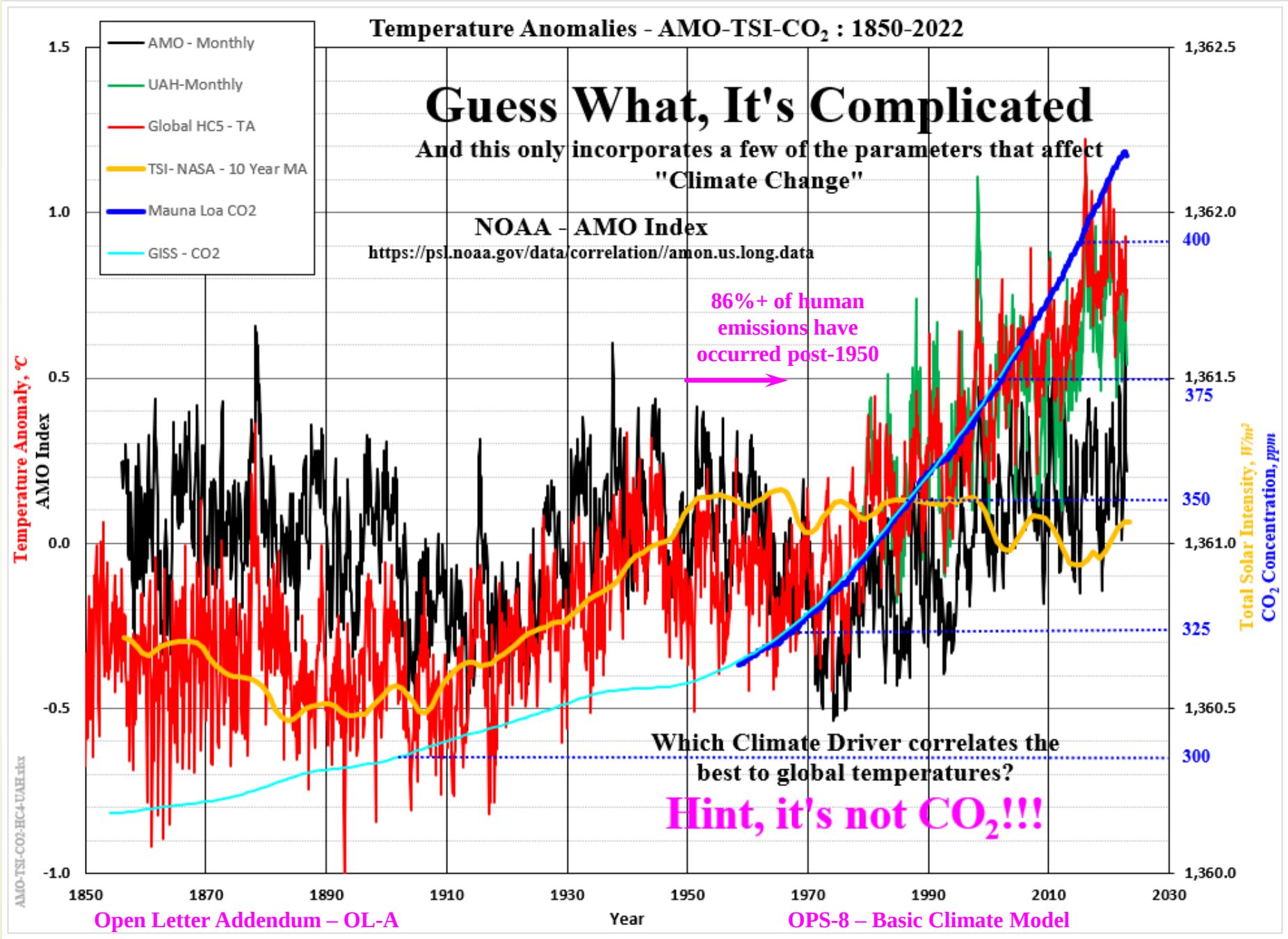
Climate Change - It's Complicated - Update

