

GSM - Grand Solar Minimum. The real "Climate Change" existential threat is right around the corner. Do the Research!

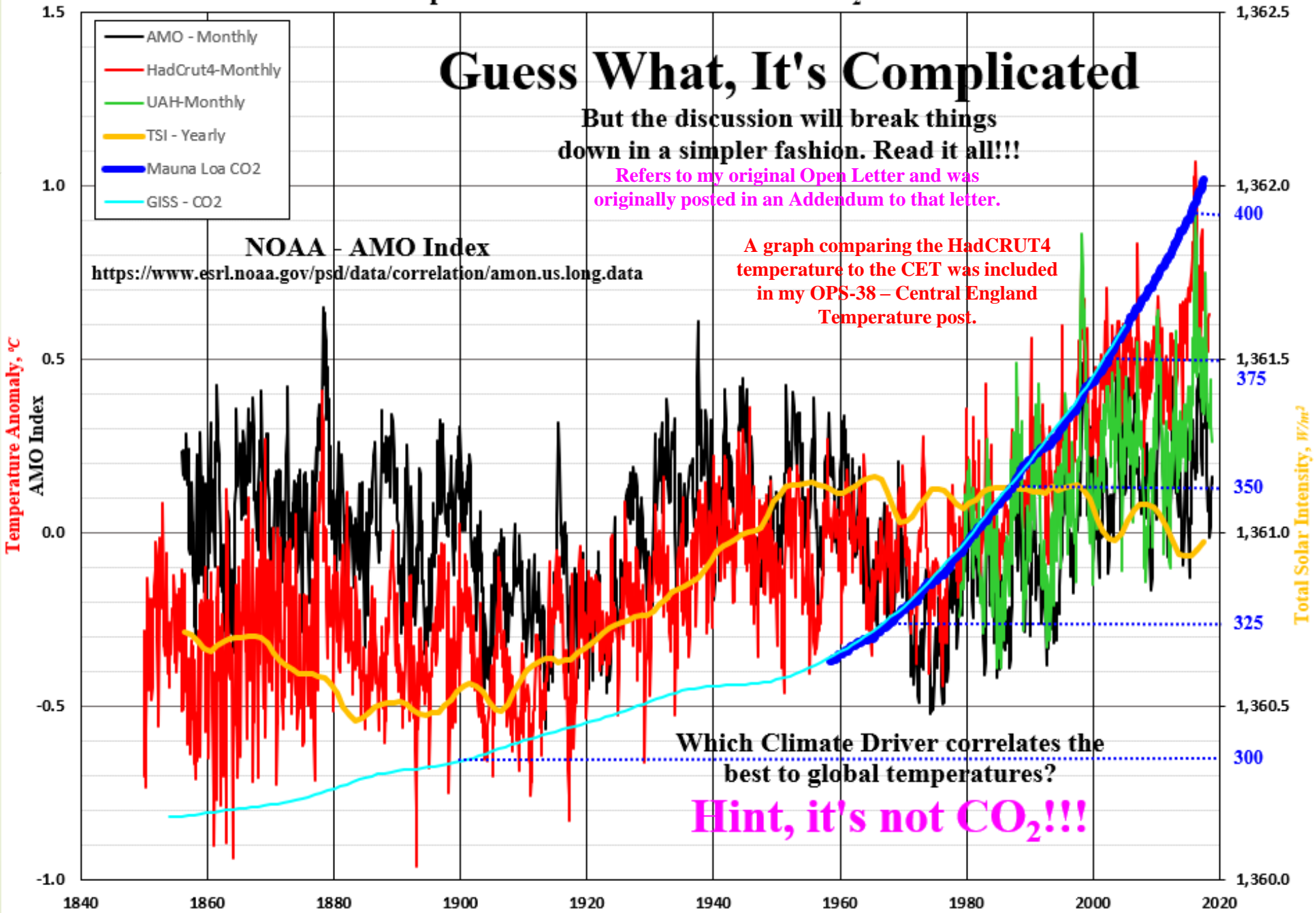
CSS-16a

Central England Temperatures - Model

I am starting this story with the Global Surface Temperatures (HadCRUT4) and the University of Alabama, Huntsville (UAH) Lower Troposphere Satellite Temperature data plotted against The Atlantic Multi-decadal Oscillation, The Total Solar Irradiance (TSI) momentum (20 Year Moving Average) and the atmospheric CO₂ levels. The AMO influence is very visible in the HadCRUT4 temperature oscillations. Solar activity (TSI_{M20}) peaked around 1950 and would have played a smaller role post-1950. CO₂'s role would have been reversed with a weaker influence pre-1950 and a stronger influence post-1950. The relative contributions from each parameter will not be discussed in any detail here. In a couple of past posts (OPS-8 - Basic Climate Model and my Open Letter Addendum), I showed that the Modern Temperature Record (MTR, 1850 to the present) could be modeled with just the TSI_{M20} and the AMO. The Central England Temperature (CET) is a longer, more localized measured temperature, but it does generally parallel the HadCRUT4 temperatures. This CSS investigates the CET in more detail and finishes with an updated simplified model that rolls the CO₂ concentration back into the mix. Is the model perfect? No, but it is interesting and the match is closer than CO₂ on its own.

It's Complicated

Temperature Anomalies - AMO-TSI-CO₂ : 1850-2018



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Central England Temperatures - Model

