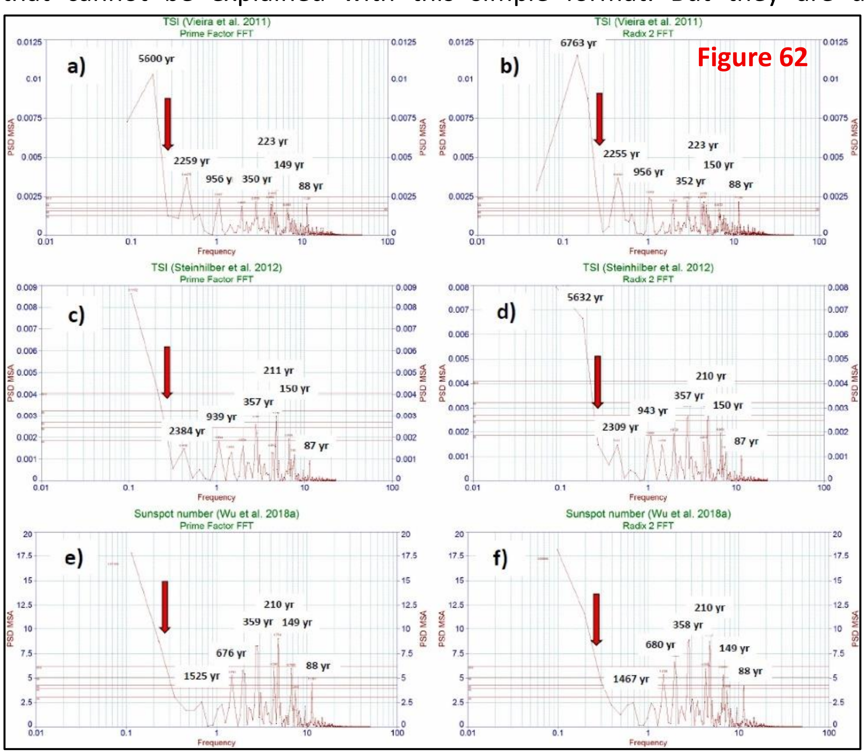
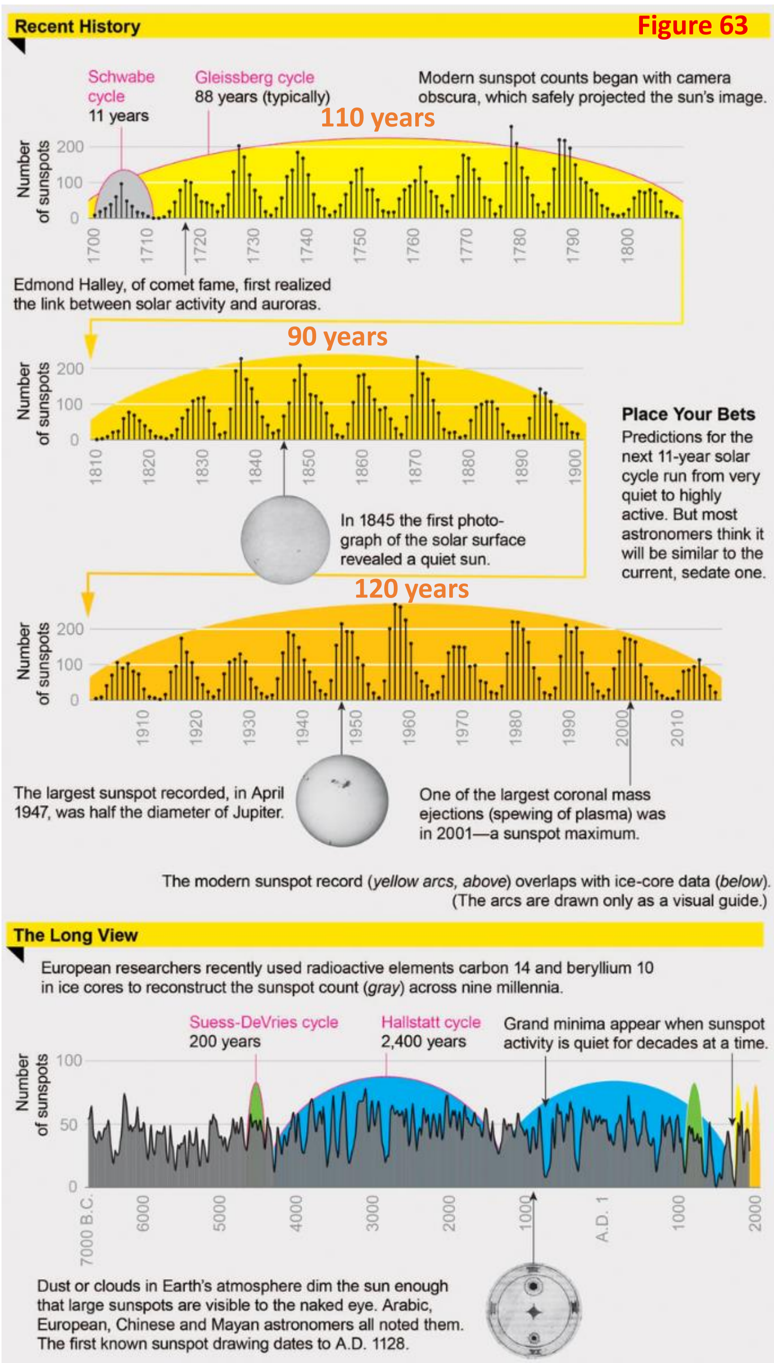


Figure 62

There are more solar cycles that could be added into a potential model. Figure 62 (to the left) shows the Fourier

Spectrum Analysis for three different solar related datasets (using two analysis techniques for each dataset). Several of the important solar cycles are highlighted. These charts were pulled from Paolo Viaggi's 2021 paper, *"Quantitative impact of astronomical and sun-related cycles on the Pleistocene climate system from Antarctica records"*. The Gleissberg Cycle has a frequency of 88 years (highlighted in a Scientific American article from August 2018, Figure 63 courtesy Katie Peek).



But as Alexei Pevtsov, an astronomer at the National Solar Observatory in Boulder, Colo. points out: *"There's an element of randomness."* The Scientific American (SA) article shows a range from 90 to 120 years. Solar Cycle 25 (not shown here) was a bit stronger than SC24, suggesting the cycle might be strengthening (i.e.: warming) again. But there is that randomness to consider and there are other cycles in play. SC20 was a random drop that coincides with the 1970's "Ice Age is Coming Scare".

Both the SA article and the Viaggi paper highlight the Suess-DeVries cycle (200 and 210 years, respectively). This cycle length also corresponds to a lunar cycle identified by Dr. Dilley (to be discussed later).

The Grand Solar Minimum (GSM) cycle shows up in the Viaggi Fourier Spectrum Analysis (FSA, with a 350-to-400-year cyclicity). SA mentions the Grand Minima without stating a periodicity. Zharkova's work (discussed earlier) also showed the GSM cycle.

The Bond/Eddy cycle (±1,000 years) shows up in Viaggi's analysis but is not mentioned in the SA discussion. More on that later.

The Hallstatt cycle (2,400 years) is also visible in both documents. The 6,000-year Heinrich cycle is only discussed in the Viaggi paper. There are two other cycles visible in the Viaggi FSA. The ±150-year peak does not seem to be discussed in the historical literature and therefore remains unnamed at this point.

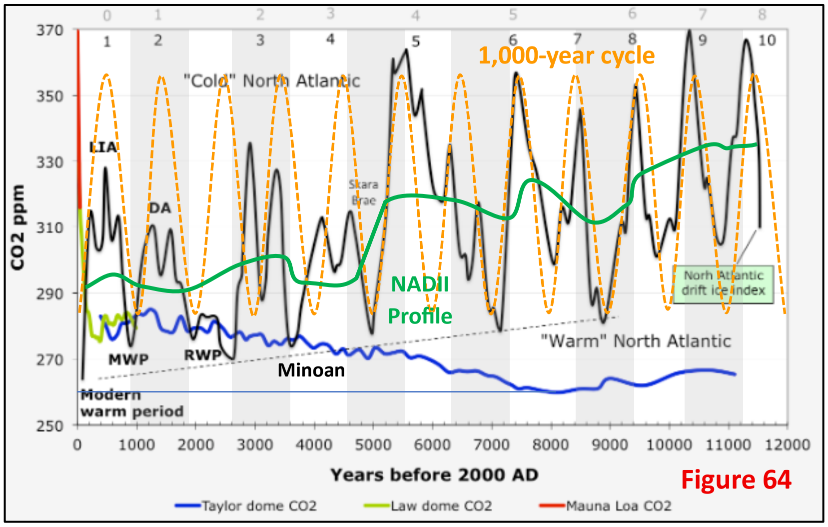


Figure 64

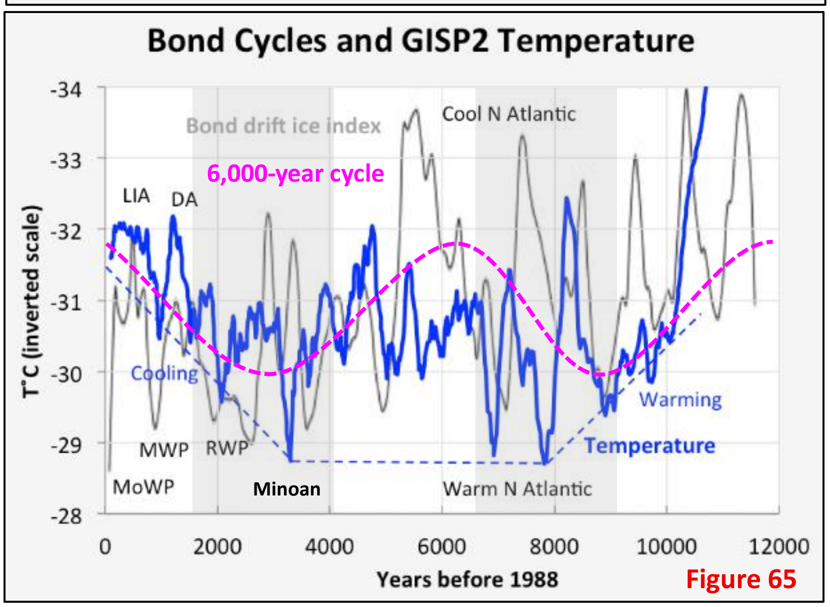


Figure 65

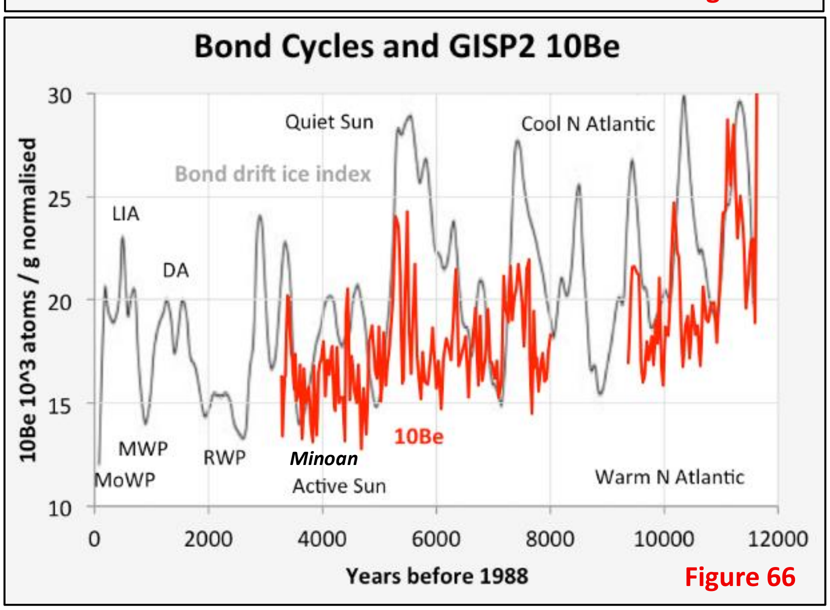


Figure 66

The other unnamed cycle is longer (±1,500 years) and could be a sub harmonic on a longer cycle (like the ±6,000-year Heinrich cycle).

The Bond/Eddy cycle (±1,000 years) is an important solar activity indicator that reflects directly on humanity's historical, current and future climate scenarios. As shown earlier, solar activity is expressed strongly in Greenland's historical data. Those effects may be more muted globally, but they are there. The three charts (Figures 64, 65, and 66) shown here plot the North Atlantic Drift Ice Index (NADII) against CO_2, the North Atlantic Temperature, and solar activity (based on Beryllium isotopes, ^{10}Be), respectively.