CC-IC Update

One of my early plots was one I called "It's Complicated". The plot showed the HadCRUT4 Surface (HC4) and University of Alabama, Huntsville (UAH, normalized) Lower Troposphere Satellite temperatures plotted with a few key forcings. Those forcings in alphabetical order are the Atlantic Multi-decadal Oscillation (AMO), atmospheric Carbon Dioxide Concentrations (CO_2) and the Total Solar Irradiance Momentum (TSI_M (as a proxy), 20 Year Moving Average (YMA)). When you looked at that plot and the updated one to the right, there is obviously more going on than just CO_2. Even with the homogenized (i.e.: manipulated) HC4 (and HC5 to the right) data, CO_2 has questionable correlation, let alone causation. Roughly half of the IPCC's official Global Temperature rise (AR6, 1.07 °C) occurred prior to 1950. Given that 86%+ of human CO_2 emissions have occurred post-1950, there have to be significant natural forcings acting on our planet as well. How much does CO_2 contribute? The contribution may be significant post-1950, but not singular. In fact, I showed that this temperature record could be modeled closely using just the AMO and the TSI_M (as a proxy, OL-A, OPS-8). I will expand on this plot a bit and bring some additional forcings into the discussion.

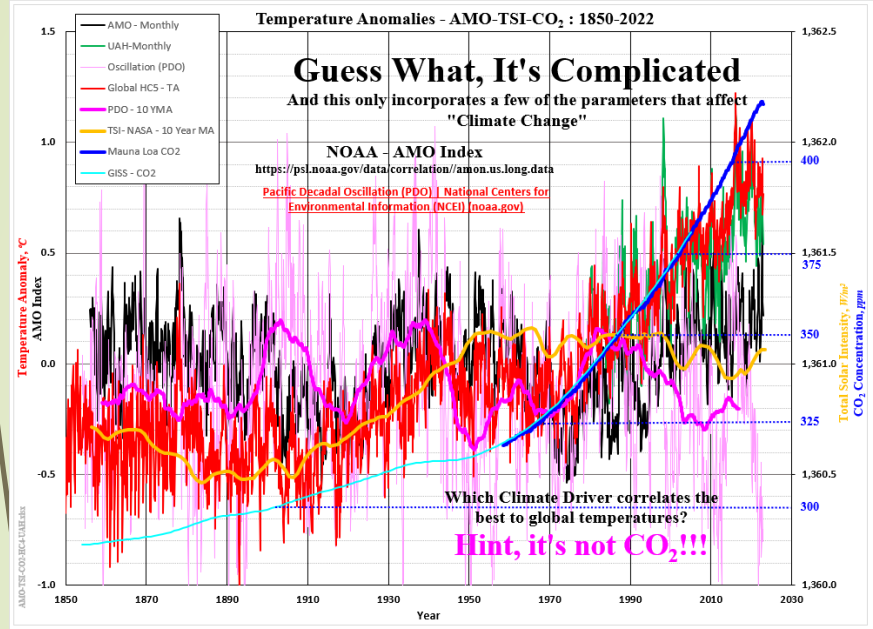


Open Letter Addendum – OL-A

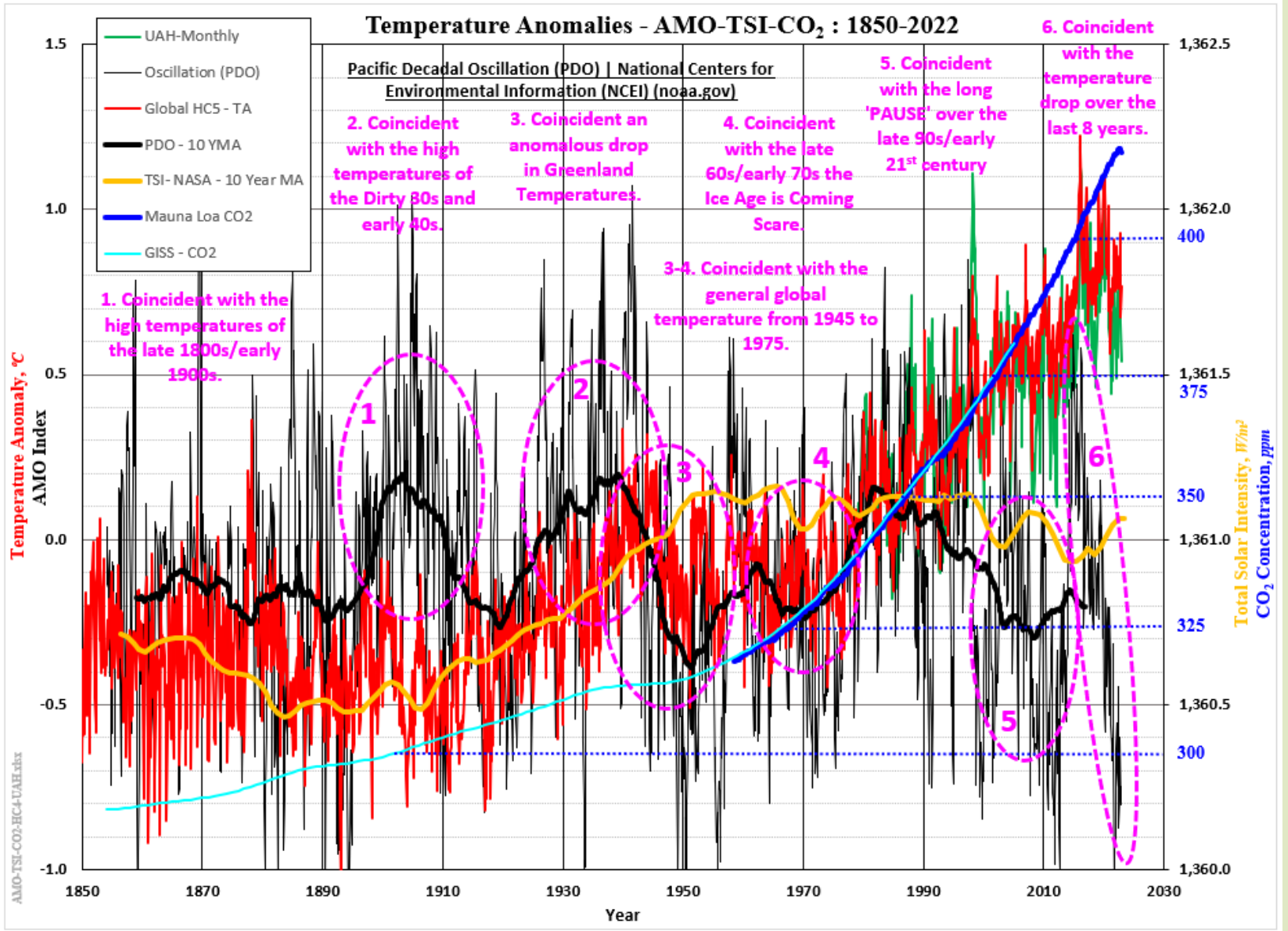
OPS-8 – Basic Climate Model

Climate Change - It's Complicated – Adding in the PDO

More detail? climatechangeandmusic.com



