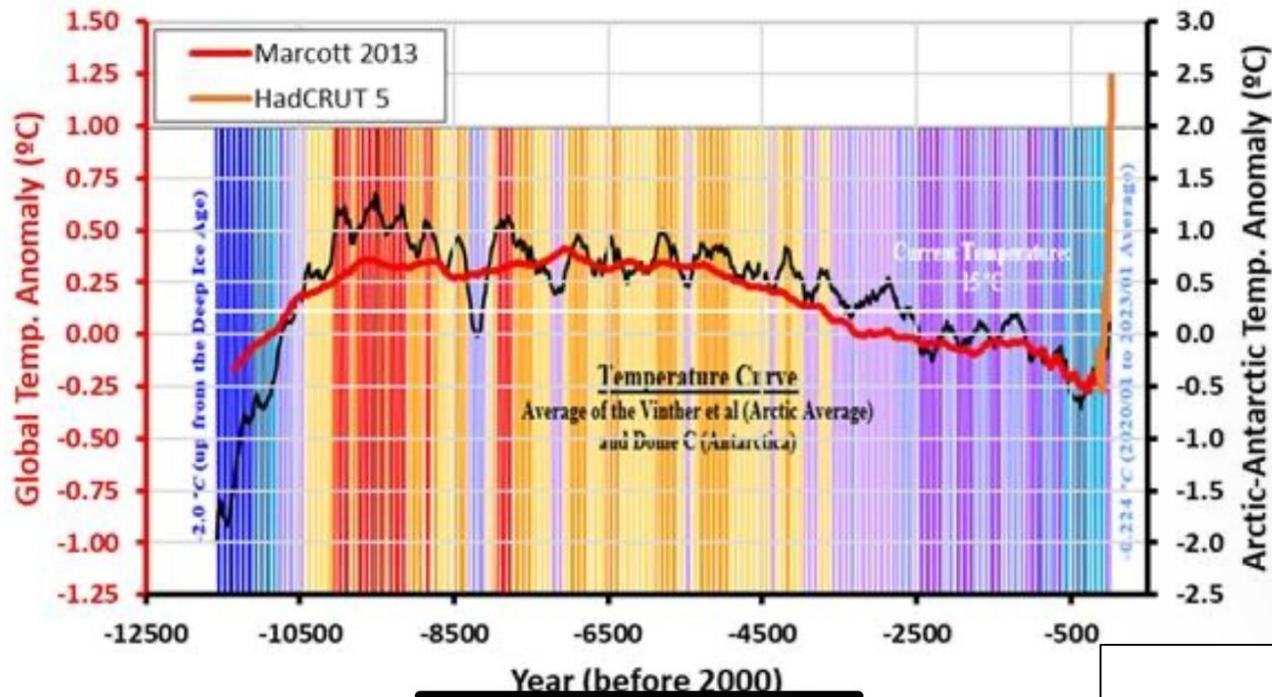


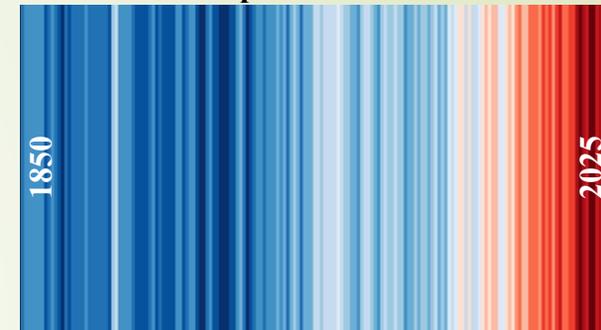
Global vs. Arctic-Antarctic Temperature Anomalies



Holocene Stripe Chart – Correcting the Record

In April 2023, I addressed Ed Hawkins' Show Your Stripes movement. An example (1850 to 2025) is shown below. These charts are focused on a natural warming trend out of the Dalton Solar Minimum (the last vestige of the Little Ice Age (LIA)) which they try to pass off as Anthropogenic (Human) Warming due to greenhouse gases (primarily CO₂). These post-1850 charts ignore the higher temperatures of the Minoan, Roman, and Medieval Warm Periods and much higher temperatures of the Holocene Climate Optimum and the Eocene Thermal Maximum.

I produced my own Stripes charts that covered several more temperature histories (Stripes Ladder). My Holocene chart is included below. The temperature anomaly profile below is an average of the Vinther et al 2009 Arctic average and the Dome C dataset from Antarctica. The Vinther and Dome C