These charts were pulled from Eaun Mearns discussion of Bond et al's 2001 paper, *"Persistent Solar Influence on North Atlantic Climate During the Holocene"*.

The peaks in the NADII correspond to a Quiet sun and a colder North Atlantic, the valleys, a more active sun and a warmer North Atlantic. Figure 65 overlays the NADII with the Greenland Summit (GISP2) temperatures. Not surprisingly, the North Atlantic temperatures are reflected in the NADII data and Greenland temperatures (shown earlier in Figure 45). Note a 1,000-year cycle was added to Figure 65.

Conversely, CO_2 does not correlate to NADII (or global temperature as shown earlier in

Figure 54). Note, CO_2 has been scaled to represent the All CO_2, All the Time alarmist narrative (140 ppm ≡ 1.07 °C) in Figure 64. CO_2 concentrations over the pre-MTR Holocene stayed within a tight range (260 to 285 ppm) and is obviously not driving the NADII (or any climate for that matter).

As mentioned earlier, the Bond Cycle is very visible in the Greenland Summit Temperature data. The Holocene temperature spikes/interstadials (i.e.: the Medieval, Roman, Minoan, etc. Warm Periods) and

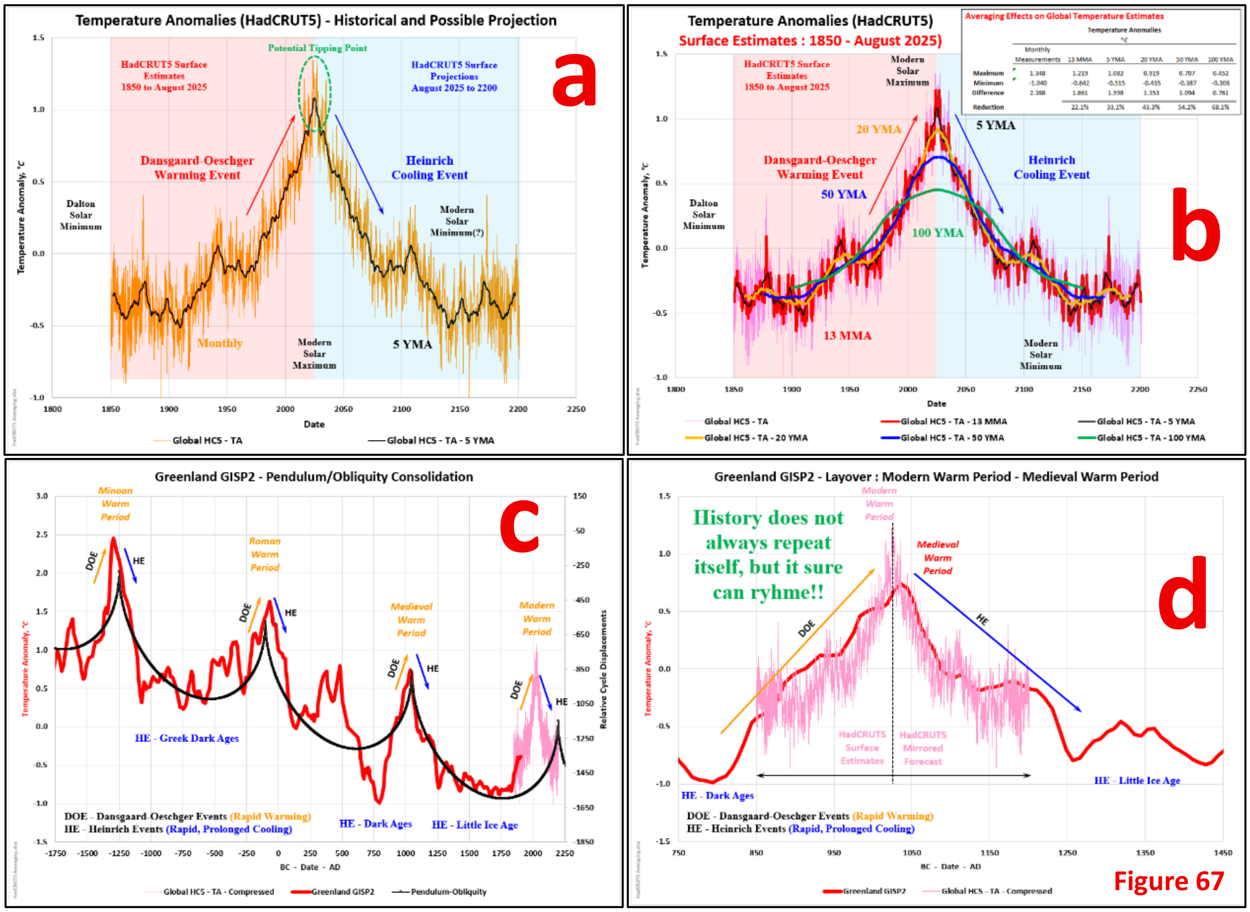


Figure 67

valleys/stadials (i.e.: the Little Ice Age, Dark Ages, Greek Dark Ages, etc.) are real and well documented. Those same events are playing out as I am putting these words to paper. We are living through the Modern Warm Period, the most recent Dansgaard-Oeschger event (i.e.: the warming out of the Little Ice Age). Remember, the pre-MTR Holocene temperature fluctuations are due entirely to natural forcings. CO_2 concentrations remained virtually flat and incapable of contributing to temperature change (as shown earlier on Figure 53). Figure 53 also confirms that recent warming began long before CO_2 concentrations began rising. The deepest cold occurred in the late 1600s, during the Maunder Solar Minimum. The initial warming out of the Little Ice Age was interrupted in the early 1800s by the Dalton Minimum cold. Post Dalton, temperatures again started rising as shown in Figure 67a (top left). But how much of that temperature rise is due to CO_2? That depends on CO_2's Equilibrium Climate Sensitivity (ECS, unsettled science, discussed earlier). How much of the MTR temperature rise is due to humanity's emissions? Again, unsettled science, but we know that 87%+ of humanity's emissions occurred post-1950. Any warming pre-1950 must be primarily due to natural forcings!

The Modern Temperature Record (the homogenized HadCRUT5 surface temperatures, 1850 to the present) represents the tail end of the current Dansgaard-Oeschger event. Have we reached the tipping point where, historically, temperatures start dropping into the next Heinrich event? That is an open question, but we are likely getting close. There have been many papers/reports outlining that the Atlantic Meridional Overturning Circuit (AMOC) is either slowing down, stable, or speeding up (welcome to "climate science" 2025). In reality, the AMOC will likely collapse suddenly, whether it is through the NADII process and/or an overdue, major release of the cold, freshwater Beaufort Gyre into the North Atlantic. The North Atlantic cold blob may be an indication that we are approaching an AMOC collapse, which will cool off the Northern Hemisphere significantly and we will find ourselves in a new Little Ice Age.

There is no commonsense reason to believe that this Modern Warm Period will behave any differently than any of the previous DO/H events over the last 12,000 years. What will that Heinrich event look like? Very much like a mirror image of the preceding DO event based on historical profiles. That mirror image was added to the HadCRUT5 temperature data to produce a full DO/H event cycle model. Figure 67b (previous page) highlights how averaging data over different time intervals compresses the temperature information. The monthly data has a range of 2.388 °C, the 100-year moving average range is just 0.761 °C (a 68.2% reduction). This is important when comparing data sets that are averaged over different periods (i.e.: HadCRUT5 (monthly) and Greenland GISP2 (±100 years)). The short-term spikes visible in the monthly data, disappears progressively as longer averaging periods are used.

Figure 67c, on the previous page, consolidates the HadCRUT5 DO/H event model with the Greenland GISP2 data. The consolidation as shown is very likely historically correct. Peak monthly HadCRUT5 temperature spikes are slightly above the Greenland GISP2 Medieval Warm Period temperature, but when averaging is incorporated, those peak averaged temperatures would be a bit below the GISP2 MWP levels (i.e.: Greenland temperatures are not warm enough right now to support a Medieval Viking colony).

Figure 67d, on the previous page, superimposes the HadCRUT5 DO/H event model on the previous DO/H event (i.e.: the Medieval Warm Period). Interesting (but not surprising) how closely the two periods match. These events are real, sudden, and well documented in both historical empirical data sets and societal archives. The mechanisms are not fully understood, but neither was gravity until Newton was hit on the head by an apple. This might also be a great time to point out, once again, that CO_2's influence on our climate is also not fully understood. Remember, the IPCC uses a 1.8 to 5.7 °C ECS range in their models (that all run too hot, with or without unrealistically high emission scenarios).

The Bond cycle shown below in Figure 68 was pulled from A. Moberg et al's 2005 paper *"Highly variable Northern Hemisphere temperatures reconstructed from low- and high-resolution proxy data"*. The

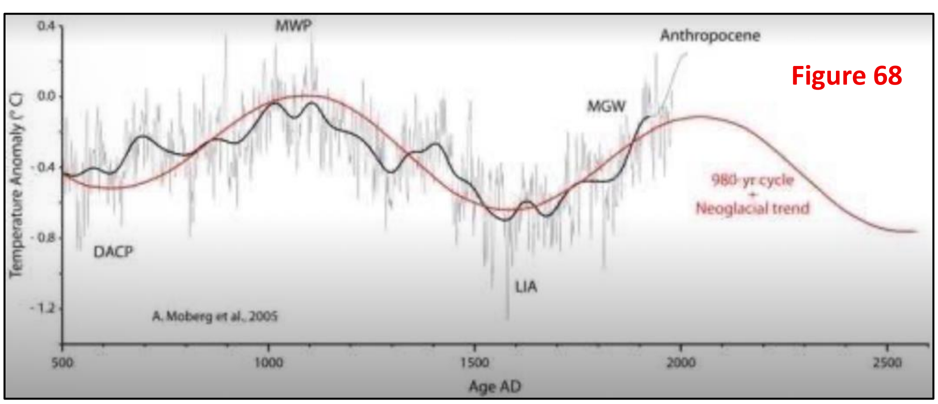


Figure 68

sinusoidal cycle shown here is just 980 years long and honours the Neoglacial decline (i.e.: the Milankovitch Obliquity cycle). Note, the DO/H event cyclicity in Figure 67c was a bit higher at 1,150 years. Are these relatively small differences a problem? No, there is always some natural variability within a system as complex as our climate. The general trends are there and there are obviously many cycles at play over the pre-MTR Holocene, just NOT CO_2 (at least not based on CO_2's ice core data). There are CO_2 estimates based on chemical measurements that suggest that CO_2 levels were not always as low as the ice core data shows. Figures 69 and 70 below highlight some of those differences.

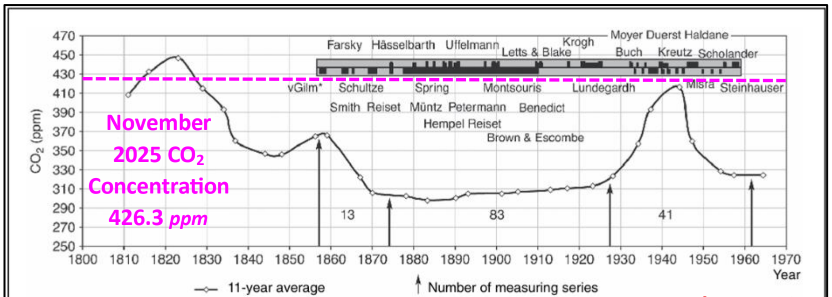


Figure 69

Figure 10
11-YEAR AVERAGED CO_2 MEASUREMENTS IN NORTHERN HEMISHPHERE (1812-1961)
For most of the 19th and 20th centuries, atmospheric CO_2 measured above 300 ppm, and sometimes above 400 ppm, despite claims to the contrary by Keeling and the IPCC. This 11-year averaging of data has eliminated short-term daily and seasonal variations. The researchers who compiled the data are noted by name, roughly on a time line; the bar diagram shows the periods of data coverage; and the number of measuring series for each period is given between the arrows.