Another major influence, the Pacific Decadal Oscillation (PDO), was added to the plot on the previous slide (shown to the left). And yes the complications compound. You can zoom in on that plot if you like, but the discussion will focus on the plot below (AMO has been replaced by the PDO). The PDO does not correlate with general temperature oscillations as well as the AMO, but there are some interesting "coincidences". The high temperatures of the late 1800s/early 1900s and the Dirty 30s/early 40s coincide with warm PDO phases (1, 2). The highlighted cold



PDO phases (3, 4, 5, 6) line up with some anomalous temperatures in Greenland/Iceland (shown in a later slide), the 1970's the Ice Age is Coming Scare, the 'PAUSE' and the recent, ongoing 8 year temperature decline, respectively. The PDO cycle is more erratic than the AMO cycle. But as should be expected, the PDO appears to have some significant effects on global temperatures. The warm PDO in the late 70s through the 80s would have contributed to the 1975 to 2000 temperature rise (along with the AMO, CO_2 and homogenization). The other significant ocean cycle is the El Niño Southern Oscillation (ENSO). This cycle is much shorter and more erratic than the other mentioned cycles. The most prominent ENSO example is the step increase in temperature beginning in 2015. This strong, warm ENSO pulse is responsible for most of the recent warming. Those temperatures have dropped due to a triple cold La Niña phase, the cold PDO and some minor TSI_M declines.