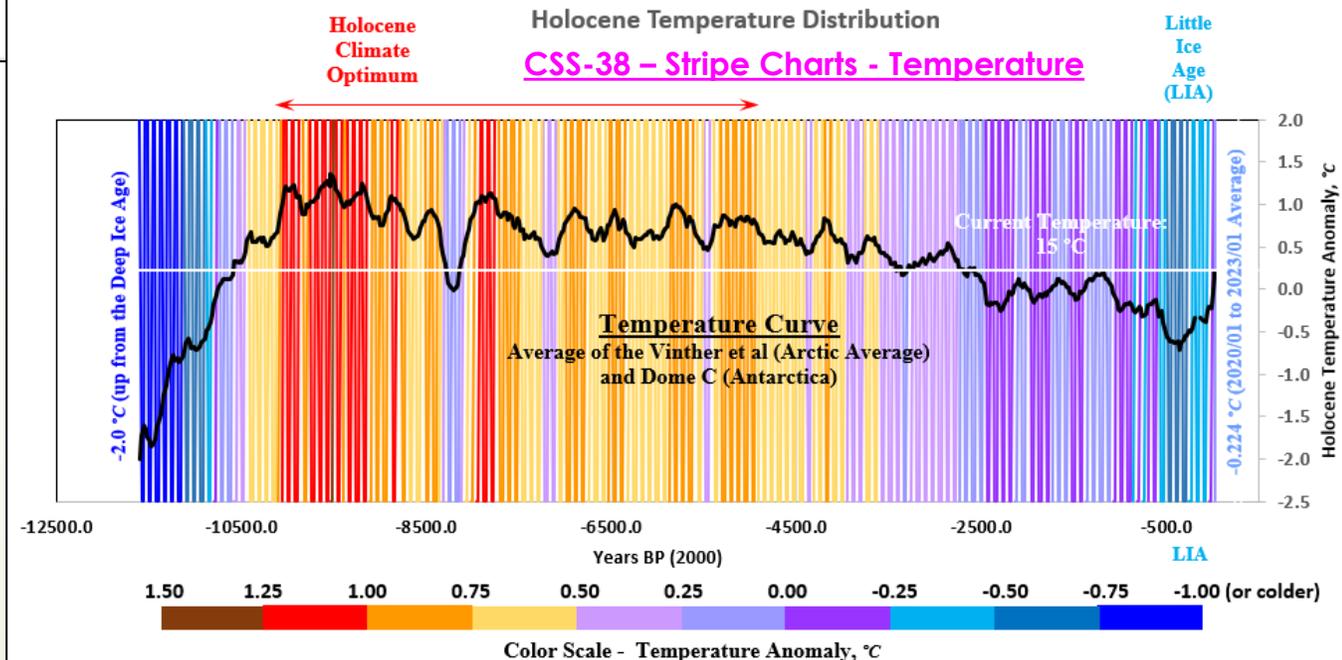
data are shown on the next slide. Recently my version of the Holocene Stripes chart has been questioned as inadequate, lacking context, etc. In the chart above, the Marcott 2013 Holocene temperature estimate has been overlaid on my Arctic-Antarctic average. Same general profile, no issues there. But adding on the HadCRUT5 surface temperature dataset (multiplied by 2 to 3 (?)

is questionable at best. Their premise is that polar temperatures are rising faster than the global average. Whoever produced the chart above makes the same mistake as the “Hockey Stick” crowd. You cannot just attach one data set to another without adjusting for data handling (averaging for example) techniques. You also must understand the data sets used. The Vinther et al 2009 dataset is based on five sites in Greenland and one site on the nearby Ellesmere Island (in Canada). Greenland temperatures have been rising at a much lower rate than the arbitrarily expanded HadCRUT5 data shown above. Antarctica has been statistically flat through the satellite period, generally declining overall.