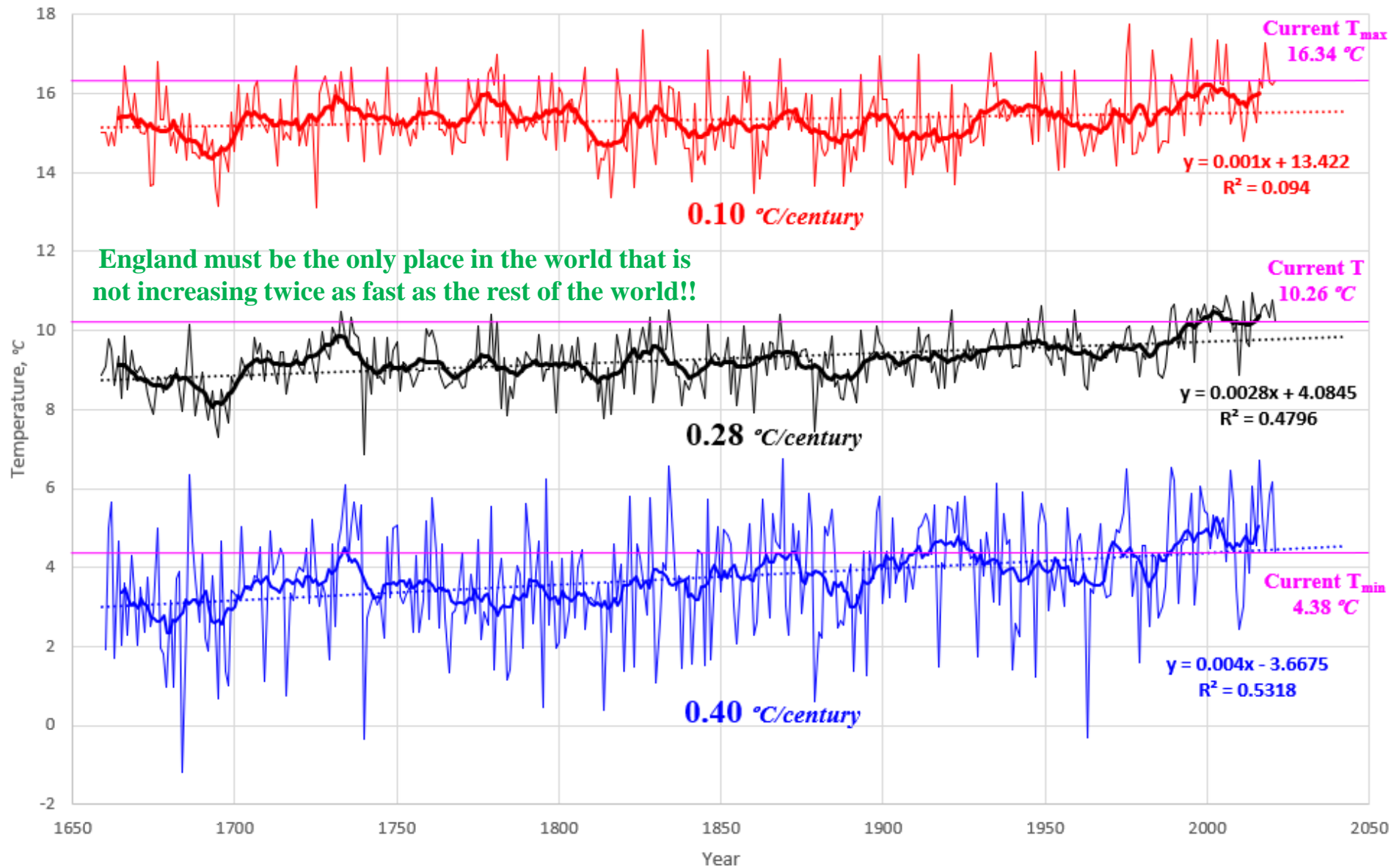
The CET is broken up into three categories on this slide. The upper red curves are the average temperatures during the summer (June, July, August (JJA)). The general range is 14 – 17 °C and has been increasing at a scorching rate of 0.1 °C/century. Does not appear to be all that dangerous to me. The blue average winter (December, January, February (DJF)) curve has been increasing at an even more horrendous rate of 0.40 °C/century (with a general range of 1.5 – 5.5 °C). The black yearly averages (January – December (JD)) are increasing at 0.28 °C/century (with a general range of 8 – 11 °C). Looks like England will be just fine a century from now (assuming that the temperatures do not drop drastically as the AMO enters its cold phase and the TSI_{M20} drops as per usual in a Grand Solar Minimum (GSM).

Over the next few decades. In this example, the winter temperatures are increasing

Yearly Temperatures JJA-JD-DJF

at 4 times that of the summer temperatures. Given that cold kills a lot more people than heat does, I suspect that the English population is very grateful for those warmer temperatures in the winter and they probably do not mind the warmer summer temperatures either. The current temperature rise (1975 to the present) is neither unusual nor unprecedented and will certainly not be dangerous.

Central England Temperature - Yearly/11 Year Moving Average



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- J-D Average
- JJA Average
- DJF Average
- J-D - 11 YMA
- JJA - 11 YMA
- DJF - 11 YMA
- Linear (JJA - 11 YMA)
- Linear (J-D - 11 YMA)
- Linear (DJF - 11 YMA)

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CSS-16d Central England Temperatures - Model

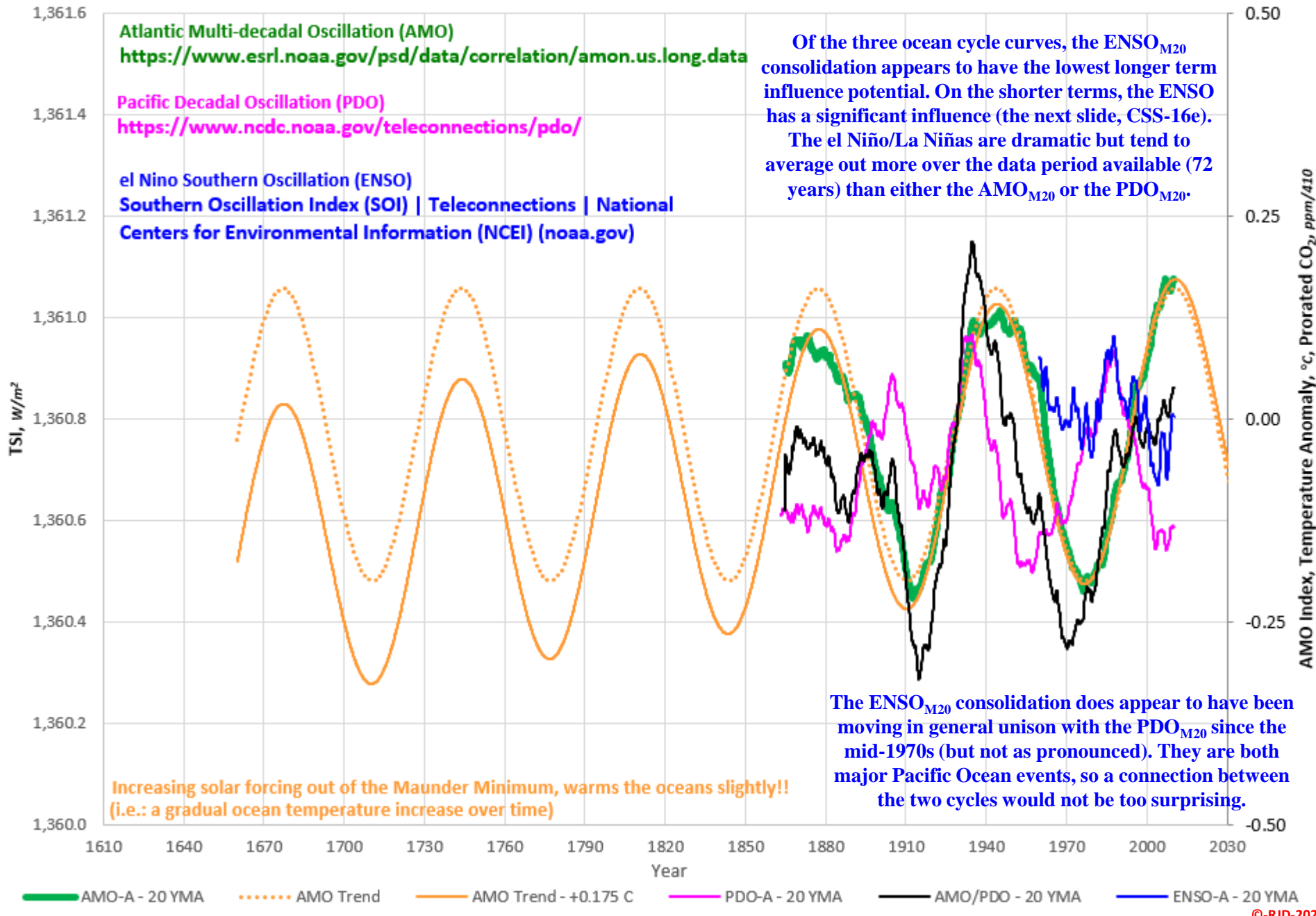
In an attempt to develop a multi-ocean cycle model, I looked at the easily accessible ocean cycle data (AMO, PDO and ENSO). There are of course, other ocean cycles, but these three appear to have the most effect globally.