CC-IC Adding in the PDO

Climate Change - It's Complicated – Forcing Discussion

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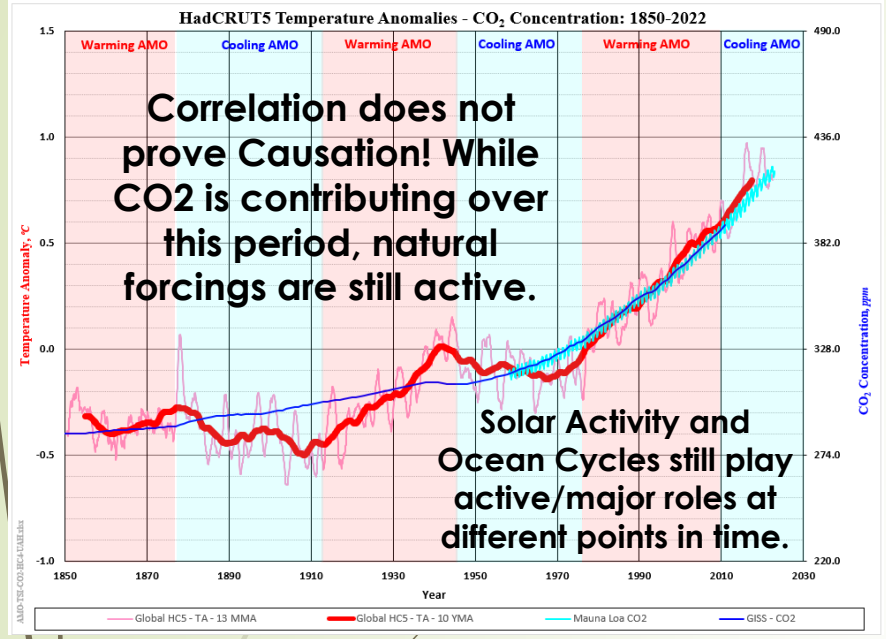
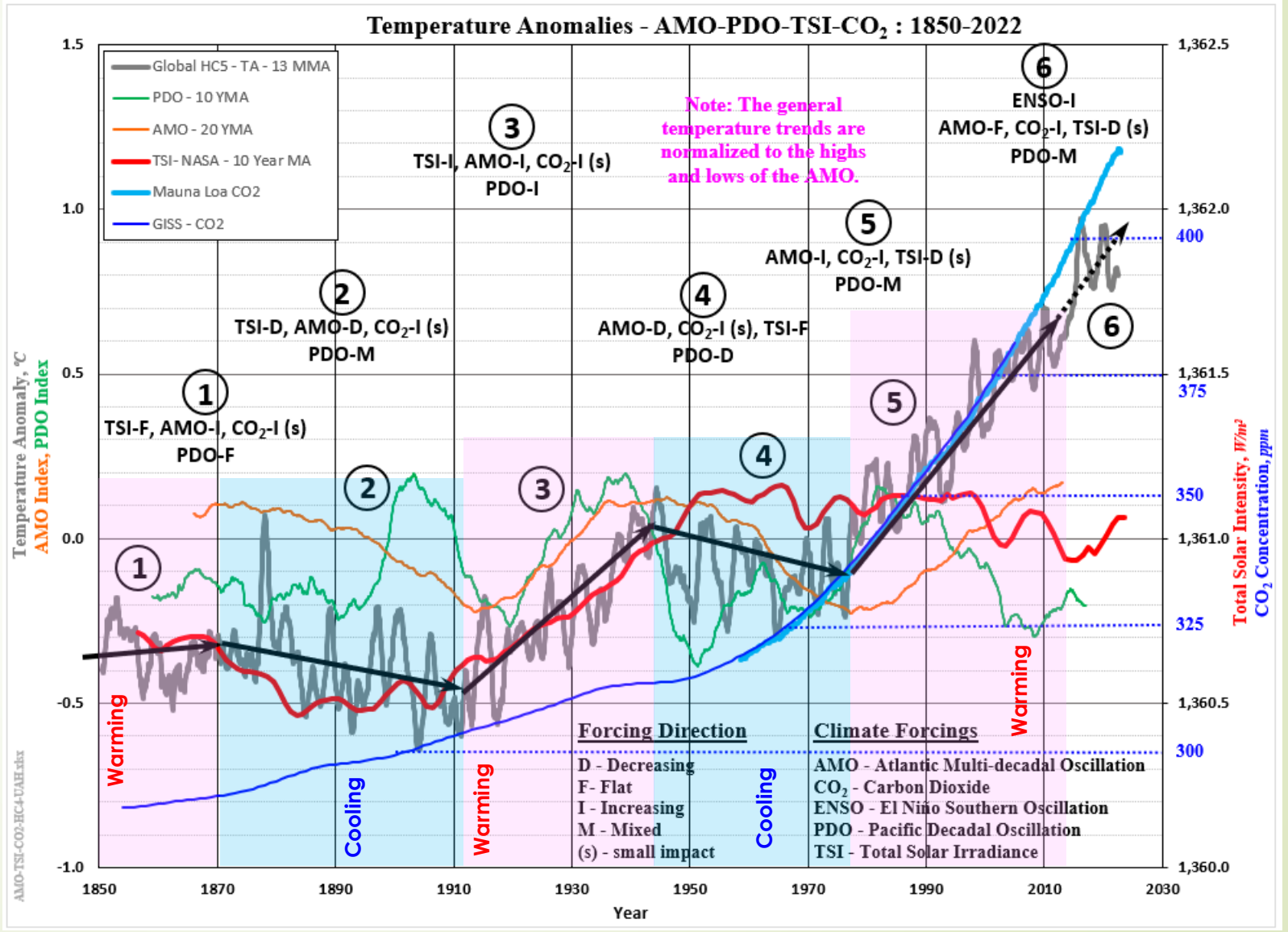