Holocene Stripe Record Correction

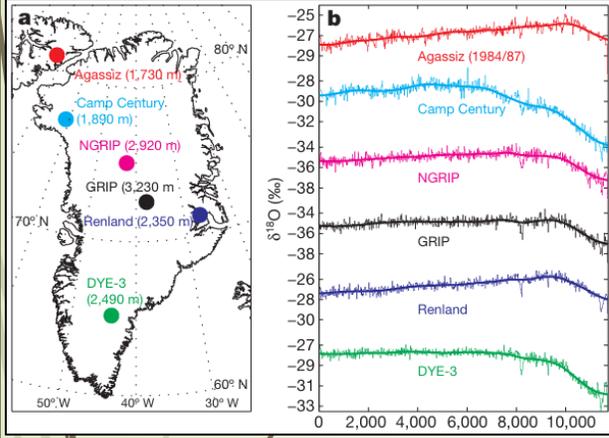
Holocene Temperature Distribution

CSS-38 – Stripe Charts - Temperature



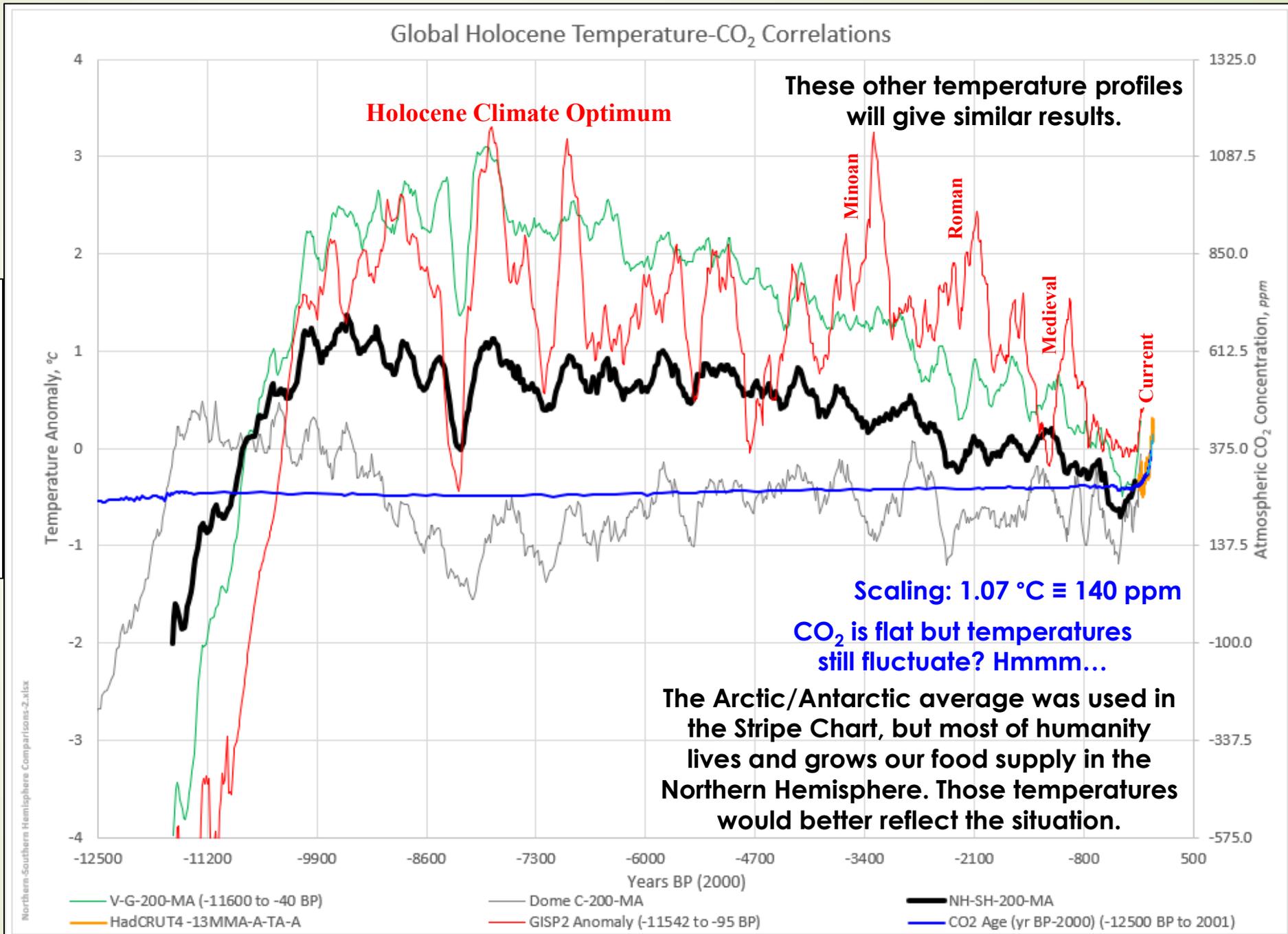
Holocene Stripe Chart Holocene Temperatures

This slide compares a few different temperature data sets and lays out the Arctic (Vinther et al 2009) and Antarctic (EPICA Dome C) temperature data sets that were averaged to produce the average global temperature used in the Stripe Chart. Vinther et al 2009 is primarily

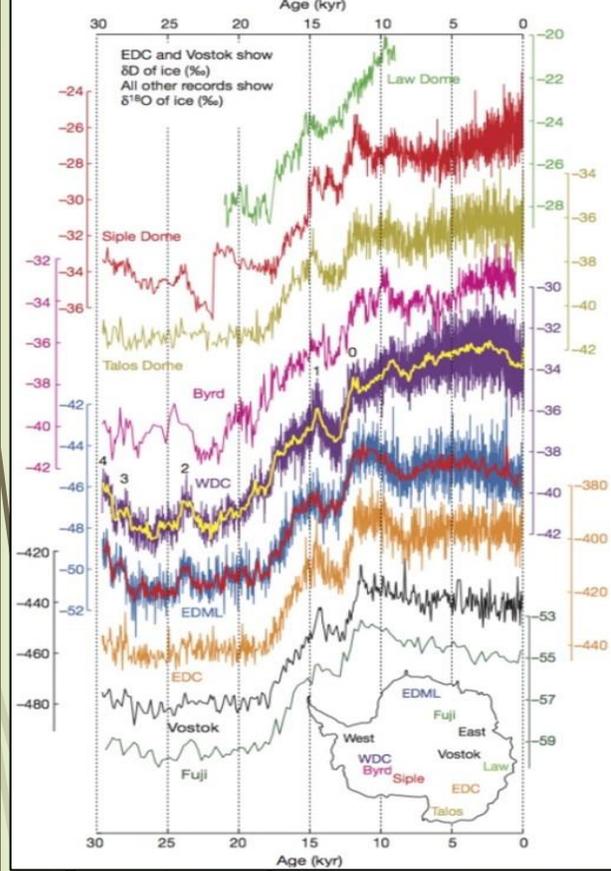


HSC Greenland Temperatures

Greenland oriented with one ice core from Canada's Ellesmere Island (all adjusted for elevation). The GISP2 data (included for context but not used in the average) highlights the sensitivity of Greenland to the natural forcings present throughout the pre-MTR Holocene. The temperature (i.e.; climate) fluctuations are due to natural forcings (primarily solar (directly or indirectly)). Somehow the climate changes without CO₂ changes?