Unfortunately, the readily available ocean cycle data only goes back to the late 1800s for the AMO and PDO. The ENSO data begins around 1950. To match the CET data, we require ocean cycle data back to the 1600s. Of the three ocean cycles, only the AMO_{M20} (AMO Momentum, 20 year moving average) data was easily hindcasted. So, the model will only be using the AMO_{M20}. Notice that there are two AMO_{M20} trend lines, The dashed lines are a flat sinusoidal curve. The solid AMO_{M20} trend line builds in a +0.175 °C increase from 1659 to the present. This small increase is required to history match the AMO_{M20} data and very likely reflects the gradual ocean warming associated with the long term TSI rise out of the depths of the Little Ice Age (the Maunder Minimum), peaking around 1950 (the current Solar Maximum (the highest TSI in 7,000 years). Any chance the highest TSI in 7,000 years has anything to do with the HOTTEST YEARS EVER? Will the gradual rise in AMO_{M20} continue into the future. Probably, but that will also likely turn down as the GSM effects take hold.

Ocean Cycles AMO, PDO & ENSO

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Central England - AMO-PDO-ENSO Comparison



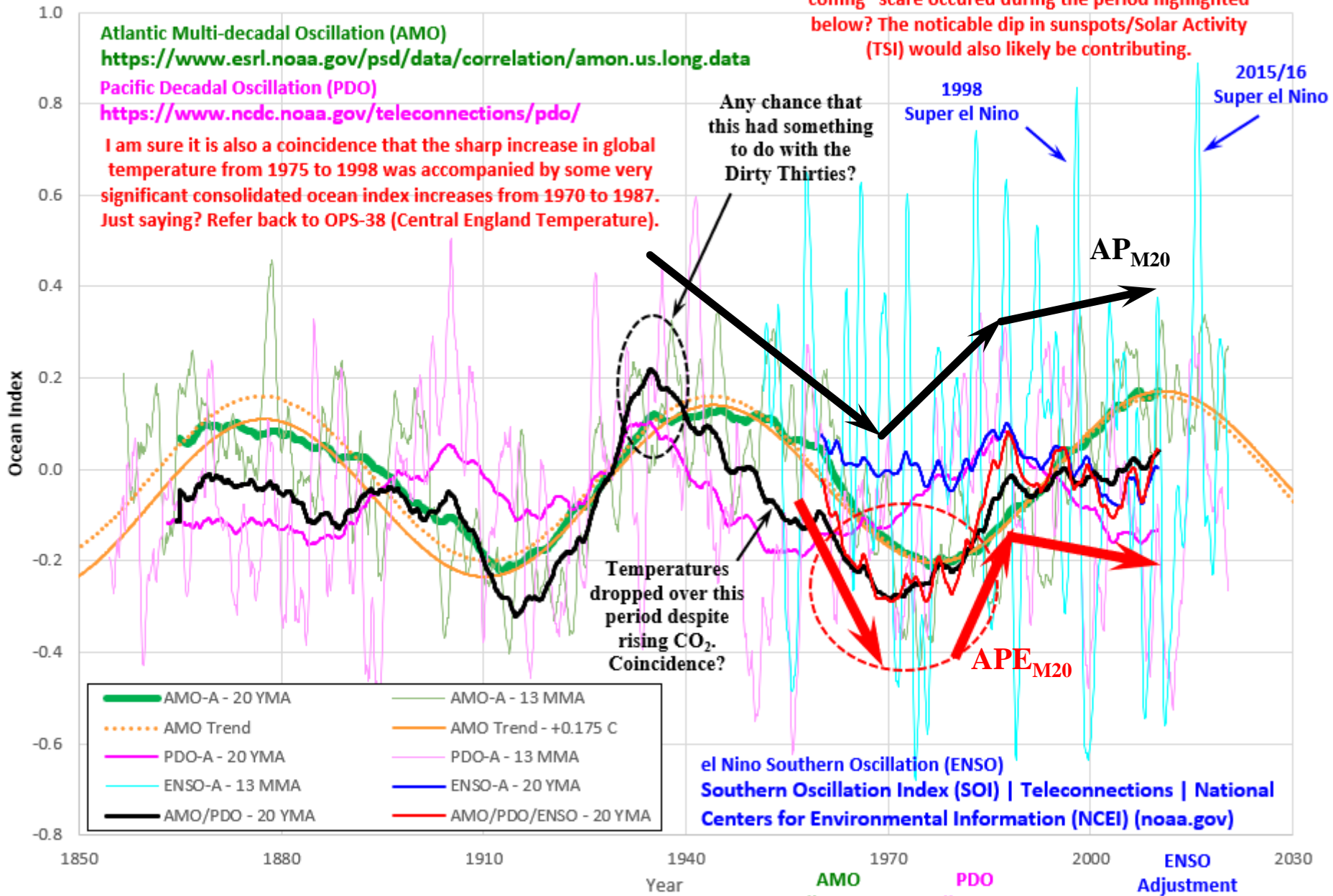
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CSS-16e Central England Temperatures - Model