The plot to the left shows the HadCRUT5 surface temperature data with a tight correlation to atmospheric CO_2 concentrations. Those curves are overlying the warm and cold AMO cycles. The CAGW alarmist crowd likes to proclaim that this correlation proves that CO_2 is the primary climate driver. Sorry, no. Prior to 1850, CO_2 levels were virtually flat, but temperatures still fluctuated significantly (shown on the following slide). The models (also shown on the following slide) are running too hot (by their own admission) and therefore are useless for forecasting.



The plot to the right qualitatively highlights the general forcings acting on our planet and no, CO_2 is not the only climate driver. The ocean cycles are active throughout. Solar Activity has a significant influence pre-1950 with minor influences post-1950. CO_2 has a minor influence pre-1950 and "may" have a significant influence post-1950. That, of course, is the big question. And you will not get your answer from the IPCC computer models since they use Equilibrium Climate Sensitivities (ECS) that range from 1.8 to 5.6 °C. The ECS reflects the temperature increase that can be expected from a doubling of atmospheric CO_2 concentrations. Remember, the models by their own admission, run too hot. The real test comes over the next few decades, when temperatures are very likely to fall (as they have been for the last 8 years). The ENSO and PDO are already in their cold phase. The AMO is just starting into its 30 year cold phase and the TSI_M will head lower as we move into a GSM.

CC-IC Forcing Discusssion

GSM – Grand Solar Minimum. You really should do the Research!