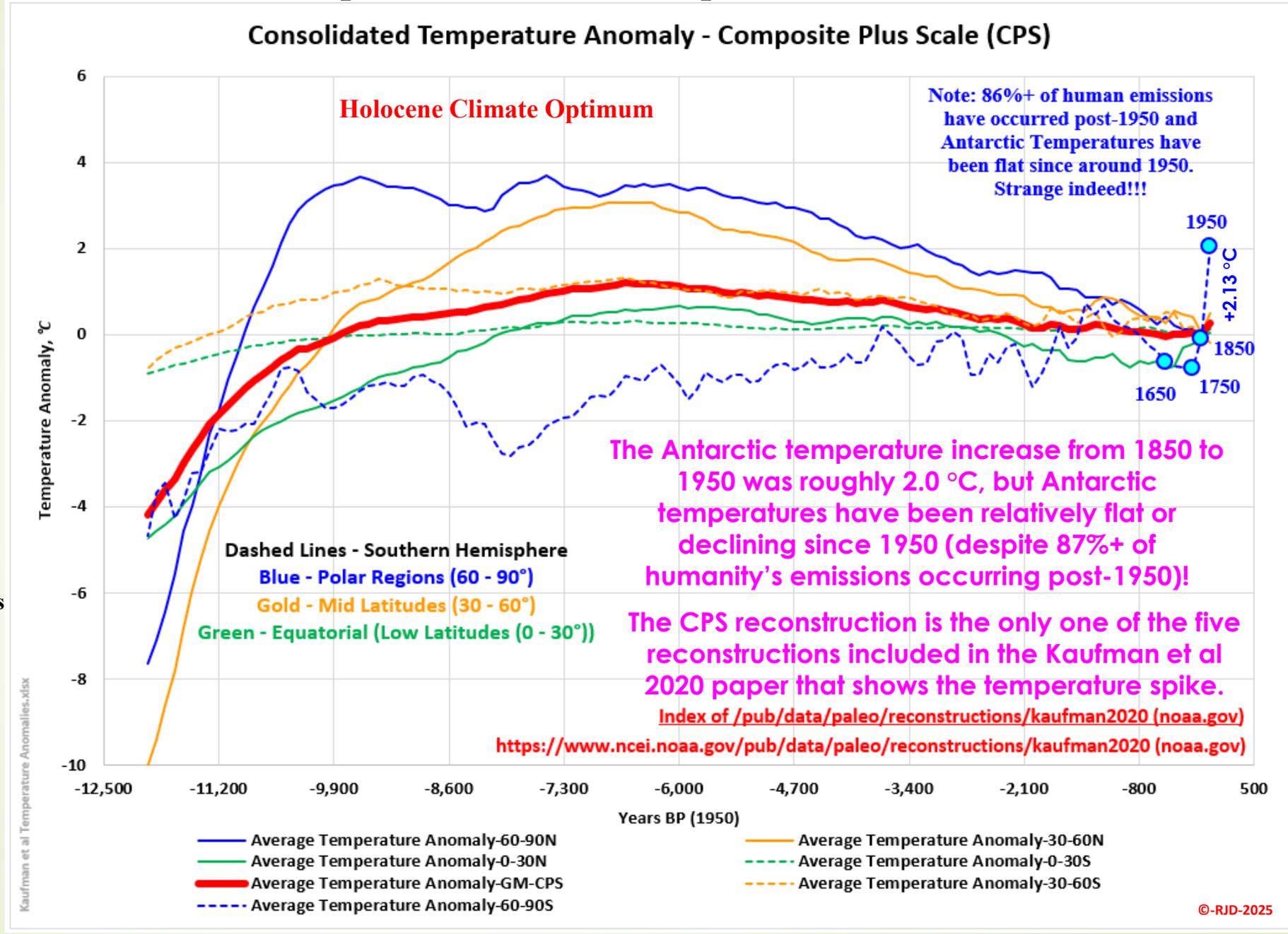


GSM - Grand Solar Minimum. You really should do the Research!