This slide focusses in on and shows more ocean cycle detail than the previous slide. The lighter lines are the monthly data. The thicker lines are the 20 year moving averages of that monthly data. As mentioned on the previous slide, the AMO_{M20} data was easily fitted with an inclined sinusoidal curve. There are some interesting points that come out of the ocean cycle consolidations. The AMO_{M20} and PDO_{M20} consolidation (the black line) has some interesting character. The strong warming event from 1910 to 1940 corresponds to a strong increase in the AMO_{M20}/PDO_{M20} consolidation (AP_{M20}) from 1915 to 1935. The AP_{M20} consolidation then declines to the early 1970s. The AP_{M20} (and the APE_{M20}) are at a low during the early 1970's Ice Age is Coming Scare. That timing also corresponds to the dip in TSI_{M20} associated with Sunspot Cycle 20. That temperature decline into the Ice Age is Coming Scare corresponds closely to the ocean cycles declines, which were obviously overpowering whatever forcing CO_2 was generating. The Ice Age Scare was immediately followed by a sharp increase (from 1975 to 1987) in APE_{M20} which would have contributed significantly to the 1975 - 2005 temperature rise. Since 1988, the APE_{M20} has had a shallow decline (contributing to the "PAUSE" perhaps?).

Consolidated Ocean Cycles

Ocean Cycles - AMO-PDO-ENSO Consolidation



Increasing solar forcing out of the Maunder Minimum, warms the oceans slightly!! (i.e.: a gradual ocean temperature increase over time)

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CSS-16f

Central England Temperatures - Model

This slide layers in the three main radiative forcings on the CET. The red line is the Solar Activity (TSI_{M20} as a proxy). The green line is the AMO_{M20} with the gold lines reflecting the trends. And last, but not least (??) the blue lines are the atmospheric CO₂ concentration.

There are a lot of temperature fluctuations in the data that have virtually no CO₂ influence. Exactly how can the Catastrophic Anthropogenic Global Warming (CAGW) alarmists believe CO₂ is the only significant climate driver? The computer models have virtually no chance of hindcasting the Maunder Minimum or any of the other significant temperature fluctuations. So, the models cannot hindcast accurately, the models cannot replicate the measured data accurately (by the modellers own admission), but we should still use them to implement

climate policy that mortgages our children's future, unnecessarily. But sure, CO₂

Radiative Forcings

is obviously the only influence here. CO₂ is increasing but prior to 1950, that increase is primarily natural, since over 86% of human emissions occurred post-1950. Temperatures started rising centuries before human emissions could have had any measurable influence and significantly more than half of the CET rise (roughly 2/3) is due to natural forcings (with very minor CO₂ contribution).

Central England - Temperature-TSI-AMO Comparison

Coddington et al, BAMS, 2015

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

NOAA - AMO Index

<https://www.esrl.noaa.gov/psd/data/correlation/amon.us.long.data>

SUGGESTED DATA CITATION: Monnin, E., et al., 2004. EPICA Dome C Ice Core High Resolution Holocene and Transition CO₂ Data. IGBP PAGES/World Data Center for Paleoclimatology Data Contribution Series # 2004-055. NOAA/NGDC Paleoclimatology Program, Boulder CO, USA.

Met Office Hadley Centre Central England Temperature Data Download

1659-1973 MANLEY (Q.J.R.METEOROL.SOC., 1974)

1974 ON PARKER ET AL. (INT.J.CLIM., 1992)

PARKER AND HORTON (INT.J.CLIM., 2005)

Solar (TSI) and Ocean (AMO) are working against one another through this period (keeping temperatures relatively flat despite fluctuations).

Human CO₂ emissions pre-1950 would have only minor impacts. Post-1950, the AMO and ENSO contributed as much to the warming as CO₂, and potentially, most of it.

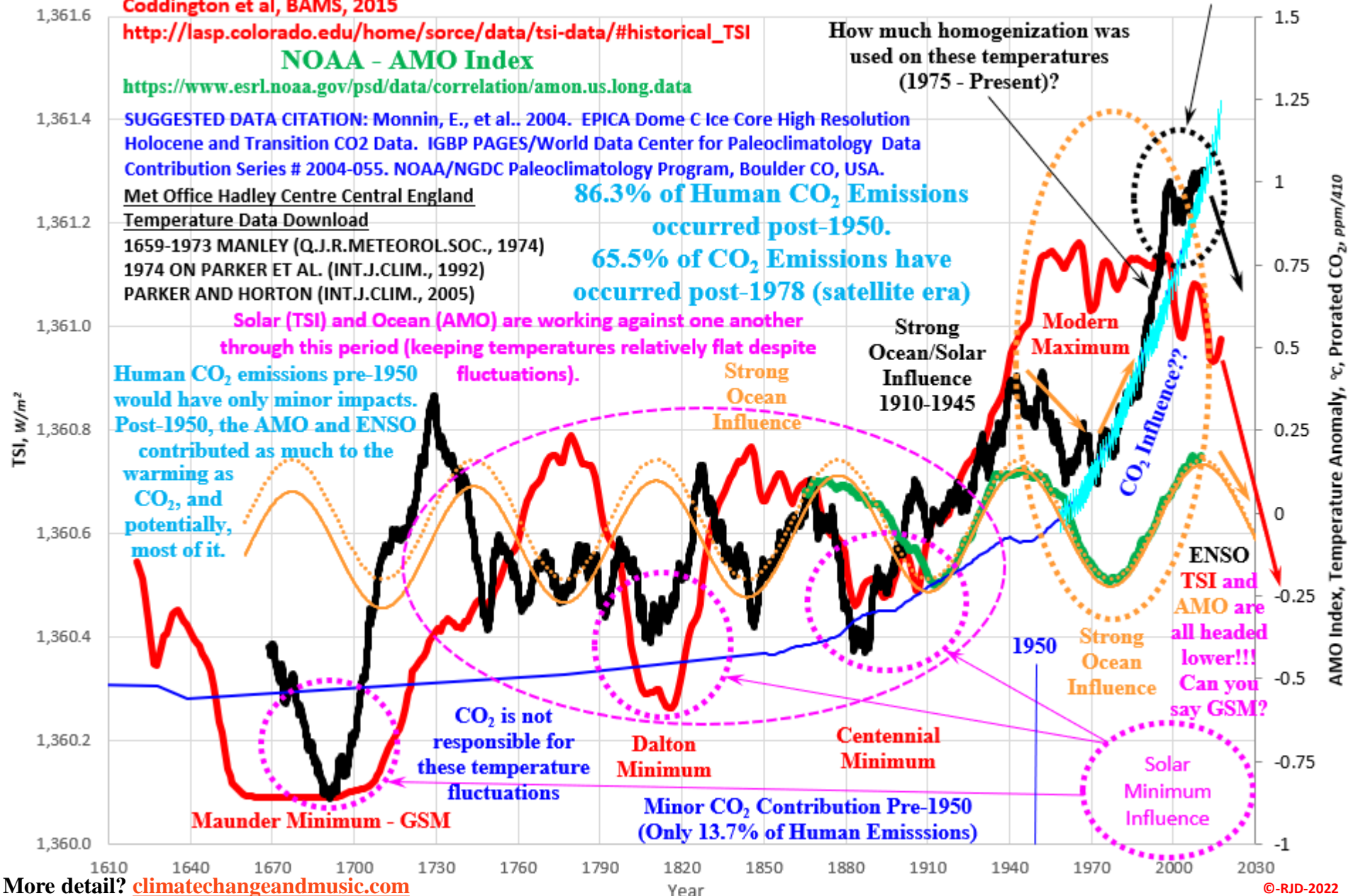
86.3% of Human CO₂ Emissions occurred post-1950. 65.5% of CO₂ Emissions have occurred post-1978 (satellite era)