CSS-35d Climate Change - It's Complicated – Past/Future

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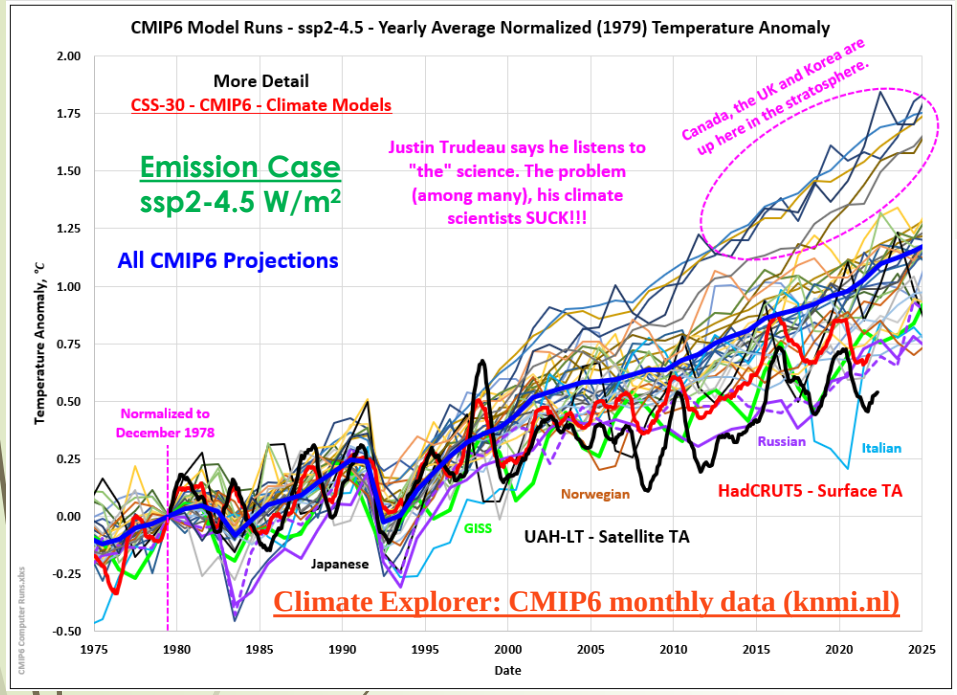
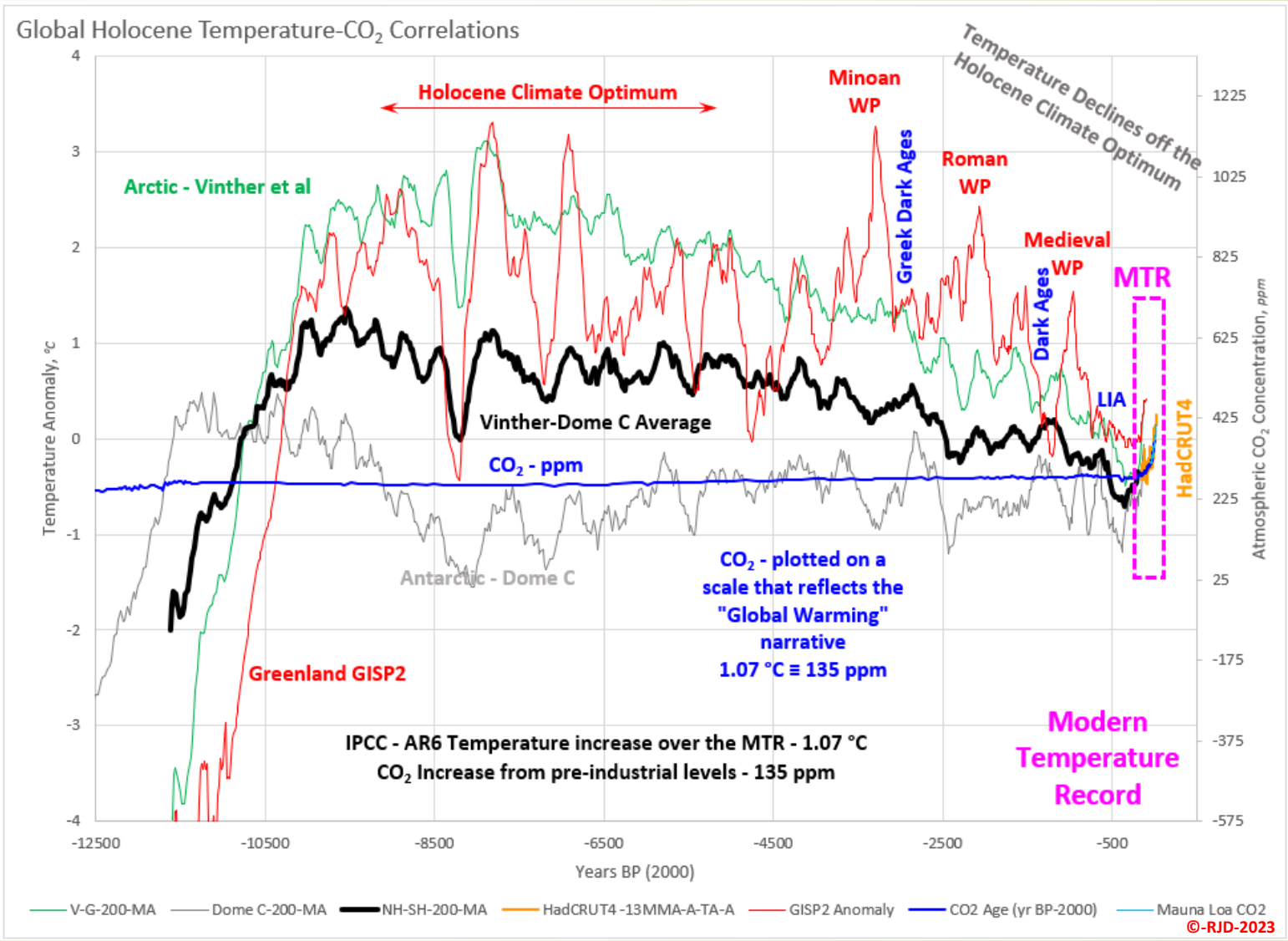
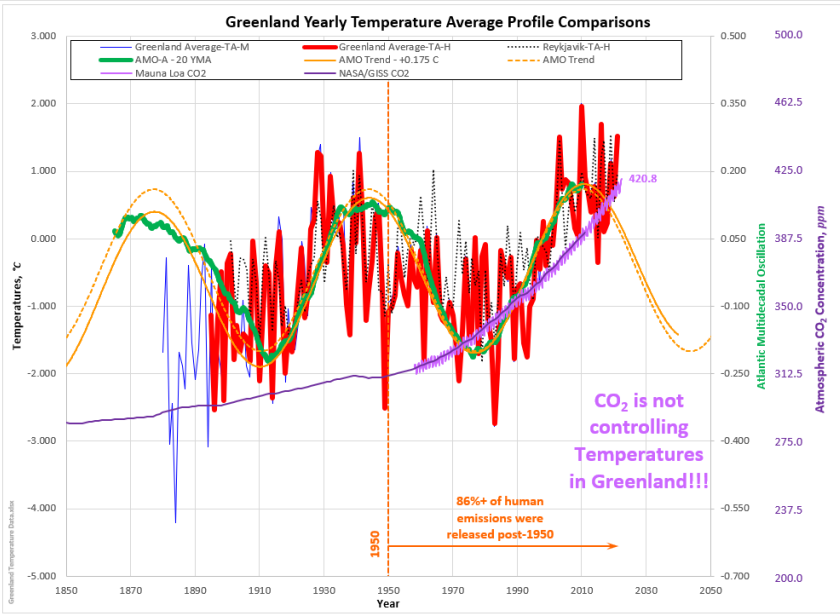