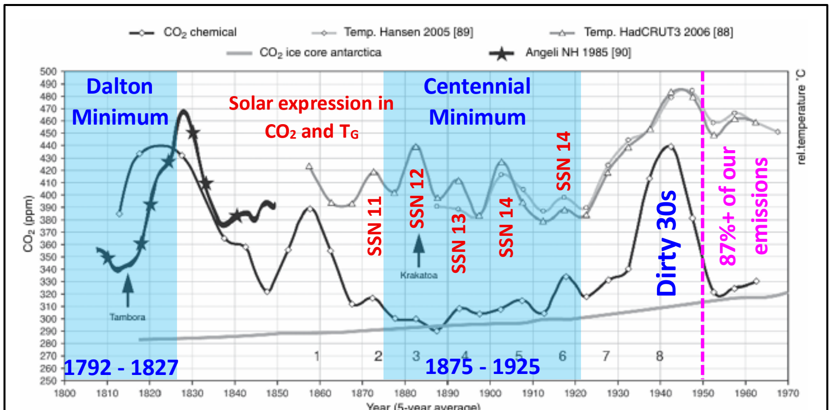


Figure 70

Figure 13
5-YEAR AVERAGED CO_2 MEASUREMENTS, COMPARED TO TEMPERATURE RECORD AND ICE CORE RECONSTRUCTIONS (1812-1970)
Plotted on a 5-year average, the shorter-term CO_2 fluctuations reassert themselves, showing a close correlation with temperature and suggesting that temperature is driving the level of CO_2, not the other way around.

Atmospheric CO_2 concentrations can be determined accurately using chemical measurements. The problem with those measurements, they do not conform to the All CO_2, All the Time alarmist narrative. These two plots were pulled from some work done by Ernst-Georg Beck in his 2007 paper, *"180 Years of Atmospheric CO_2 Measurement by Chemical Methods"*. There are three periods of higher CO_2 in the historical data. The highest CO_2 levels since 1800 occurred in the early 1800s (440 to 470 ppm, shortly after the Dalton Minimum ended). A second lower spike peaked between 1855 and 1860 at 390 ppm. The third prominent spike peaked in the early 1940s (the end of the dirty 30s) at 440 ppm.

The chemical measurement profile is significantly more erratic than the slow gradual increase visible in the Antarctica ice core data. Ice core CO_2 concentrations were just 320 ppm in 1970 at the end of this dataset (a bit lower than the chemical measurement estimate). Since 1970, CO_2 concentrations have risen to 426.26 ppm (November 2025). Those levels are strangely like the three peaks in the chemical measurement data. Those same three peaks correspond to warm periods in the past, two of which were warmer than our current temperatures. Begs the question, how much of our current atmospheric CO_2 concentration is due to natural forcings (i.e.: natural degassing from the warming oceans)? Humanity's contribution to CO_2 concentrations does not explain the spikes shown here, given that 87%+ of our emissions occurred post-1950. The chemical measurements certainly indicate that CO_2 levels could (for the most part) just be reacting to the natural fluctuations in global temperatures we have been experiencing. Just more evidence that CO_2 may not be as important as the All CO_2, All the Time alarmist community would like you to believe.

Ultimately, the lower the CO_2 influence, the more important the natural forcings become (i.e.: solar (directly or indirectly)). The shorter solar cycles discussed to this point have the most effect on our individual lives. The Bond/Eddy Cycle, at ±1,000 years will very likely have a profound effect on us because we are approaching the DO/H event tipping point. Longer cycles like the Milankovitch cycles, and the Hallstatt cycle (±2,200 years, Figure 71 to the left) tend to produce steady but slow temperature changes. They could be cooling or warming depending on where they are in their cyclicity. The Milankovitch cycles are all pushing us towards colder temperatures, ultimately a deep ice age within the next few millennia. The Hallstatt cycle is currently in a warming phase (reflected in the earlier Zharkova (Figure 19) and my own (Figure 29) schematics). The underlying TSI reconstruction (Reimer et al 2009, based on Carbon 14 (^{14}C) isotopes) was pulled from the 2023 Zharkova et al paper, *"Periodicities in Solar Activity, Solar Radiation and Their Links with Terrestrial Environment"*. The Reimer et al 2009 paper is titled *"IntCal13 and MARINE13 radiocarbon age calibration curves 0-50,000 years cal BP"*. The Fourier Spectrum Analyses shown in Figures 72 (TSI - Vieira et al 2011, ^{10}Be) and 73 (TSI – Steinhilber et al 2012, ^{14}C) confirm the presence of the Hallstatt cycle (and others).

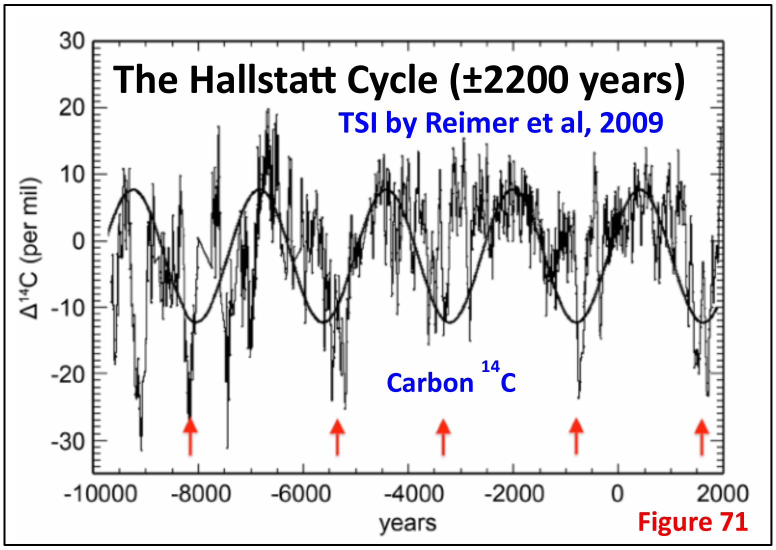


Figure 71

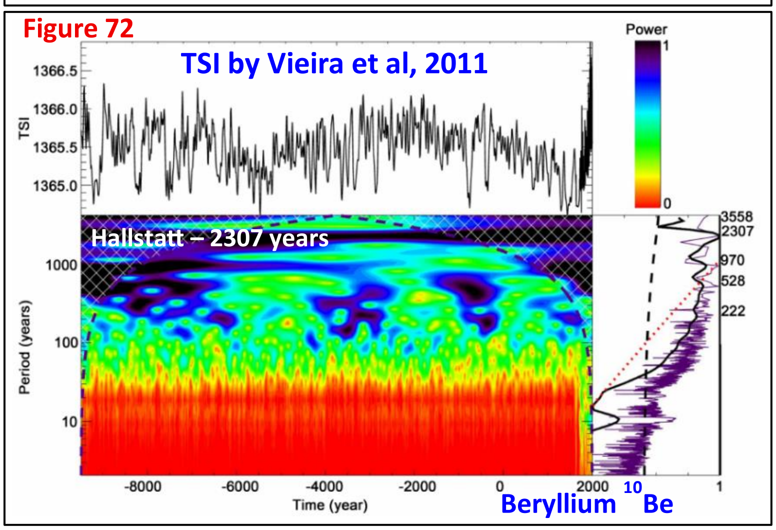


Figure 72

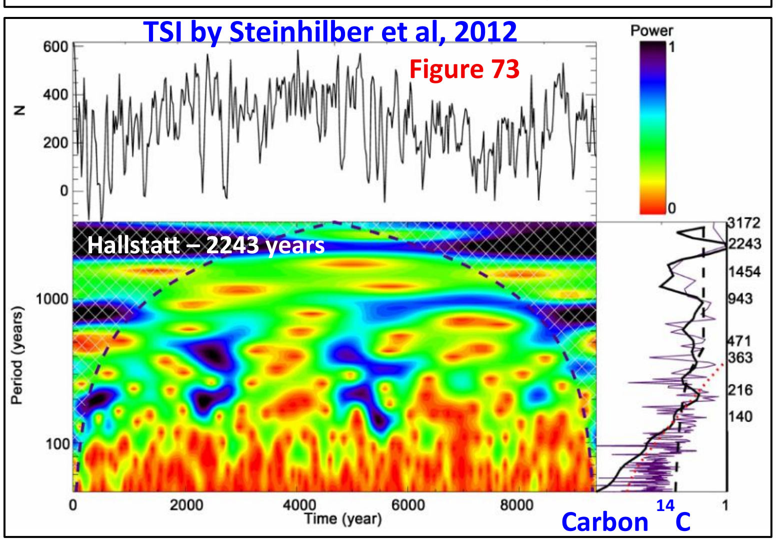


Figure 73

The discussion so far has focused on the sun. But there is another celestial body that interacts with the earth very closely, the moon. Work by Dr. David Dilley has shown that the moon's orbital characteristics also appear to influence our global temperatures. He has identified cyclicities of 9, 72, 220, and 1200 years.

There are both gravitational and electromagnetic correlations with temperature. Plant stomata density also correlates with the temperature data (which was drawn from D.E. Koelle's work with tree ring data from Antarctica and Greenland). There also appears to be some older CO_2 chemical measurement estimates by Beck that I can neither confirm nor deny. The information is presented in Figure 74, below. More confirmation is needed on Dr. Dilley's work, but the work is interesting and should be followed up

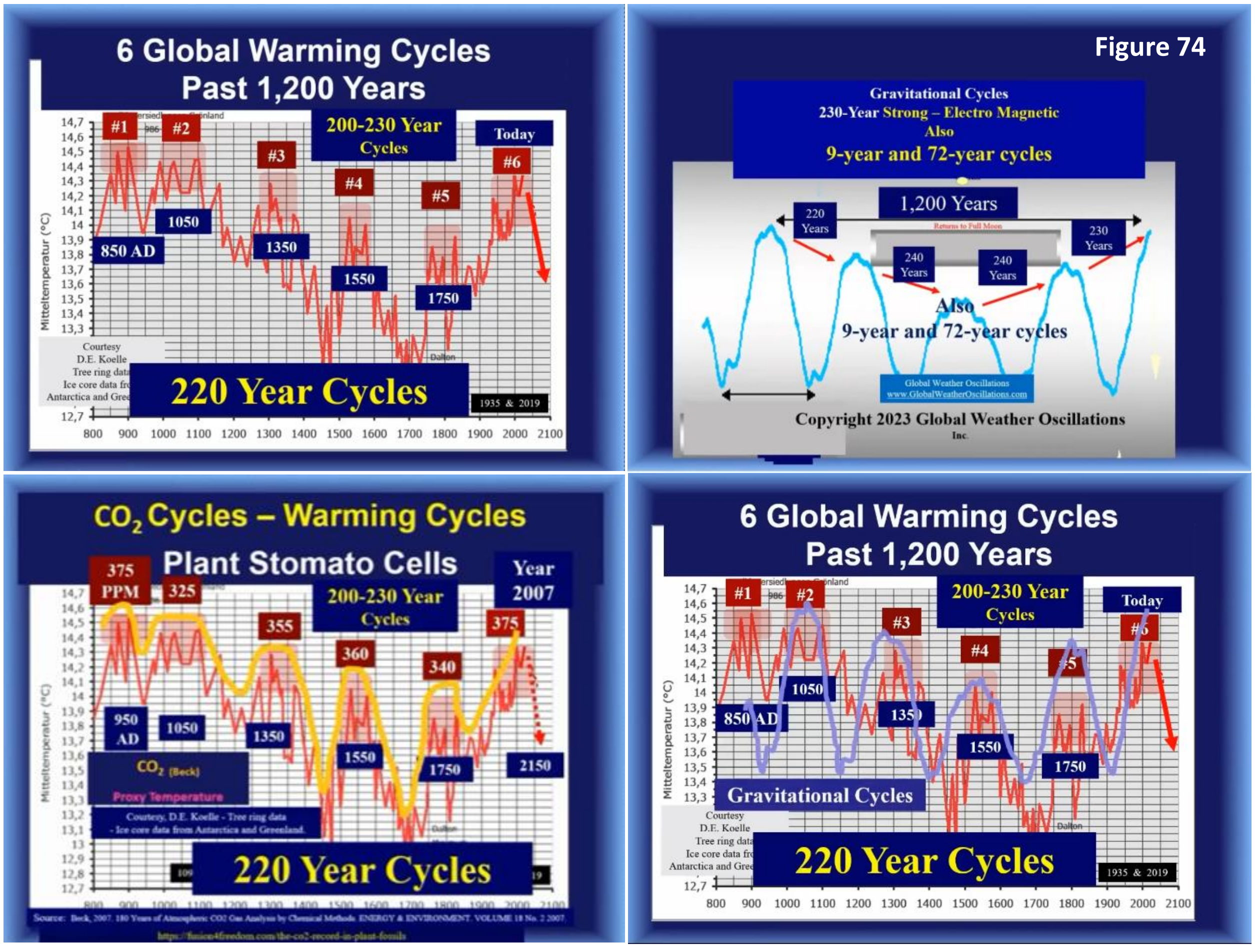


Figure 74

on at some point. Dr. Dilley provides a summary of his work on Tom Nelson's Podcast – Episode #284.