Strong Ocean/Solar Influence 1910-1945

Strong ENSO Influence el Niños (1998,2010,2015 and 2018)

Strong ENSO Influence el Niños (1998,2010,2015 and 2018)

How much homogenization was used on these temperatures (1975 - Present)?



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Legend: TSI (20 Year MA) - Red line; CE - 20 YMA Temperature Anomaly - Black line; AMO-A - 20 YMA - Green line; AMO Trend - Dotted orange line; NASA/GISS-EPICA - CO₂ - Blue line; Mauna Loa - CO₂ - Cyan line; Inclined (i.e.: a gradual ocean temperature increase over time) - Orange line.

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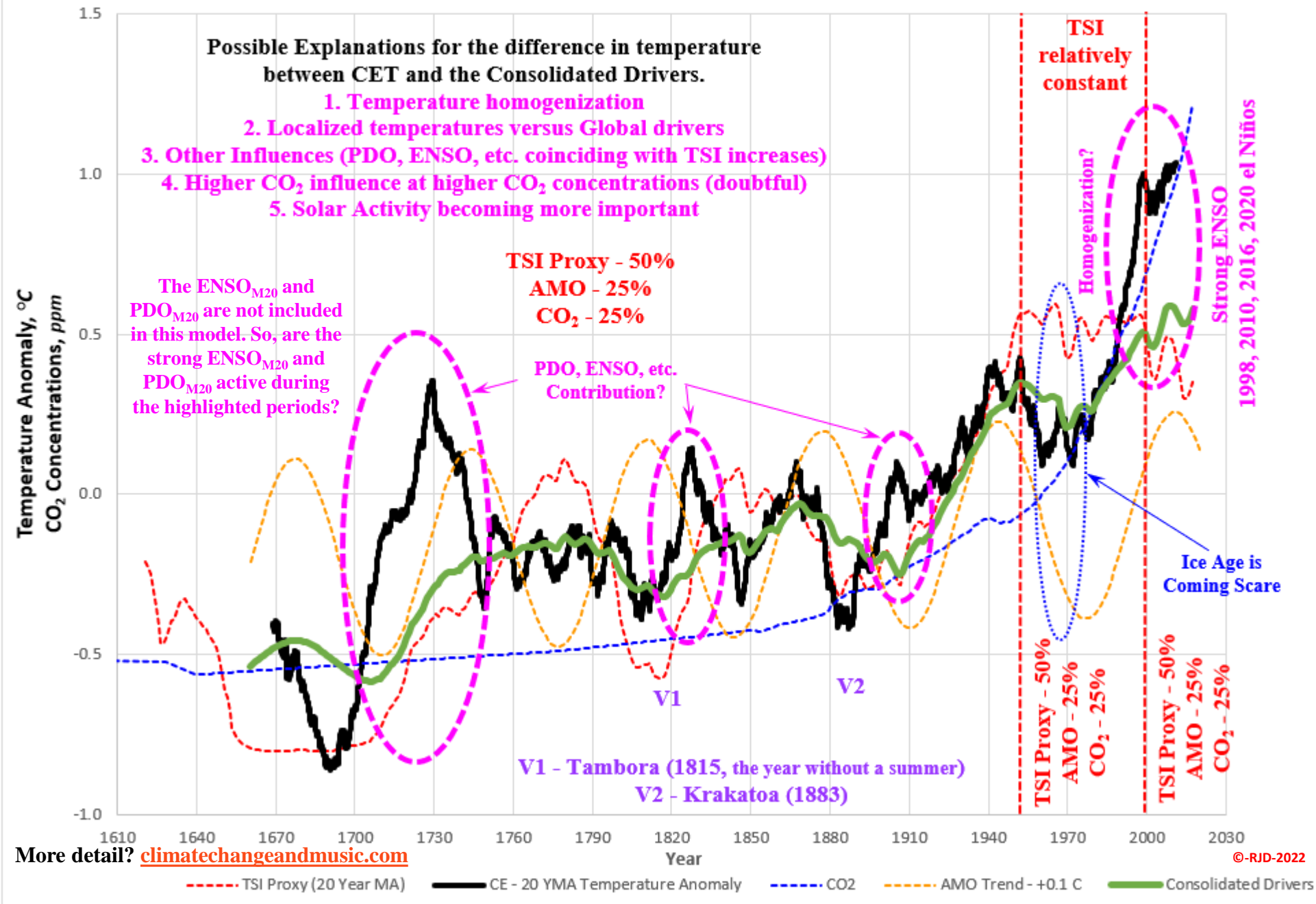
CSS-16g Central England Temperatures - Model

Can the CET be modeled with a combination of TSI_{M20}, AMO_{M20} and CO₂? Not on an absolute basis but the results look a whole lot closer than CO₂ alone. The ratios were set here to give each parameter a fair shake. The Maunder Minimum is difficult to explain without having the TSI Proxy dominate (50%). The remaining 50% was split evenly between the AMO and CO₂. Based on the empirical data, the ocean currents (each individual or in concert) are enough to overpower CO₂'s effects and could be weighted more heavily. A little more to TSI and a little more weighting to CO₂ does tighten up the correlation a bit. The CET deviates from the model in a few circumstances. At the beginning of each TSI rise, the CET spikes noticeably. Is this due to more aggressive PDO, ENSO activity or some other temporary shift in ocean cycles (brought on by the mechanisms causing the solar cycles in the first place)?