The plot to the left shows the most recent computer model output plotted against the HadCRUT5 surface and UAH Lower Troposphere Satellite temperature data. All these projections use the latest CMIP6 computer protocols. What are my main takeaways? Firstly, the science is obviously not settled even within the IPCC. These runs (based on the IPCC's latest AR6 report) use CO_2 Equilibrium Climate Sensitivities (ECS) that range from 1.8 °C to 5.6 °C. The IPCC uses the average of these runs (bold blue line) to forecast future temperatures. Averaging all these incorrect runs does not produce a realistic, let alone representative projection. Secondly, both the HadCRUT5 and UAH "observed" temperature data sets are significantly lower than the CMIP6 average. (i.e.: the models, as the programmers have conceded, run too hot). The plot to the right shows a variety of temperature datasets plotted with the atmospheric CO_2 data over the Holocene. The twist, the data is plotted on vertical scales that represent the CAGW alarmist narrative that CO_2 is responsible all the global warming over the Modern Temperature Record (MTR, 1850 to the present). That narrative claims that the 1.07 °C warming is due to the 135 ppm CO_2 increase. The main takeaway, temperatures fluctuate significantly when CO_2 is virtually constant. Obviously, CO_2 is not the only climate driver, let alone the dominant driver. Those pre-MTR natural forcings (primarily solar) were still active during the MTR and will continue to be active in the future. So, in what universe does it make sense to use these inaccurate future (our future) computer model projections, when those models cannot replicate even recent historical temperatures?