The images in Figure 75, below were pulled from a February 2025 paper, *"Why is the Earth System Oscillating at a 6-Year Period?"*, authored by A. Cazenave et al. From their abstract, *"A 6-year cycle has*

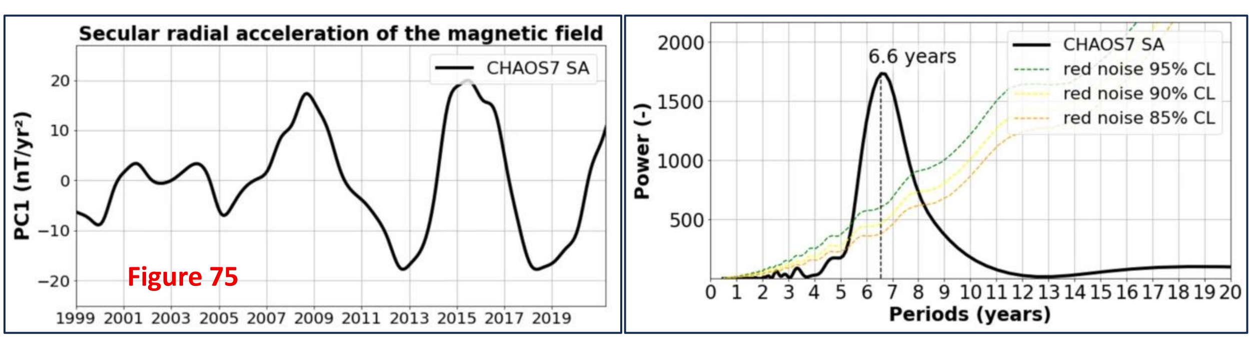


Figure 75

long been recognized to influence the Earth's rotation, the internal magnetic field and motions in the fluid Earth's core. Recent observations have revealed that a 6-year cycle also affects the angular momentum of *the atmosphere and several climatic parameters, including global mean sea level rise, precipitation, land hydrology, Arctic surface temperature, ocean heat content and natural climate modes.”* The effect these oscillations have on our climate are not well understood and should be researched in more detail. Do these oscillations influence the El Niño Southern Oscillation? Could these oscillations have contributed to the unusually high temperatures we experienced since 2023? Given the significant changes going on with our weakening Electromagnetic Field strength, is the secular radial acceleration stable or is it also in flux? A lot of questions, no answers. One more example of how complicated our climate system really is.

A few years back, I noticed that the satellite temperature data (in both the Arctic (Figure 76) and Antarctic (Figure 77)) consisted of a series of temperature pulses with a cyclicity of ±8 years. Overall, Arctic temperatures have been increasing at 2.5 °C/century over the satellite period (December 1978 to the present). Antarctic temperatures have been statistically flat over that period at just 0.13 °C/century. Is the earth’s magnetic field and internal fluid movement producing these pulses? Might the pulses be related to the moon’s 9-year orbital cycles? Are the pulses some combination of the two parameters? Are there other factors? More questions, still no answers. But sure, “the science is settled”!

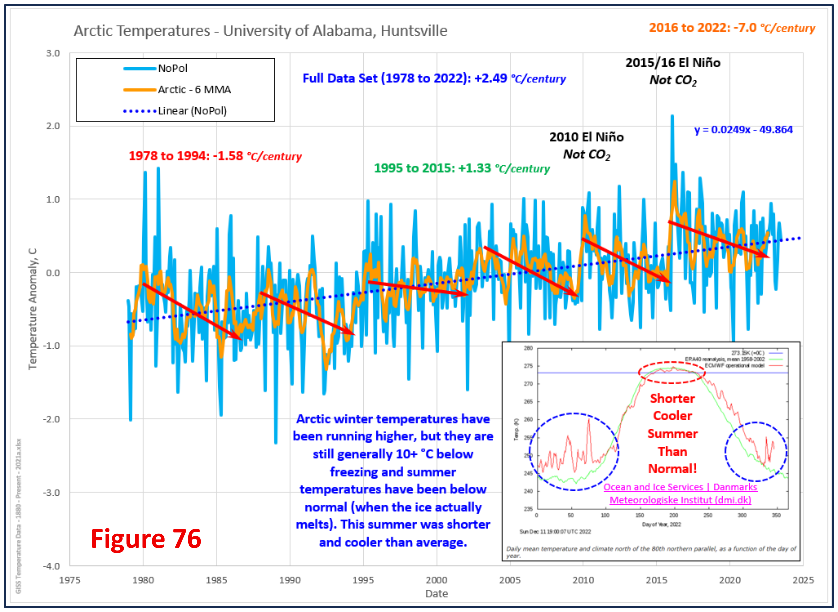


Figure 76

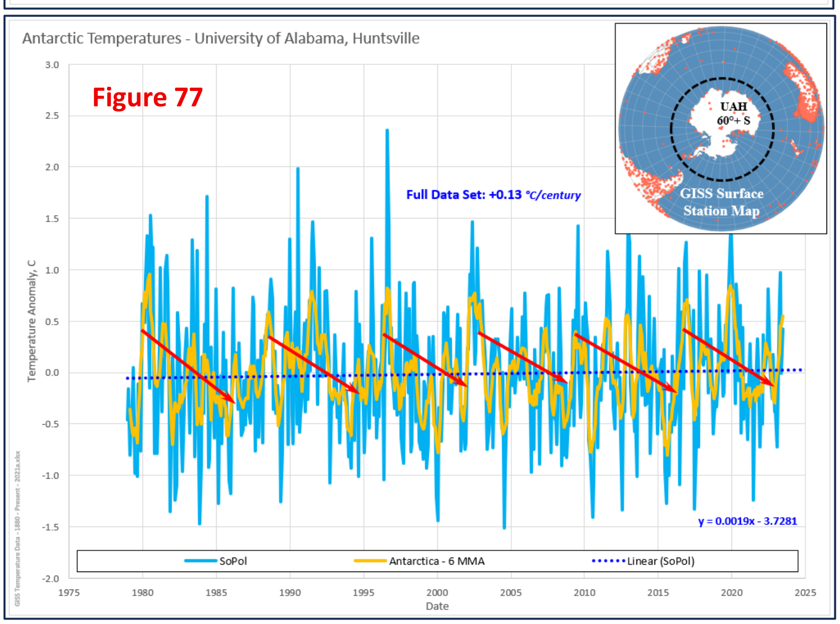


Figure 77

There is evidence of climate change throughout our planet’s history on far more dramatic magnitudes than the minor 1 to 1.5 °C warming we have experienced since 1850. All that climate change happened without any help from humanity’s emissions. Reviewing the last 67 million years (Figure 78 on the following page, the Cenozoic era), shows that plate tectonics and some celestial interventions were the primary driver of major climate change. Our planet transitioned from the ice free, tropical heat of the Eocene Climate Optimum to the current Pleistocene Ice Age we are living through. Thankfully our society developed during one of the brief interglacial warm periods that periodically interrupt the deep ice ages that have dominated for the last 2.6 million years.

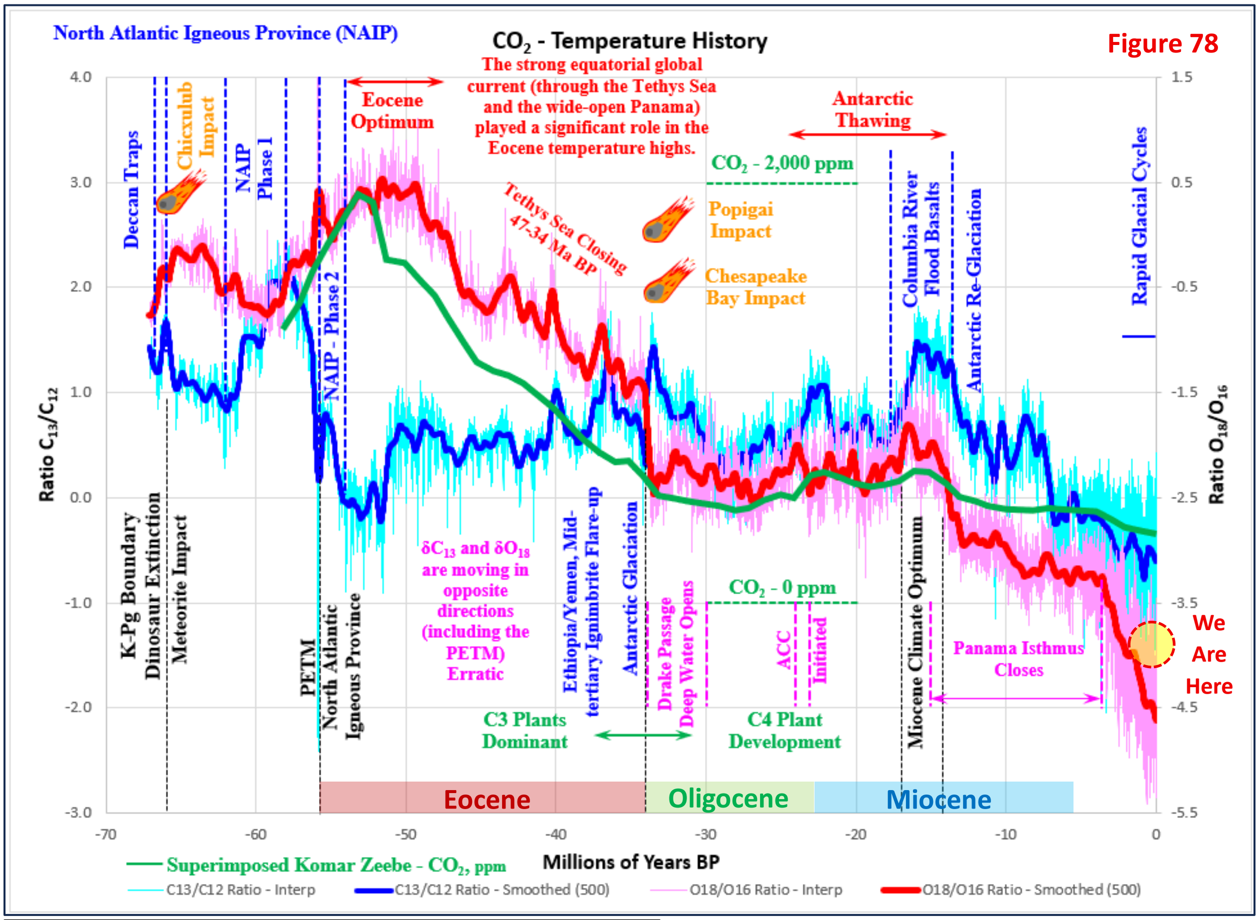


Figure 78

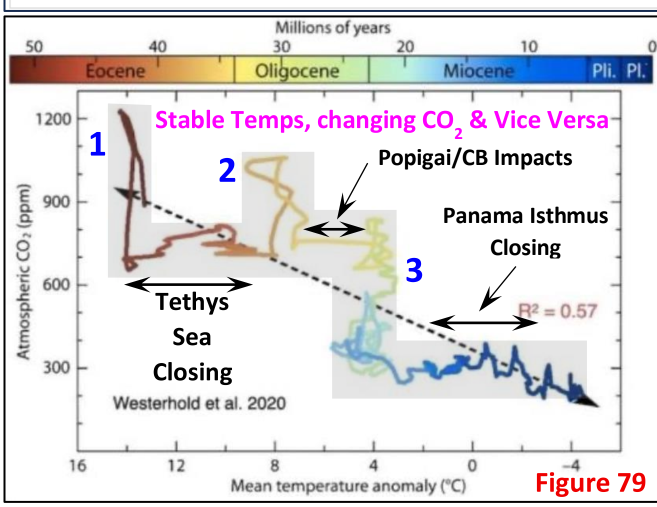


Figure 79

The Tethys Sea Closing (from 47 to 34 million years ago) dropped average global temperatures from 14 °C to 10 °C with only minor changes in CO_2. The dual impacts of Popigai and Chesapeake Bay dramatically dropped the temperatures 2 °C more, initiating Antarctic glaciation. Temperatures were relatively stable during the Oligocene, then began falling as the Panama Isthmus started closing. Temperature decline accelerated significantly when the Isthmus closed completely. The total temperature drop over the Cenozoic has been ±18 °C. Figure 79 (to the left) plots Cenozoic atmospheric CO_2 concentrations against the mean temperature anomalies. CO_2 is obviously not driving the Cenozoic climate (i.e.: the major changes in CO_2 concentrations (**1, 2, and 3, above**) were associated with minor temperature deviations). Over the last few million years (the Pliocene and Pleistocene epochs), temperatures and CO_2 concentrations have been declining together. But as shown in ice core data, temperature is driving CO_2 concentrations.