Model Results

The major volcanic eruptions contribute to the CET downward spikes but are short lived. The current deviation (1990 to the present) likely has a couple of explanations. The strong el Niños (in 1998, 2010, 2016, 2018 and 2020) would lift the model curve by roughly 0.4 °C (next slide). Some of the difference could be due to homogenization (depending on how aggressive this data set is manipulated). CO₂ is not acting alone!

Central England Temperature - CO₂ - TSI - AMO



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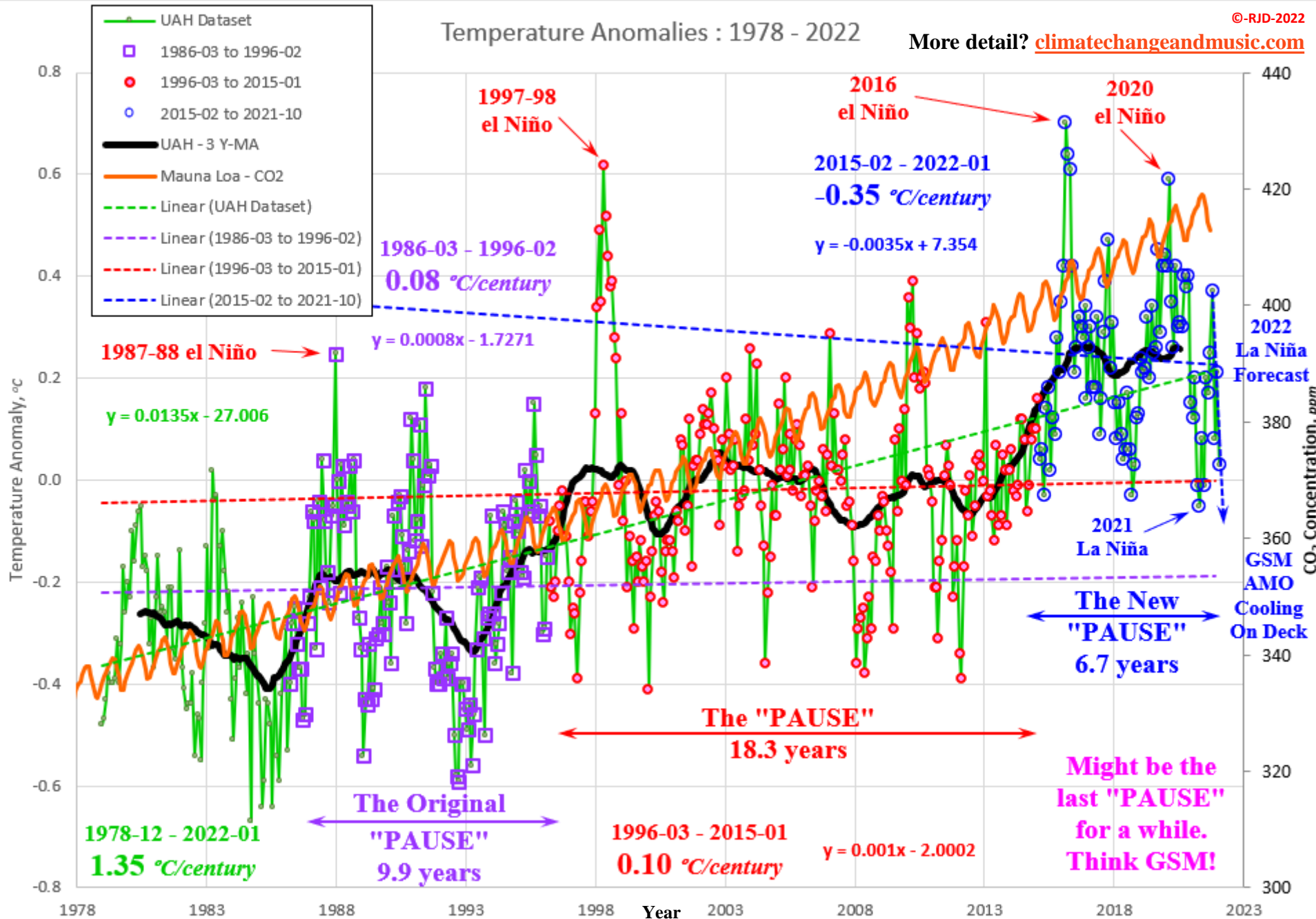
Central England Temperatures - Model

This chart was included in my OPS-56 – The PAUSE post. The chart is included here to compliment the CET story. As shown earlier, the AMO_{M20} (1975 – 2005), PDO_{M20} (1957-1987) and $ENSO_{M20}$ (1964-1987) warming were all active through the early satellite data period. After 1987, The PDO_{M20} and $ENSO_{M20}$ both declined and then levelled out in 2002 (potentially cancelling out some of the AMO_{M20} warming). The AMO_{M20} appears to be the stronger, longer-term ocean forcing, with the $PDO/ENSO$ providing the shorter term more prominent temperature fluctuations. The PDO_{M20} contributes to the long term. Since 2002 the AMO has been relatively flat, while the $PDO_{M20}/ENSO_{M20}$ values were also flat until 2010. $PDO/ENSO$ then both dropped drastically and increased even more drastically (as the 2016 el Niño kicked in). During most of the “PAUSE”, the ocean cycles were generally flat, leaving only the shallow TSI_{M20} decline as the likely

UAH PAUSES

reason for the “PAUSE”. After all something must be responsible for offsetting all that dangerous CO_2 warming. A couple of quick notes, the overall satellite era rise has been just $1.35\text{ }^\circ\text{C/century}$ despite continually rising CO_2 and much higher warming in the “models” and the average $0.2\text{ }^\circ\text{C}$ global temperature jump in 2015 to the present was due to $PDO/ENSO$ (not CO_2). Remember, It’s Complicated.

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Remember, CO_2 's Climate Sensitivity declines exponentially as concentrations rise. If CO_2 is effectively the only driver, that $1.35\text{ }^\circ\text{C/century}$ value can only go down (i.e.: not dangerous, no emergency). Over 65% of humanity's emissions occurred over this period and the best CO_2 could do is $1.35\text{ }^\circ\text{C/century}$?