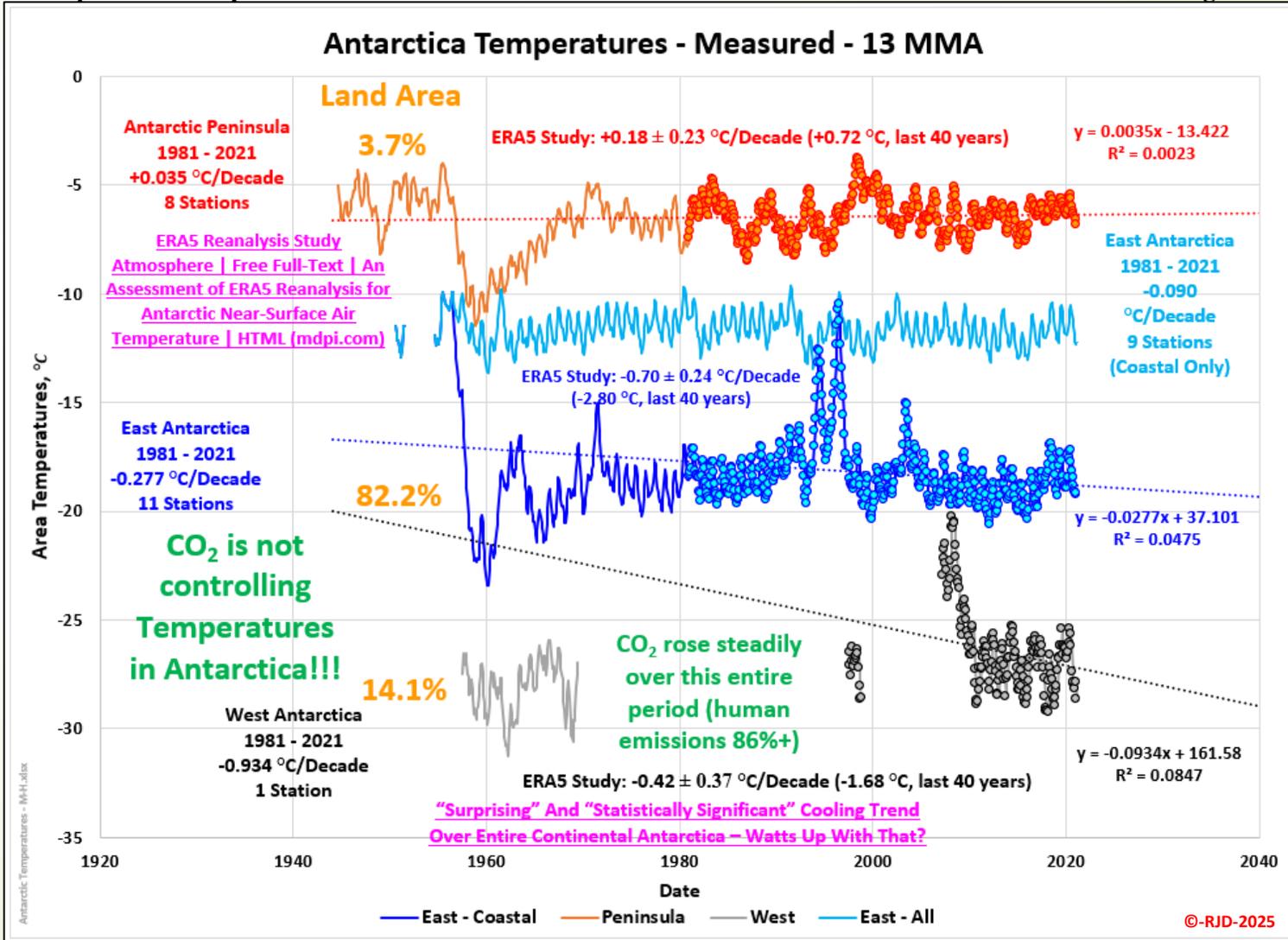
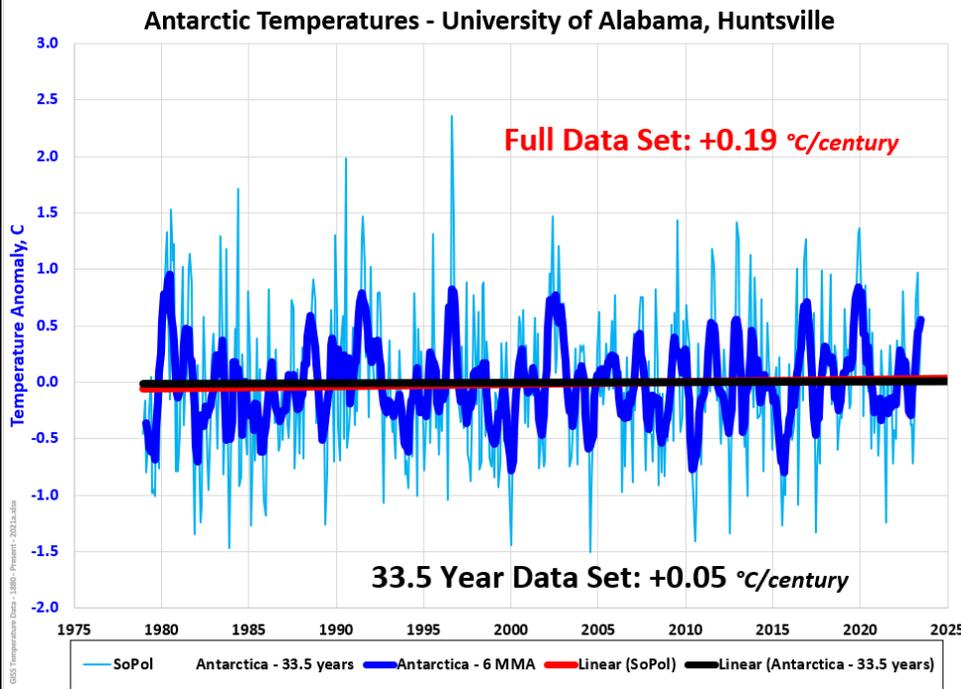
HSC Greenland Temperatures

The chart above shows a variety of Antarctic ice core temperature reconstructions. I originally choose the EPICA Dome C reconstruction. This curve closely matched the Antarctic average laid out in my [CSS-45 - Antarctica Average Consolidated Temperature \(AACT\)](#) post. No need for a change. The chart to the right comes from my [CSS-54 - Global Temperature Distributions](#) post. One of the global Kaufman reconstructions (CPS) is shown here. The Antarctic CPS curve shows a sharp increase post-1750. The other Kaufman options do not show that increase. For the following discussion we will use that increase (the maximum possible).



Holocene Stripe Chart - Antarctic Temperatures

Unfortunately, we do not have much in the way of Antarctic measured temperatures prior to 1950. Satellite measurements were first taken in December 1978 and have been statistically flat since then. The calculation (bottom left) uses the University of Alabama, Huntsville satellite temperature dataset for the post-1950 data. That does not cover the full post-1950 period but should be overestimating the total temperature rise given the surface temperature datasets and an ERA5 study show temperatures have been declining since ≈1950. The pre-1950 temperature rise comes from the Kaufmann CPS reconstruction shown on the following slide.