Where is the Emergency? Temperatures over the Cenozoic have been higher than our current temperatures roughly 98% of the time. Yet somehow life thrived at much higher temperatures and much higher CO_2 concentrations. Even the most ridiculous IPCC projections will not produce temperature estimates that take the planet above the Pliocene/Pleistocene's low levels (i.e.: 92.1% of the Cenozoic is warmer than the projected catastrophic levels). A more detailed discussion can be found in my [CSS-10 – A Ride Through the Cenozoic] post.

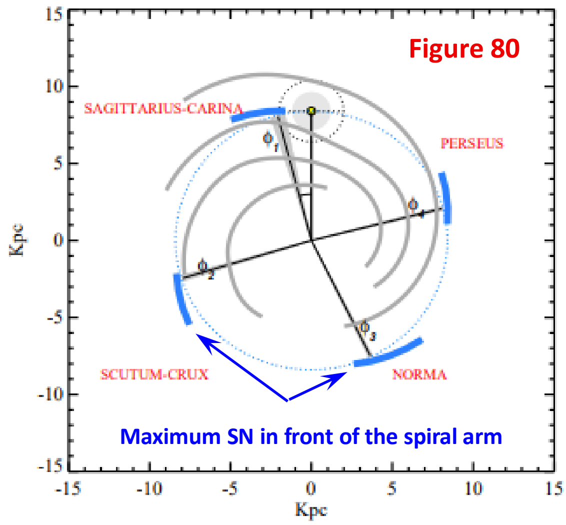


Figure 80

The Phanerozoic Era goes back roughly 541 million years, with temperatures higher than current levels 86% of the time. There is one major cycle visible in these data sets, our solar system's position within our Milky Way galaxy. When we are located within the direct influence of one of the spiral arms (Figure 80, schematic to the left), we are exposed to higher levels of Cosmic Rate Flux (CRF, based on proximity to higher Super Novae (SN) density). A significantly higher CRF is associated with severe cold periods (often a deep ice age) every 150 million years (as shown in Figure 81, below). The less dramatic response from the Perseus and Scutum-Crux arms could mean that our solar

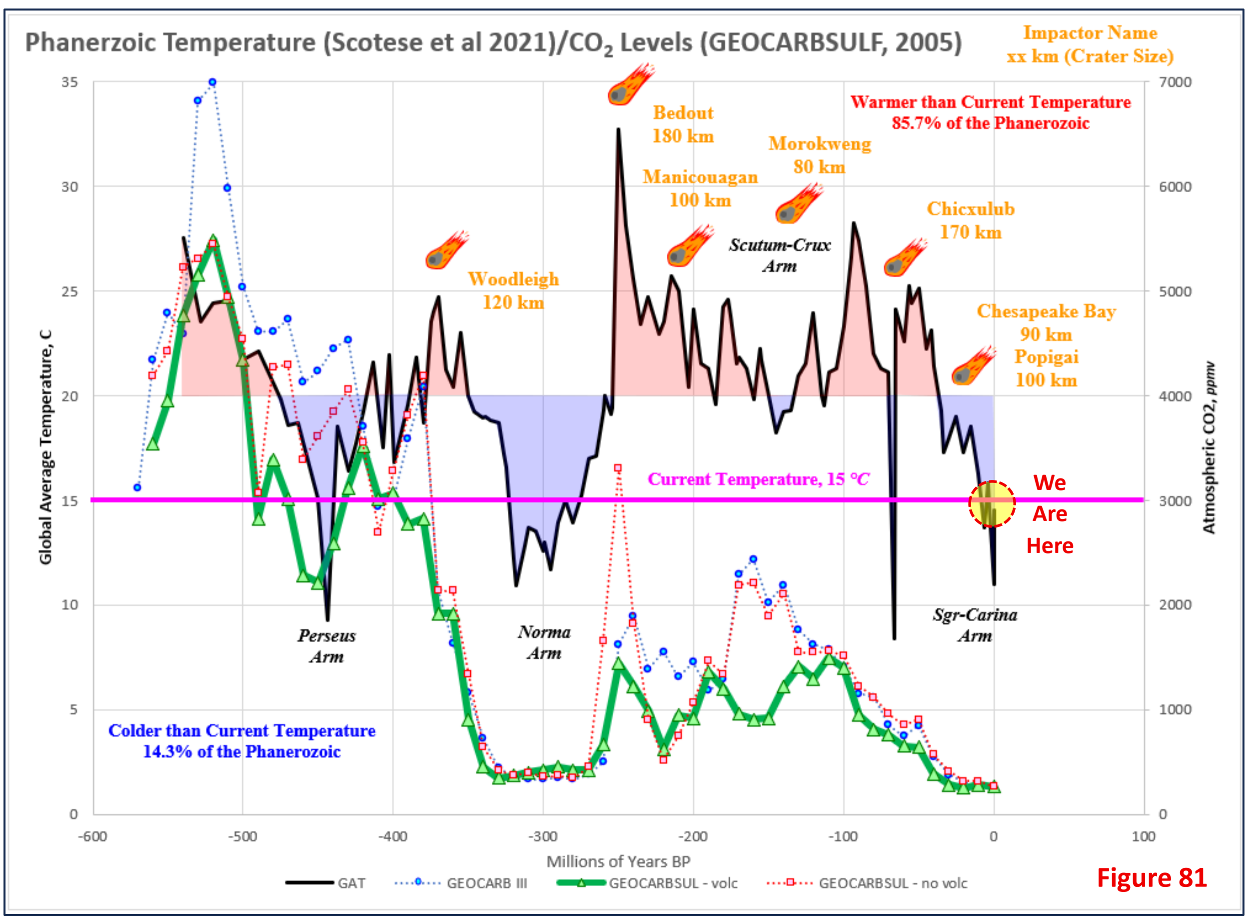


Figure 81

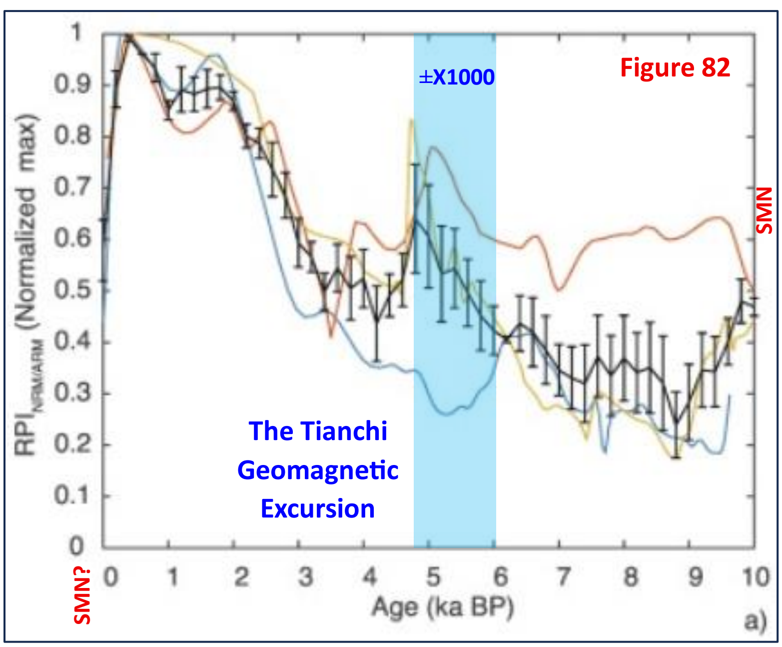
system was located above or below the galactic plane (i.e.: away from the main CRF/SN influence). There is no correlation between CO_2 and Global Temperatures on this time scale (i.e.: CO_2 is not driving the climate). The Phanerozoic era and the CRF relationship is discussed in more detail in my CSS-12 – Cosmic Ray Discussion post. A general discussion on historical global temperatures can be found in my CSS-14 – Has Our Planet Been Warmer than Today? post.

There is one more solar cycle that I will close the discussion with, the 12,000-year solar micro-nova (SMN) cycle (driven by the electromagnetic waves in the galactic current sheet). Discussion on this cycle is limited to non-existent in the mainstream media. That may be intentional given the catastrophic implications of a solar micro-nova and the last one occurred roughly 12,000 years ago. Earlier data sets hinted at this cycle. The 6,000-year Heinrich cycle is a sub harmonic of the micro-nova cycle. The table below lays out some recent Heinrich events and the geomagnetic excursions that appear to accompany them.

Table – Heinrich Events and Associated Geomagnetic Excursions

Heinrich Designation	Climate Period	Geomagnetic Excursion	Age
Tropical/Mid-Latitude Hydroclimate	Interglacial (Warm)	Tianchi (Noah event)	≈6,000 years ago
SMN Younger Dryas "H0"	Glacial (Cold)	Gothenburg	≈12,000 years ago
±X1000 Heinrich Event "H1"	Glacial (Cold)	Halini Pali	≈18,000 years ago
SMN Heinrich Event "H2"	Glacial (Cold)	Lake Mungo	≈24,000 years ago
±X1000 Heinrich Event "H3"	Glacial (Cold)	Michoacan	≈30,000 years ago
SMN Heinrich Event "H4"	Glacial (Cold)	Mono Lake	≈36,000 years ago
±X1000 Heinrich Event "H5"	Glacial (Cold)	Laschamp	≈42,000 years ago

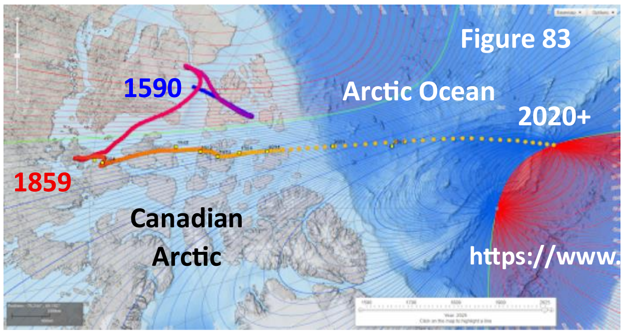
This information comes from Ben Davidson's recent 2025 book, *"The Sun, the Earth and the Disaster Cycle"*. Unfortunately, the geomagnetic excursion is in sync with the 6,000-year solar flare cycle (magnitude ≈X1000). To put that in perspective, the 1859 Carrington Event was in the X50 to X100 range. A Carrington level event now would be devastating. X1000 is small in comparison to the micro-nova events (highlighted in yellow above). The next micro-nova could happen in the next few decades, but the risk of strong solar flares/Coronal Mass Ejections (CME) prior to that are the immediate concern. For those that want to go down this rabbit hole, a more complete picture can be found at https://spaceweathernews.com.

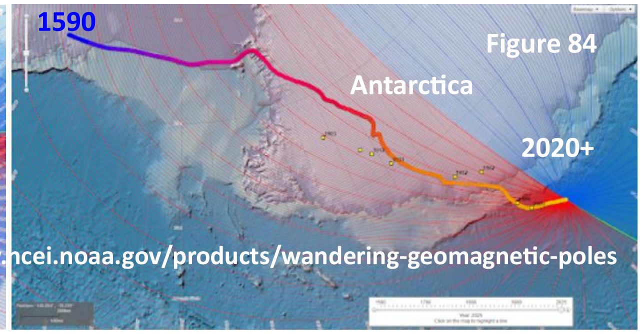


A very recent paper (January 2026), *"Improving the reconstruction of Holocene geomagnetic paleosecular variation in the Antarctic region" by* Sagnotti et al produced Figure 82 (to the left), showing the Relative Paleo-Intensity (RPI) from the Ross Sea in Antarctica.

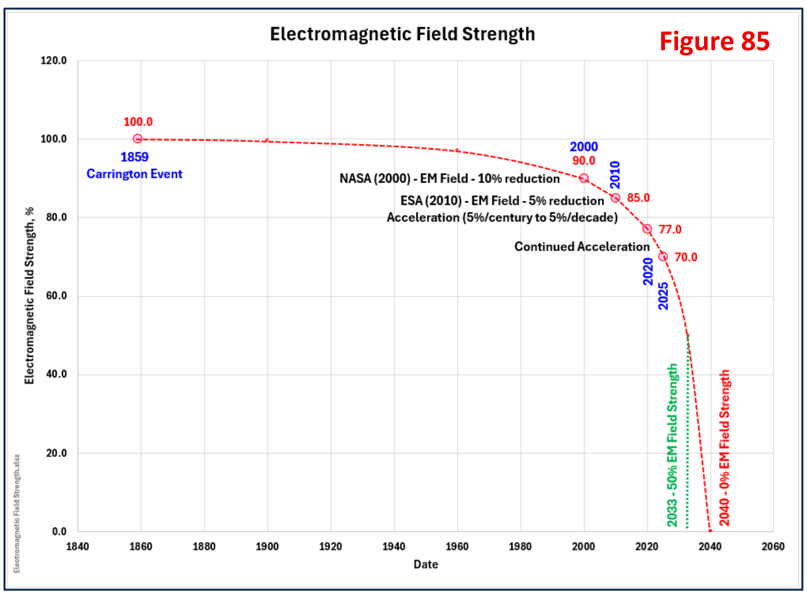
The data indicates that we reached our peak RPI around 400 years ago, which would coincide with the Maunder Minimum. Since then, RPI has declined by 55% (i.e.: our Electro-

Magnetic Field (EMF) strength is down significantly). There is no doubt we are experiencing an electromagnetic excursion. Both the north and south magnetic poles have been moving away from the traditional locations in the Canadian Arctic Islands (Figure 83, below left) and the middle of the Ross Sea (at the south end of Antarctica, Figure 84, below right).