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CSS-16i

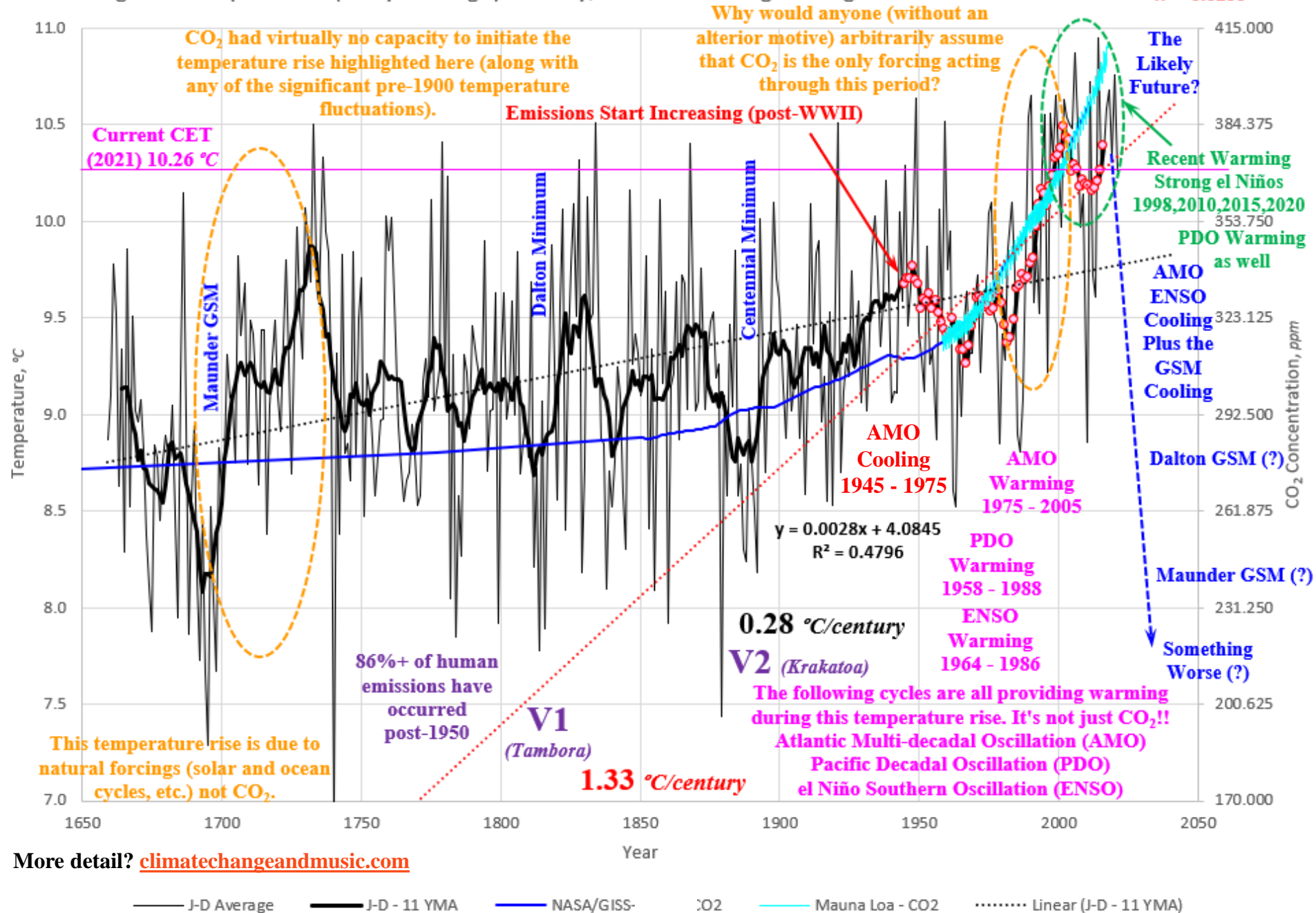
Central England Temperatures - Model

This is the same data that was presented in slide CSS-16b. The focus here is just the average daily CET data (showing the yearly and 11-year moving average). As mentioned earlier, the temperature over this 363-year period increased by just 0.28 °C/century. The temperature increase since the end of World War II (WWII) increased to 1.33 C/century (consistent with the UAH Satellite data in the previous slide (1.35 C/century)). Most (86%+) of humanity's emissions occurred post-WWII. If you look at the data realistically, most of the post-1990 data would be due to the strong positive PDO/ENSO. CO₂ cannot invoke step changes in temperature. If that post-1990 data is removed, the post-WWII to 1990 data fits nicely with the average historical temperature increases (despite a significant CO₂ contribution). Over the 1705 - 1991 period (287 years) temperatures increased at just 0.13 °C/century.

Expanded Yearly Daily Average

But remember that ignores the very cold temperatures of the Maunder Minimum. CO₂ can just not explain the pre-WWII temperature fluctuations, or the colder temperatures associated with the solar minimums or even the Ice Age is Coming Scare of the early 1970s (which coincided with the lower activity, solar cycle 20). The model focus on CO₂ is missing the very real GSM we are just entering. **A stupid, dangerous mistake!**