The Antarctic temperature increase since 1850 works out to 2.27 °C. That is a high-end estimate, given many of the other reconstructions do not show a major increase 1850 to 1950. The same temperature spike is not present in the Kaufman et al 2022 CPS northern polar reconstruction. Does CO₂ only affect temperatures at the south pole? And how much of that temperature increase can be attributed to humanity given 87%+ of our emissions have been post-1950?

HSC Antarctic Temperatures

Not much! The ERA5 Reanalysis study shows a 2.80 °C temperature drop which would wipe out the temperature gains shown in the Kaufmann et al 2022 reconstructions. There is no overwhelming consensus that the temperatures in the Antarctic have risen by 3.0 °C (or close to it).

Temperature Increases since 1850

Antarctic $y = 0.0019x - 60.118$ (UAH)
 Kaufmann et al 2022 - Paleo Reconstructions (pre-1950)
 University of Alabama, Huntsville Satellite Temperature Dataset

Year	Temperature °C	Temperature Anomaly °C
1850	-0.0781	
1950	2.05	2.1281
1950	-56.413	
2025	-56.2705	0.1425
1850 to 2025		2.2706

Holocene Stripe Chart Greenland Temperatures

Temperature Increases since 1850

Arctic $y = 0.0101x + 20.231$
HadCRUT5 Surface Temperature Dataset

+1.77 °C

Year	Temperature °C	Temperature Anomaly °C
1850	38.916	
1950	39.926	1.01
2025	40.6835	0.7575
1850 to 2025		<u>1.7675</u>

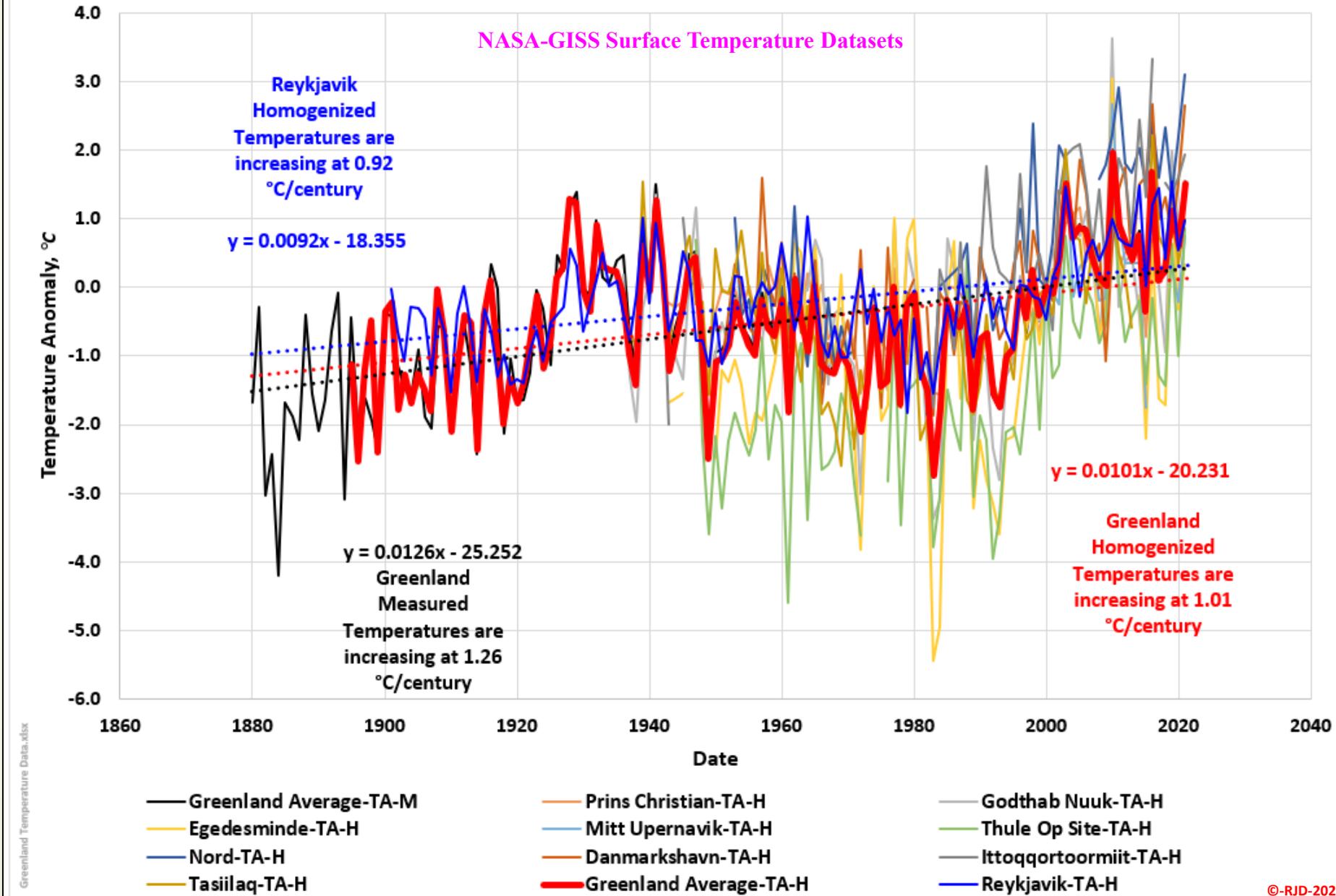
Unlike Antarctica, we do have surface temperature measurements back to 1850. Greenland temperatures have been rising at a rate of 1.01 °C/century since 1850 (with some obvious temperature cyclicality (very likely the Atlantic Multi-decadal Oscillation)).