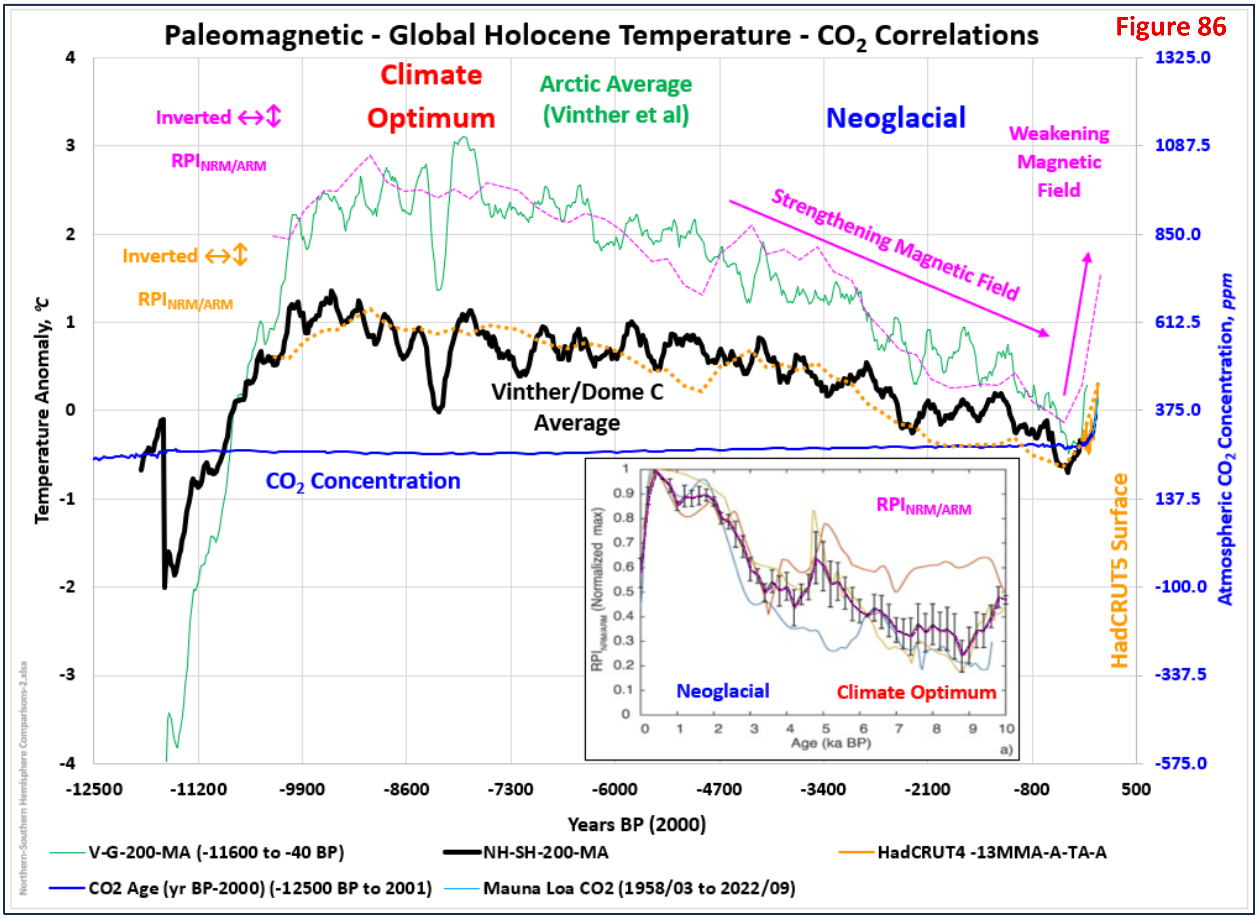
The Carrington Event in 1859 appeared to initiate an acceleration in the magnetic north pole movement. Figure 85 (below) shows the electromagnetic field (EMF) strength since 1859. Our EMF strength has been decreasing quickly and at the same time accelerating. A combined decline of 25 to 30% already, not a good sign!



The EMF strength decline is readily and easily visible in our night skies. The auroras (visible down to the lower equatorial latitudes and displaying brilliant colours) indicates that space weather is impacting our planet more, and reaching deeper into our atmosphere. Historically, a Carrington level event was required to produce auroras of the magnitude we are routinely seeing now. A Carrington level event without the EMF strength reduction would cause severe damage to our electrically dependent society. The result now would be catastrophic. And our sun is easily capable of producing another Carrington level event. In fact, the March 12th, 2023, solar flare/CME was likely close in size. Luckily, that event took place on the far side of the sun. Coincidentally, my CSS-36 – Solar Flares and CMEs was posted earlier that same day. In my opinion, we should be spending the money we waste on Net Zero, the Paris Accord, the Energy Transition, etc. on hardening our electrical grid to withstand as big a solar blast as possible. That is a real existential threat!

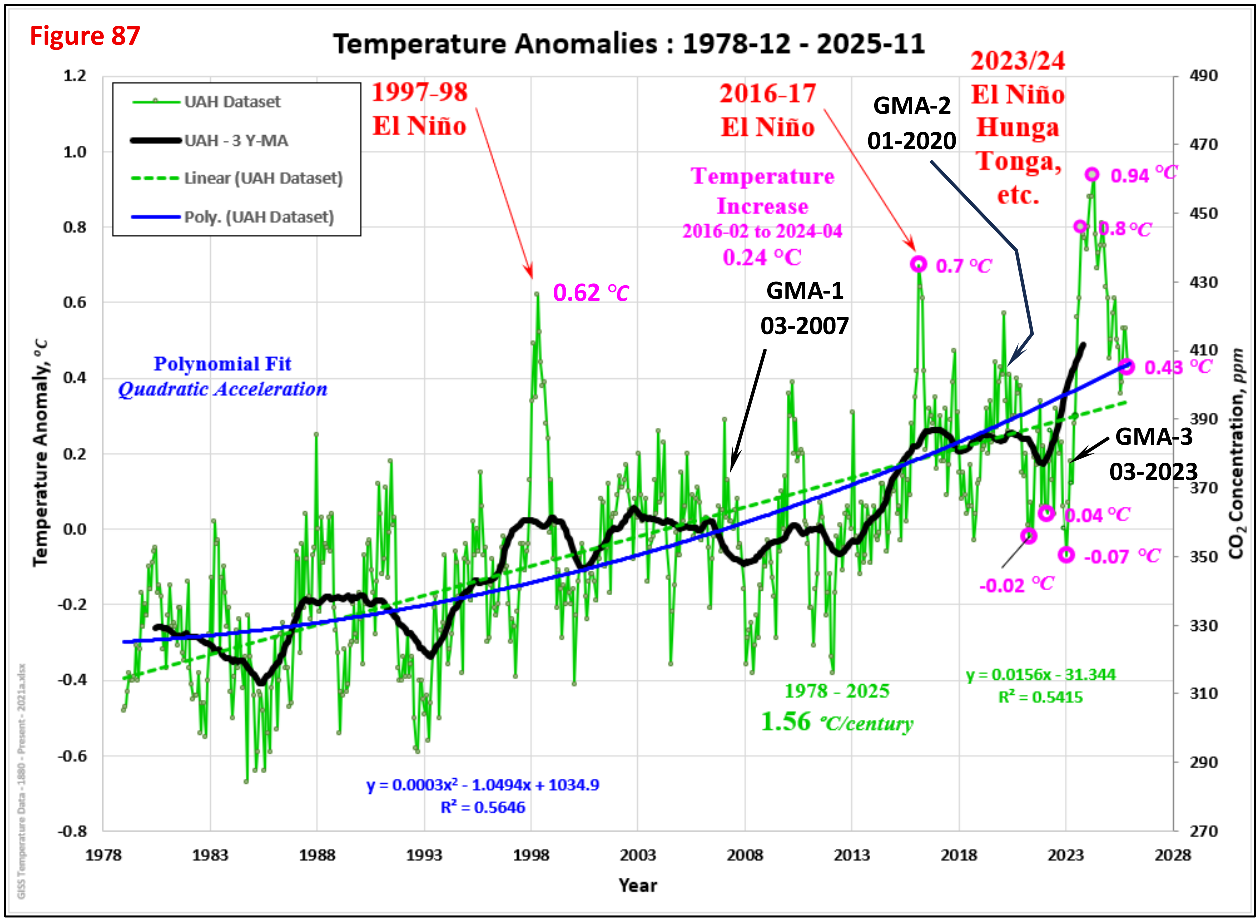
As I was contemplating the RPI plot (Figure 82 on the previous page), I realized the profile was like the Holocene temperature profiles (just inverted in both directions). Figure 86 (on the following page) shows the RPI profile overlain on both the Vinther et al Arctic Average Temperature Anomaly and the average of the Vinther et al and Antarctic Dome C temperature anomalies.

Interesting how closely the $RPI_{NRM/ARM}$ correlates with the global average temperature. But is it really that surprising that temperatures would rise when our electromagnetic field strength weakens and temperatures would fall when our electromagnetic field strength increases? Not really. When the EMF



strength goes down, more energy can penetrate our atmosphere easier, physically and electromagnetically. That energy tends to affect the entire biosphere. More energy, higher temperatures (oceanic and atmospheric), and more volcanic/seismic activity. The effect on temperature may not be that different than a large flare/CME when the EMF strength was at higher levels. The global temperatures in 1859, 1921, 2012, and 2023 were all anonymously higher than expected (even when the CMEs were not directed at earth). The magnitude of the energy flux is dependent on a lot of things. Solar Energetic Particle (SEP) event strength, solar wind strength, event duration, multiple event consolidations, CME velocities, EMF strength all factor into the geomagnetic storm strength. One of the biggest mistakes that the IPCC alarmist crowd makes is assuming that the absolute TSI value represents all the energy being delivered to the planet. During solar flare/CME events, TSI decreases despite the significant increase of energy that is being delivered to our planet. These Forbush decreases are discussed in my CSS-36 post (mentioned earlier).

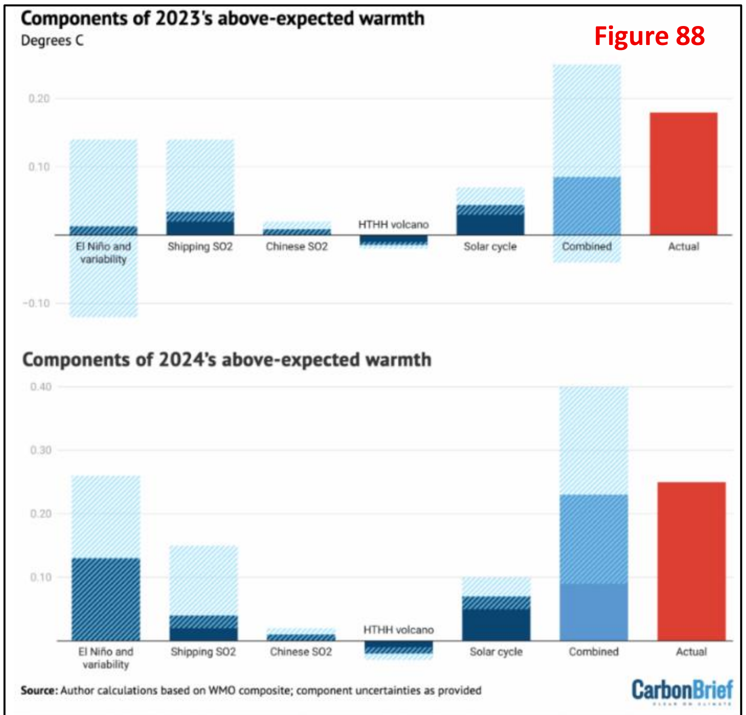
That energy influx may be playing out noticeably and recently, given the significant acceleration of the EMF weakening. Figure 87 (on the following page) shows the University of Alabama, Huntsville (UAH) satellite temperature dataset (up to and including November 2025). Temperatures over the entire period have risen at a 1.56 °C/century rate (the linear green dashed trend line). Prior to the step increase in 2015



(initiated by a strong ENSO warming pulse), temperatures had been rising at a lower ±1.3 °C/century rate. The anomalously high temperatures of 2023 and 2024 have also contributed to the increased temperature rise rate.