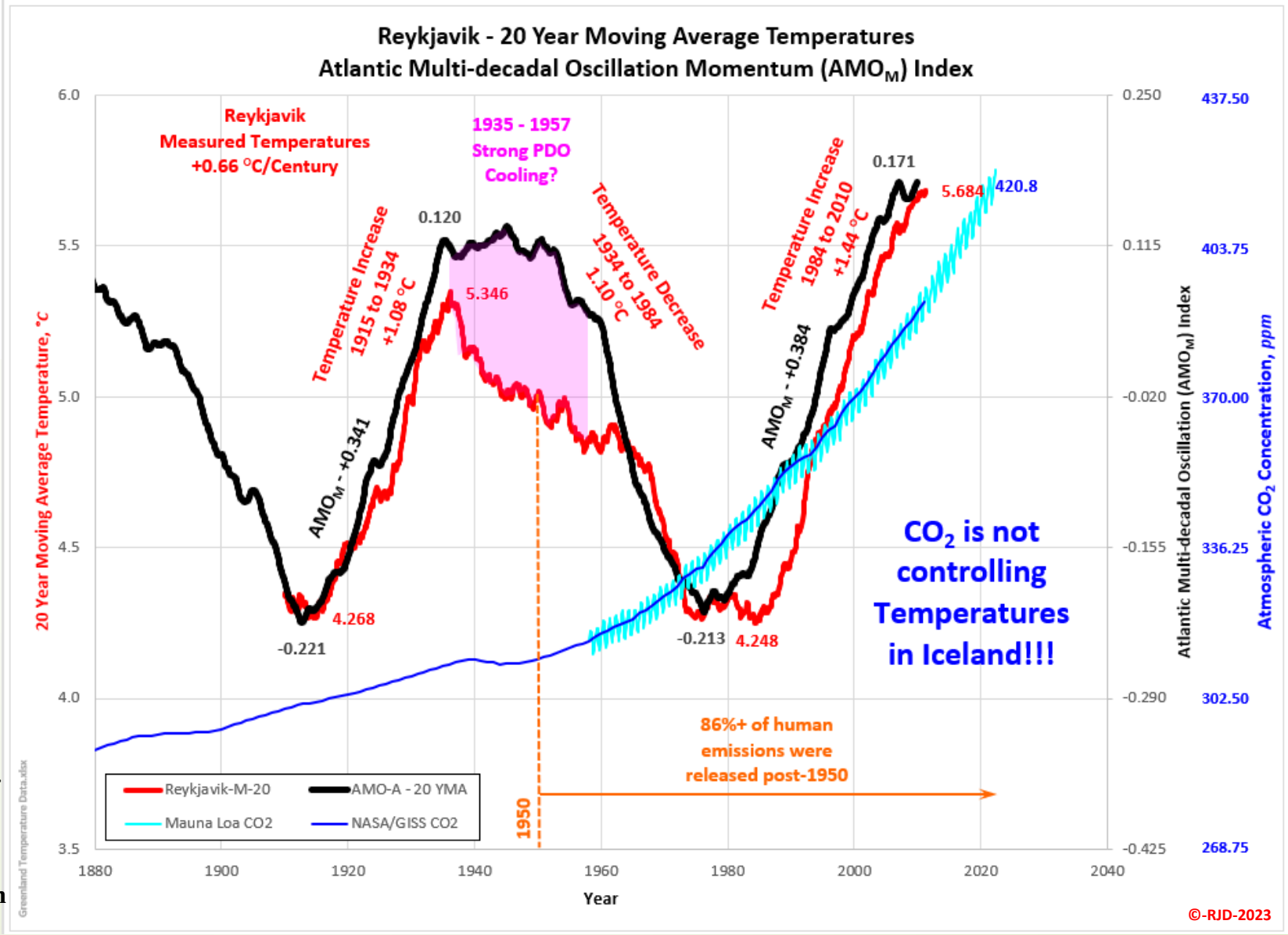
CC-IC Past/Future



Climate Change - It's Complicated – Greenland/Iceland/AMO



The historical temperature in Greenland/Iceland has, not surprisingly, been strongly influenced by the Atlantic Multi-decadal Oscillation (AMO). They after all, are located in the North Atlantic. The same influences can be seen in the Central England Temperature (CET) dataset (CSS-27 – Is CO_2 Really the Primary Climate Driver). The plot to the left shows the yearly average temperature anomaly data (Greenland and Reykjavik, Iceland) and the 20 YMA AMO Index.



A more detailed look is presented in my CSS-26 – Greenland/Iceland – AMO-PDO-CO_2 Distribution and CSS-32 – UAH Temperature Analysis posts. Obviously, the AMO is more important to this significant area of the world than CO_2. But something dropped the temperatures in the late 1930s and the logical answer is the strong PDO cooling from 1935 to 1957. The AMO did not begin dropping until the early 1950s. Both the AMO and PDO significantly affect the global temperature, but their influences would be stronger locally. The temperatures are oscillating with the AMO, but they are also generally increasing (with CO_2 contributing to that increase) . The Greenland average has increased by 1.26 °C/century (measured) and 1.01 °C/century (homogenized). The respective Reykjavik numbers are 0.66 and 0.93 °C/century. The CET is rising at a mediocre 0.28 °C/century. The northern hemisphere ice is not melting away any time soon.

CC-IC Greenland AMO

Climate Change - It's Complicated – Temperature Reality

More detail? climatechangeandmusic.com

GSM – Grand Solar Minimum. You really should do the Research!

Given that I was updating the "It's Complicated" plot, I thought I would throw in an updated "Temperature Reality" plot as well. The red curve is the temperature anomaly data (the temperature relative to a recent 30 year average). The green curve is the average global temperature (currently ±15 °C). Both curves represent HadCRUT5 surface temperature data. The HadCRUT5 data closely reflects the IPCC's stated 1.07 °C temperature rise since pre-industrial times. Plotting the temperature anomaly amplifies the perceived temperature rise. In the real world that 1.07 °C rise (green curve) is barely noticeable on the graph and virtually imperceptible in the real world. This plot is scaled from -30 to +45 °C (a representative range of human habitation). In Calgary, we experience Temperatures yearly that range from -35 to 40 °C. We can survive another 1 or 2 °C of warming (assuming that the planet even warms from here (i.e.: the coming GSM and AMO cooling)). And as shown on earlier slides, the 1.07 °C temperature increase is not unusual, not unprecedented and not attributable to just CO_2. There is no Climate Emergency (at least not from warming)! There are more important climate policy induced Energy, Food and Financial Emergencies that are essentially being ignored to fix a non-problem.

CC-IC Temperature Reality