That temperature increase works out to 1.77 °C (which is a bit high given that

HSC Greenland Temperatures

the temperature cyclicality will reduce that value a bit). Again, nowhere near the 3.0 °C temperature increase shown in the initial Stripe chart (slide CSS-72a). So, neither the Arctic nor Antarctic temperature reconstructions justify that 3.0 C rise. The rest of the discussion lays out the averaging problem that further reduces that temperature increase.

Greenland/Reykjavik Temperatures



CSS-72f Holocene Stripe Chart HadCRUT5 + DOE-HE Forecast

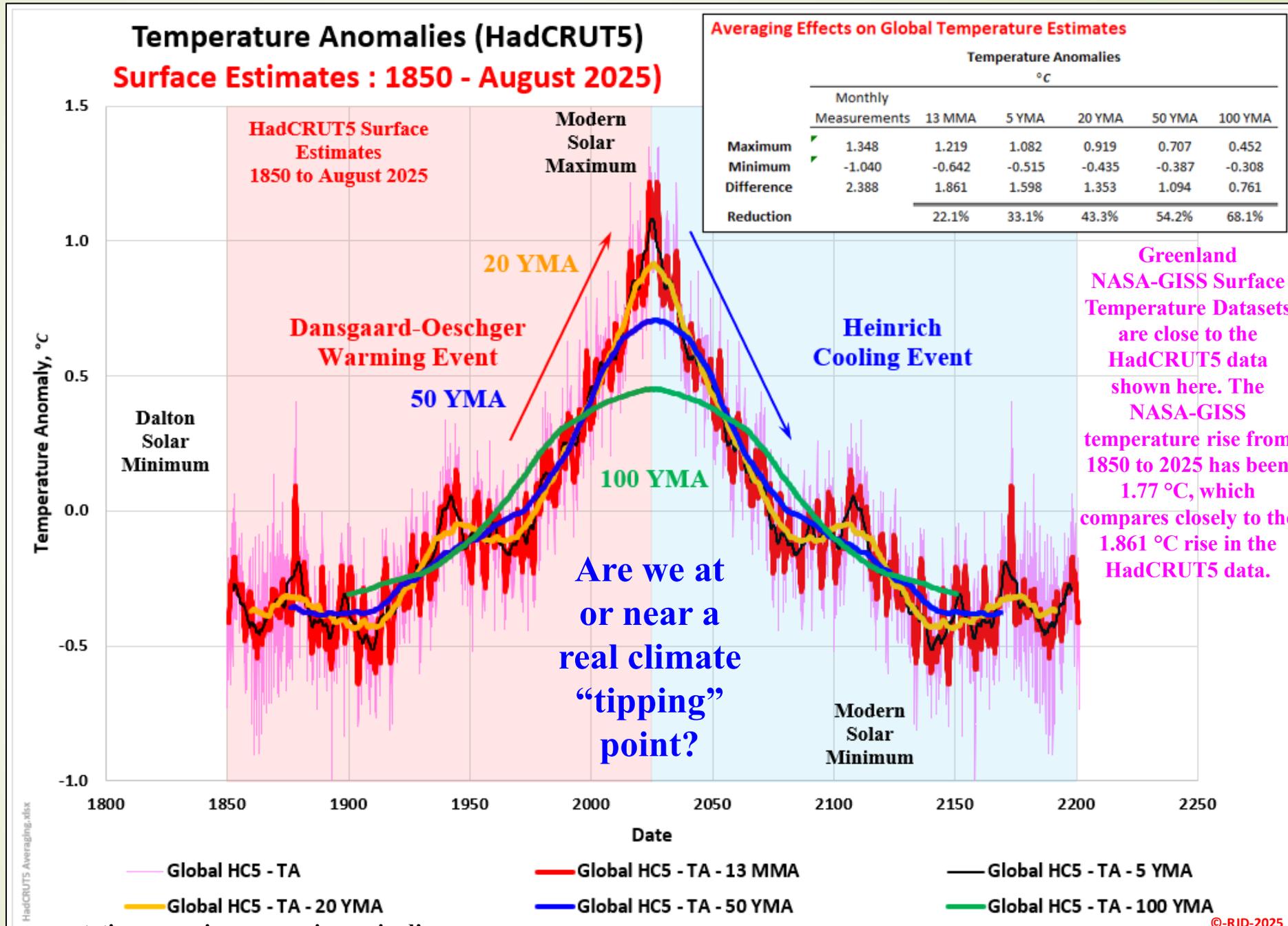
The All CO₂, All the Time alarmist narrative assumes that temperatures will just continue to rise unabated.

That assumption ignores the historical temperature record. Greenland temperatures have routinely fluctuated significantly with no CO₂ contribution over the Holocene (CSS-72b). The 1850 to 2023/24 temperature rise is very likely just one more of the Dansgaard-Oeschger warming events that occur every ±1,000 years (lining up with the Bond/Eddy solar cycle). The warming actually started in the late 1600s, centuries before CO₂ started rising. And like many other

Holocene events we are at or near a real climate "tipping" point. Heinrich cooling

events routinely follow DO events. This chart uses a mirror image of the current DO event (1850 to 2025) to represent the coming Heinrich event. Based on historical temperatures this is a reasonable future scenario. The effects of temperature averaging have also been highlighted here.