An alternative trend line (the solid blue quadratic fit) shows a slight acceleration. Could that acceleration (or a portion thereof) be due to acceleration in the weakening EMF strength? A recent paper (2024) by Sergey V. Simoenko, *"The Convincing Cosmic Energy Gravitational Genesis of the Strongest Geomagnetic Anomalies of the Magnetic Field of the Earth"*, in laying out his thermohydrogravidynamic theory, highlighted three Geo-Magnetic Anomalies, "very rapid changes of the geomagnetic field". The first in March 2007, the second in January 2020, and the last in March 2023. The declining EMF strength will let more energy into and deeper into our biosphere. The weaker EMF could also be amplifying the ENSO effects and/or allowing proportionately more of the solar flare/CME energy through our natural defences.

The 2023/24 temperatures were anomalously high. A discussion in Carbon Brief attempted to explain these temperatures, *"Carbon Brief's analysis finds that a combination of these factors explains most of the unusual warmth observed in 2024 and half of the difference between observed and expected warming in 2023."* The analysis (Figure 88, on the following page) included El Niño influence (along with year-to-year variability), SO_2 reductions (shipping and Chinese), the HTHH Volcanic eruption (a small net cooling but some scientists believe there is a net warming), What is not shown is CO_2. And rightfully so, good on them. CO_2 changes over this very short interval are very small and would produce no significant or even measurable warming. The analysis puts the El Niño influence at the top, followed by solar activity. Again.



Attribution of 2023 and 2024 anomalous warmth. Light blue bars show individual factors and their uncertainties, the dark blue bar shows the combined effects and combination of uncertainties and the red bar shows the actual warming compared with expectations. Adapted from Figure 12 in WMO's state of the global climate 2024 report.

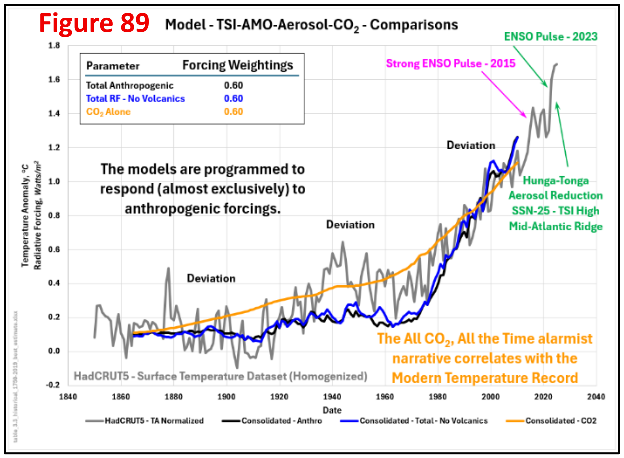
good on them. But they did use a PMOD composite for their TSI reconstruction. As discussed early on, there are many TSI reconstructions that would produce a far stronger solar influence and remember there is much more to solar forcing than just TSI. Natural variability is also discussed in the analysis. There certainly seems to be a lot of uncertainty for a field that is considered "settled science".

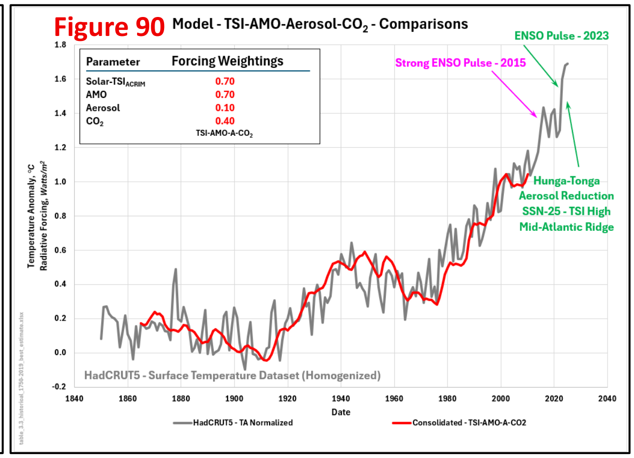
Is the EMF weakening a factor in climate change? Common sense says that it is. The magnitude of influence is certainly open to debate, but there does appear to be a correlation between EMF strength and temperatures over the Holocene. On short time intervals EMF changes normally happen very slowly and would not normally contribute much to temperature change. But is that changing as our EMF weakening has noticeably accelerated? We are down 25 to 30% from 1859 levels and 55% from EMF high during the Maunder Minimum (the late 1600s). Neither extrapolation of EMF strength paints a very pretty picture.

If we get our X1000 or a micro-nova, the All CO_2, All the Time alarmist community will get their wish. Humanity will reach Net Zero by 2050 (potentially earlier). Gates will have his depopulation dreams answered. Global populations will be down to less than a billion (in a year, give or take) based on a X1000 flare. Instantaneously based on a micro-nova. Either of those scenarios put us back in the stone age instantaneously. There are few people prepared for that (assuming they survive the initial event). The Net Zero policies being implemented in some areas of the world (it is not global) are totally unnecessary (as discussed earlier). Will we see an X1000 or a micro-nova in our lifetimes? I cannot say that with absolute certainty, but the risk is there (with more empirical data backup than the All CO_2, All the Time alarmist narrative). What we can expect is a large solar flare/CME that has the capacity to seriously damage our electrical grids. We should be hardening our grids, not adding more unreliable, expensive, destabilizing renewables. We are wasting trillions of dollars that could be deployed to deal with real problems (grid reliability, poverty, debt, inflation, etc.).

Summary

That is a lot of information. To summarize, I'll start with the recent history, then finish with the currently important cycles and their potential consequences. The All CO_2, All the Time alarmist narrative starts with the IPCC computer models. The initial discussion showed that the IPCC's "best estimates" of radiative forcing (focused almost entirely on anthropogenic influences) produced history matches that generally correlated with the over-homogenized HadCRUT5 surface temperature estimates from 1850 to the present (Figure 89, on the following page). A far better correlation can be produced by recognizing solar and ocean cycles as shown in Figure 90 on the following page. The red curve in Figure 90 was produced by adding in just one of the many ocean cycles (the Atlantic Multi-decadal Oscillation, AMO) and substituting an average of six ACRIM extended TSI reconstructions for the IPCC's "best estimate" of solar forcing (the Matthes et al 2017 (PMOD extended) TSI reconstruction, just one of 40+ options available). In reality, any of the 40+ reconstructions will produce similar results if treated as a proxy rather than an absolute value.

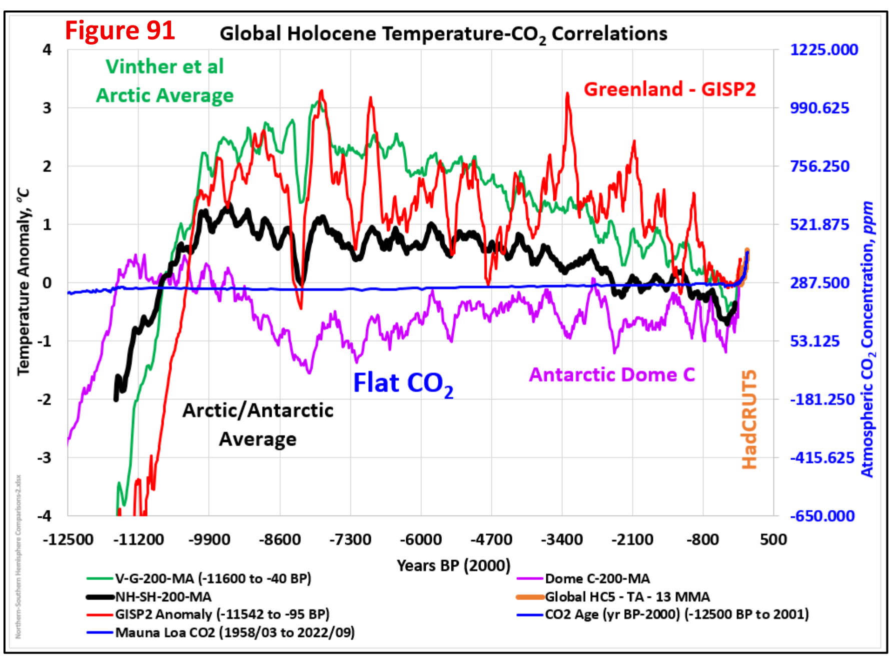




Treating the TSI as a proxy is a valid option given that solar forcings are not limited to TSI (a minor component at best).

The primary test for a climate model is its history match. The anthropogenic (primarily CO_2) focused match above is reasonable, but the naturally (solar activity and ocean cycle) focused match (to the right) is far better. But history started prior to 1850. The Holocene (Figure 91, below) experienced substantial climate change despite a virtually flat CO_2 concentration. The IPCC's "best estimates" cannot begin to explain the temperature/climate fluctuations over the Holocene (i.e.: NO history match). If there is no history match, the models are totally useless and unfit for policy purposes (or anything else for that matter).

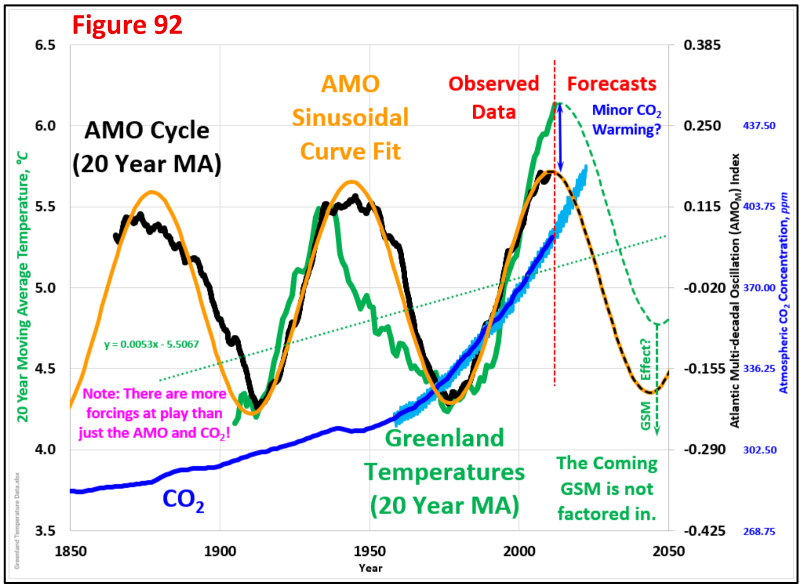
The natural forcings that created the 'climate change' over the Holocene, were still active during the Modern Temperature Record (MTR, 1850 to the present), and they will be active in the future (just not in the climate models). Humanity may have contributed some meaningful warming post-1950 (where 87%+ of our emissions occurred), but pre-1950 contributions were negligible and future contributions are limited due to CO_2's exponentially decreasing warming capacity. CO_2's warming capacity may have already

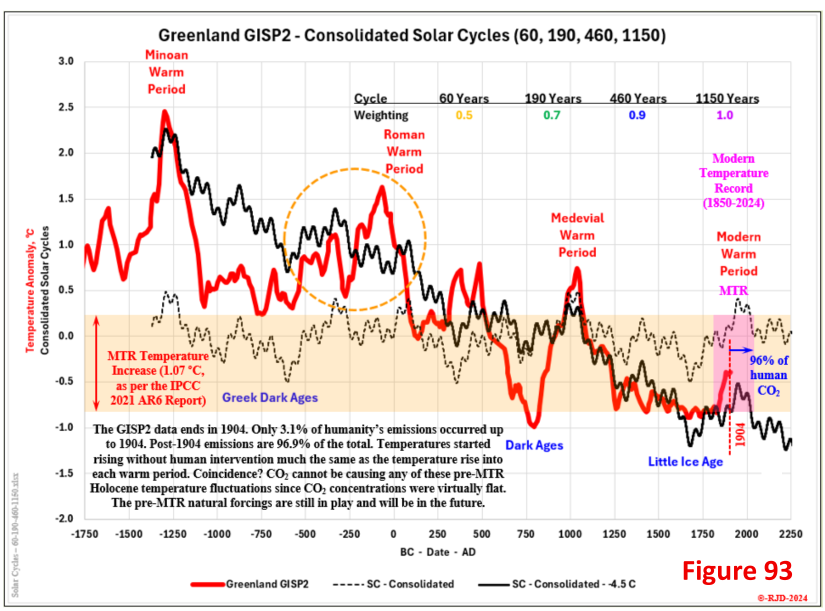


peaked (given that its two cooling properties (rising leaf coverage and co-aerosol production) may already have cancelled out or may soon be cancelling out its radiative warming properties). That discussion is available in my CSS-69 – CO_2's Cooling Parameters post.