Central England Temperature (Daily Average) - Yearly/11 Year Moving Average

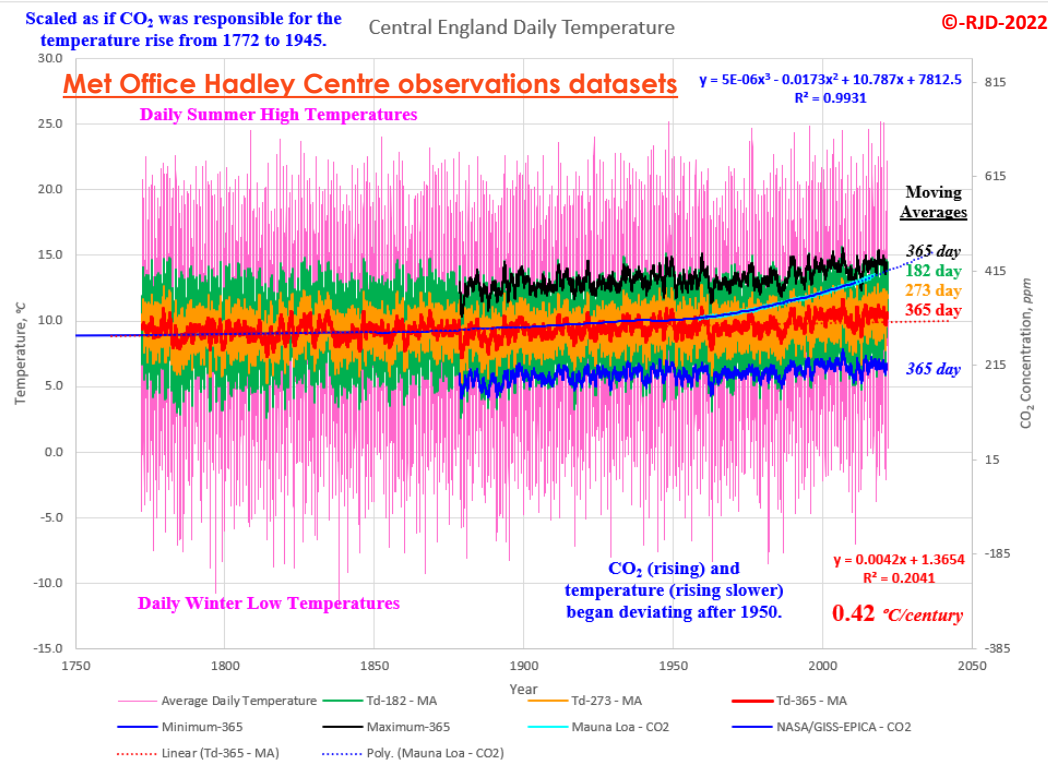


More detail? climatechangeandmusic.com

CSS-16j Central England Temperatures – Detailed Daily

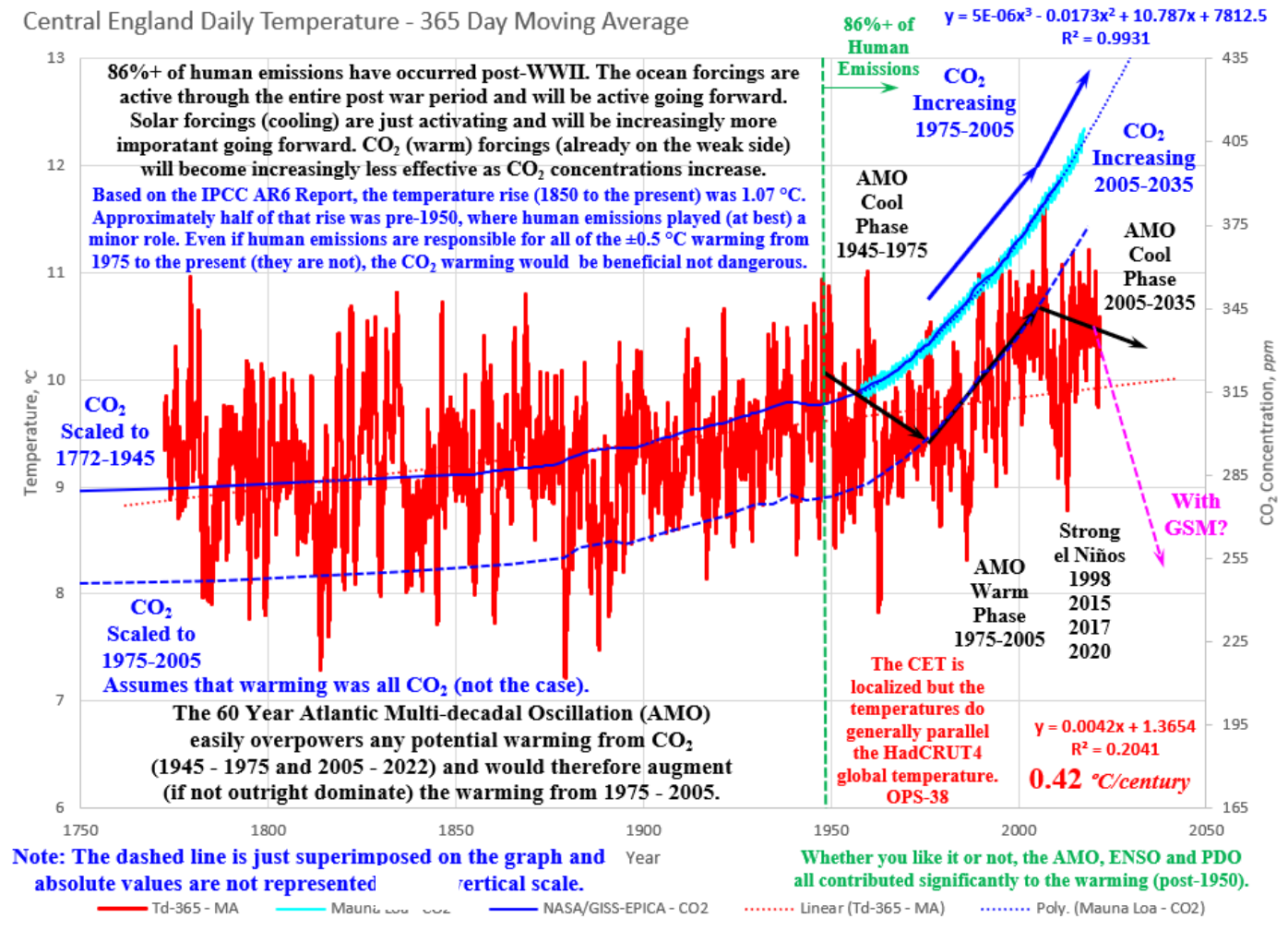
More detail? climatechangemusic.com

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The Met Office Hadley Centre data also includes a daily based temperature from 1772 to the present. The daily data (to the left) is very erratic (cycling between warm and cold over the year). None of those highs or lows are dangerous or would even be noticed by the general public if they were not constantly bombarded by climate alarmist propaganda. The average temperature rise since 1772 (0.42 °C/century) is also not dangerous (even assuming the coming GSM does not drop temperatures like it has in every other solar minimum). England (as in many areas of the world) could use some “Global Warming”. If you believe that CO₂ is responsible for virtually all global warming, the CO₂ data should fit the temperature data regardless of the time period. On a gross basis you can fit the CO₂ data to temperature over the 1772-1945 period. Under that scenario, CO₂ and temperature begin deviating post-1945. There are still significant fluctuations (on short and

Central England Daily Temperature - 365 Day Moving Average



longer term periods) that are not CO₂ related. Most human CO₂ emissions (86%+) occurred post-1950. But the only period that has rising temperatures since 1950 is (1975-2005). If you correlate CO₂/Temperature over that short period, the correlation before 1975 or after 2005 is just about non-existent. There is more to the story than CO₂.

Detailed Daily Temperatures

Ignoring the much more important drivers like the sun directly and indirect solar influences (clouds, cosmic ray flux, high energy particles, solar winds, magnetic fields, ocean cycles, etc.) is a dangerous position to take. Cold kills more people (directly or through cold related crop losses, civil strife, poor health, infectious disease susceptibility, etc.) than any potentially beneficial warming due to CO₂. The Grand Solar Minimum (GSM) we just entered will be subject to the similar circumstances experienced during past GSMs (i.e.: the Maunder GSM most recently). For those that need more “authoritative” opinions and peer-reviewed papers, some links are available in my OPS-55 – The State of Climate Science post. NOAA/NASA have both forecasted a GSM and prominent climate scientists continue to show connections between temperature and solar activity, cosmic ray flux, cloud cover, etc. and the shortcomings of the simplistic, unscientific alarmist narrative.