The All CO_2, All the Time alarmist narrative has questionable application to the MTR and totally falls apart outside of that period. Historical temperature records prove the "narrative" is totally useless pre-MTR, which makes it totally useless for future prognostications. So, what is our climate likely to do over the next few decades? Well, we are not about to leave the Sagitarius-Carina arm of the Milky Way galaxy any time soon so we will continue living through the Pleistocene ice age for several more million years. Our descendants' future will continue to fluctuate between deep ice ages and interglacial warm periods in sync with the Milankovitch cycles. These are very long cycles that have only minor, virtually undetectable influences on our life today.

The 60-year barycentre cycle is front and centre when it comes to our climate. Our climate moves to that beat. The AMO is the best expression of that 60-year cycle, but as shown earlier there are many others. Greenland (and global) temperatures, cloud albedo, and sunshine hours, rise and fall in sync with the AMO. Most of the recent warming (post 1975) can be explained by changes in the cloud cover and sunshine hours. The AMO is headed colder and will take temperatures lower over the next few decades. The plot to the left (Figure 92) assumes that solar activity is negligible (i.e.: the All CO_2, All the Time alarmist narrative). As such, the 1915 to 1945 temperature rise would have been mostly AMO related since CO_2 concentration changes were small. Rolling solar activity back in (as per Figure 90) would compress the AMO cycle by roughly one half. The AMO cold phase will likely reduce temperatures by roughly 0.7 °C.





A major solar cycle playing out over the next few decades is the ±400-year Grand Solar Minimum (GSM). The last GSM was the Maunder Minimum (1645 –

1715). Temperatures during the depths of the Little Ice Age (LIA) were roughly 1.5 °C colder than current temperatures. Will the temperatures drop back to Maunder Minimum levels? The four-component consolidated sinusoidal solar cycle model developed in Figure 93 (on the previous page) shows a temperature drop that reaches Maunder Minimum levels. The ±1,000-year Bond/Eddy cycle may be the most consequential of the four components affecting our near-term future climate. The Bond/Eddy cycle is most often represented as a sinusoidal curve. The Pendulum curve presented in Figure 94 (to the left) fits the Greenland GISP2 data better than a sinusoidal curve. At some point, I need to swap out the sinusoidal curve for the pendulum curve. That should tighten up the history match significantly.

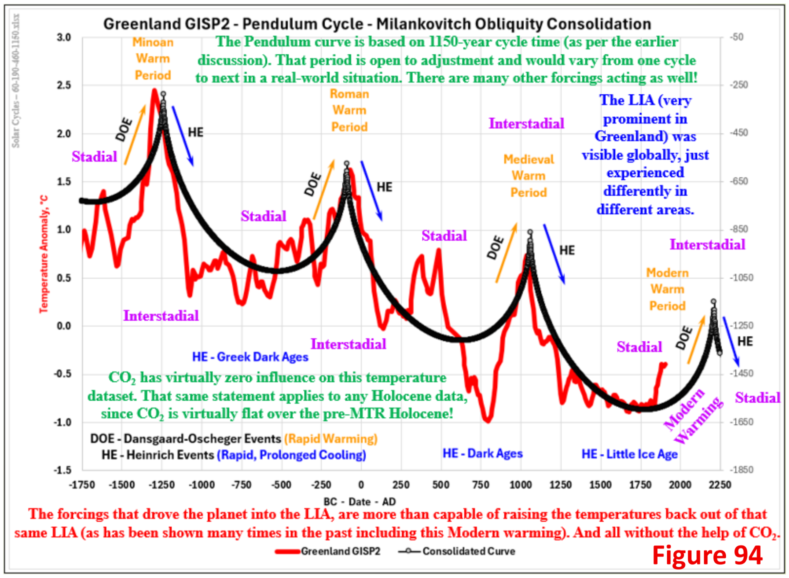


Figure 94

As mentioned earlier, the Pendulum Curve has the Milankovitch's Obliquity cycle built into it. This produces the general downward trend in temperatures. The ±2,300-year Hallstatt cycle (shown in Zharkova's (Figure 19) and my (Figure 29) solar cycle schematics) is in a warming phase and should also be factored in. The Hallstatt warming would offset some of the Milankovitch cooling until it peaks around 2700. Over the next few decades those cycles will only have minor impacts.

The current warming began during the Maunder Minimum (two centuries before CO_2 levels started rising and three centuries prior to when most (87%+) of humanity's emissions occurred. These interglacial warmings (Dansgaard-Oeschger (DO) events), as shown in the historical empirical data, are frequent and end abruptly (with no historical contribution from CO_2). The current DO event likely has some CO_2 contribution, but most of that would have been post-1950 and would be sharing the spotlight with the ocean cycles (the AMO, PDO, ENSO, etc.). The DO event was locked in place prior to any CO_2 increase and will generally play out the same way it historically has throughout the Holocene. The extra energy injection that accompanies the weakening EMF strength may also be contributing to the DO warming. And that warming literally sets the stage for the coming cooling. Did we reach the DO peak (in April 2024, Figure 95 above)? We shall see. Given the quickly weakening EMF strength, the DO peak will soon be here, if not already.

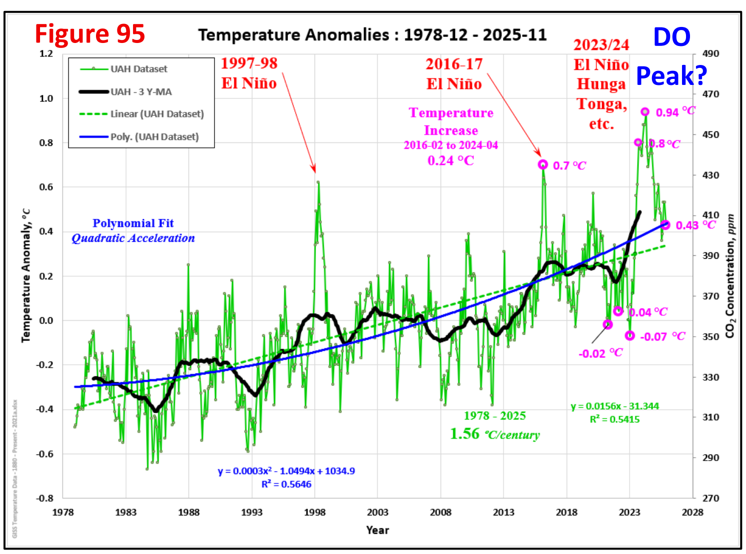
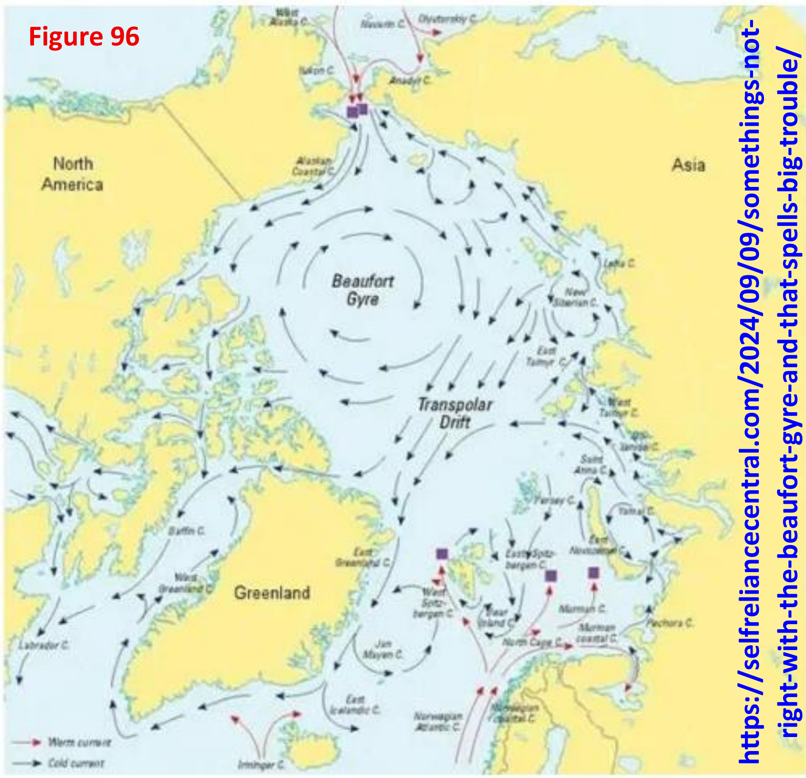


Figure 95

Figure 96



The Beaufort Gyre is a wind-driven circulation system that traps and pushes freshwater and ice around the Arctic Ocean. NSIDC/AMAP

The Heinrich event will very likely be initiated in the very near future. Given the severe cold and snow currently hammering the planet, we may already be headed down that road. And we should not forget about the overdue cold, freshwater [Beaufort Gyre 'climate bomb'] (Figure 96 to the left). The Beaufort Gyre release will kickstart and/or layer on to the Heinrich event. Temperatures will drop quickly (with or without the Beaufort gyre release).

We are far more likely to see significant cooling over the next few decades. There could be some additional minor warming before the Heinrich cold event, the AMO cold phase and the GSM cold settle in. How deep will the cold go? That is an open question, but the combination of all these events could be serious enough to push us into a new Little Ice Age and/or potentially push us past the tipping point that has ended every other interglacial period over the last several million years.

An X1000 solar flare/CME or a solar micro-nova will ultimately make this entire discussion moot. The real existential threats from 'climate change' are far more serious than the minor warming that CO_2 may produce. Those threats range from deep ice age to widespread incineration (a solar micro-nova). Humanity has survived both and will again, but not without significant depopulation consequences. In the meantime, we need to enjoy life and adapt to whatever climate gets thrown at us. For the politicians out there, enjoying life would be a lot easier if you

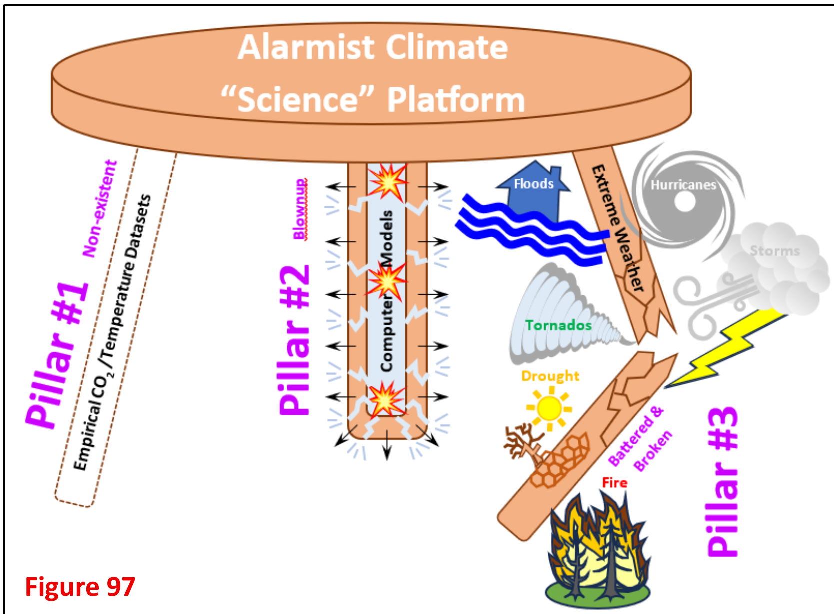


Figure 97

stopped with the Net Zero, etc. BS. There is no scientific or economic justification for greenhouse gas emission reductions (Figure 97, on the previous page). The All CO_2, All the Time alarmist narrative is based on three unsubstantiated principles.

1. Greenhouse gases (primarily CO_2) are warming the planet to catastrophic levels BUT there are no CO_2/temperature datasets that show CO_2 driving the climate on any statistically significant historical time scale (a very basic Scientific Method requirement).
2. Computer models are used to project those catastrophic temperatures BUT the models have been self-acknowledged to run too hot (by the programmers) and use unrealistically high emission scenarios.
3. Extreme weather events are allegedly becoming more severe and more frequent BUT the empirical data (CSS-52 – Extreme Weather Events) and the IPCC (CSS-64 – IPCC – Chapter 12 – Extreme Weather) say otherwise. Note, the extreme weather event attribution studies use those same models that run too hot and use unrealistically high emission scenarios. More pseudoscience!

You are just wasting our taxpayer money on a problem that does not exist at the expense of the real problems we are already facing and additional ones that are on the horizon. Please stop!