You cannot just add the modern monthly temperature records to historical proxies, a representative averaging process is required!



HSC HC5 + DOE-HE Forecast

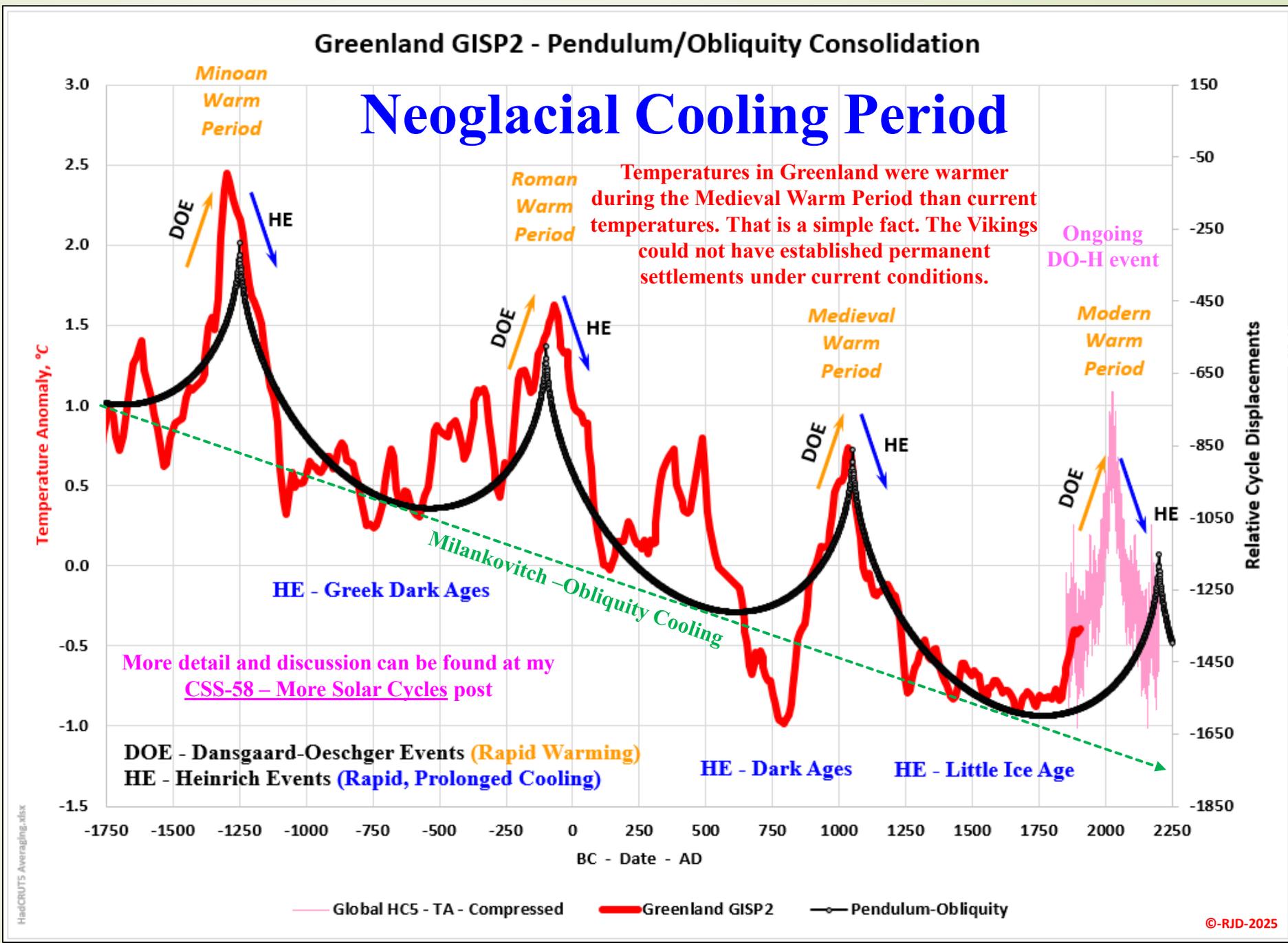
Holocene Stripe Chart Neoglacial Temperatures

How does the Dansgaard-Oeschger/Heinrich (DO-H) model from the previous slide compare with the historical data? The DO-H is plotted against the GISP2 Greenland ice core data and a representative DO-H cycle layered onto the long-term cooling produced by the Milankovitch Obliquity cycle. Is this a perfect model? No, but the DO-H/Obliquity scenario is far more representative than the All CO₂, All the Time alarmist narrative. REMEMBER, CO₂ was virtually flat pre-1850 and 87%+ of humanity's emissions have occurred post-1950. Note, there are longer and shorter solar/ocean cycles that are also playing key roles. CO₂ is minor player at best! The DO-H event shown here is based on monthly values. Applying Proper averaging techniques will compress the DO-H event (as shown in the previous slide).

HSC Neoglacial Temperatures

Proper averaging techniques will compress the DO-H event (as shown in the previous slide).

In general, the current DO warm event corresponds closely to real world observations. If monthly data were available over the Medieval Warm Period, the temperature peak would have been higher than current temperatures. This DO warming is a little earlier than expected, but the ±1,000-year cycle is subject to some flexibility.



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

Holocene Stripe Chart Medieval versus Modern

This chart just directly overlays the DO-H model on the GISP ice core data.

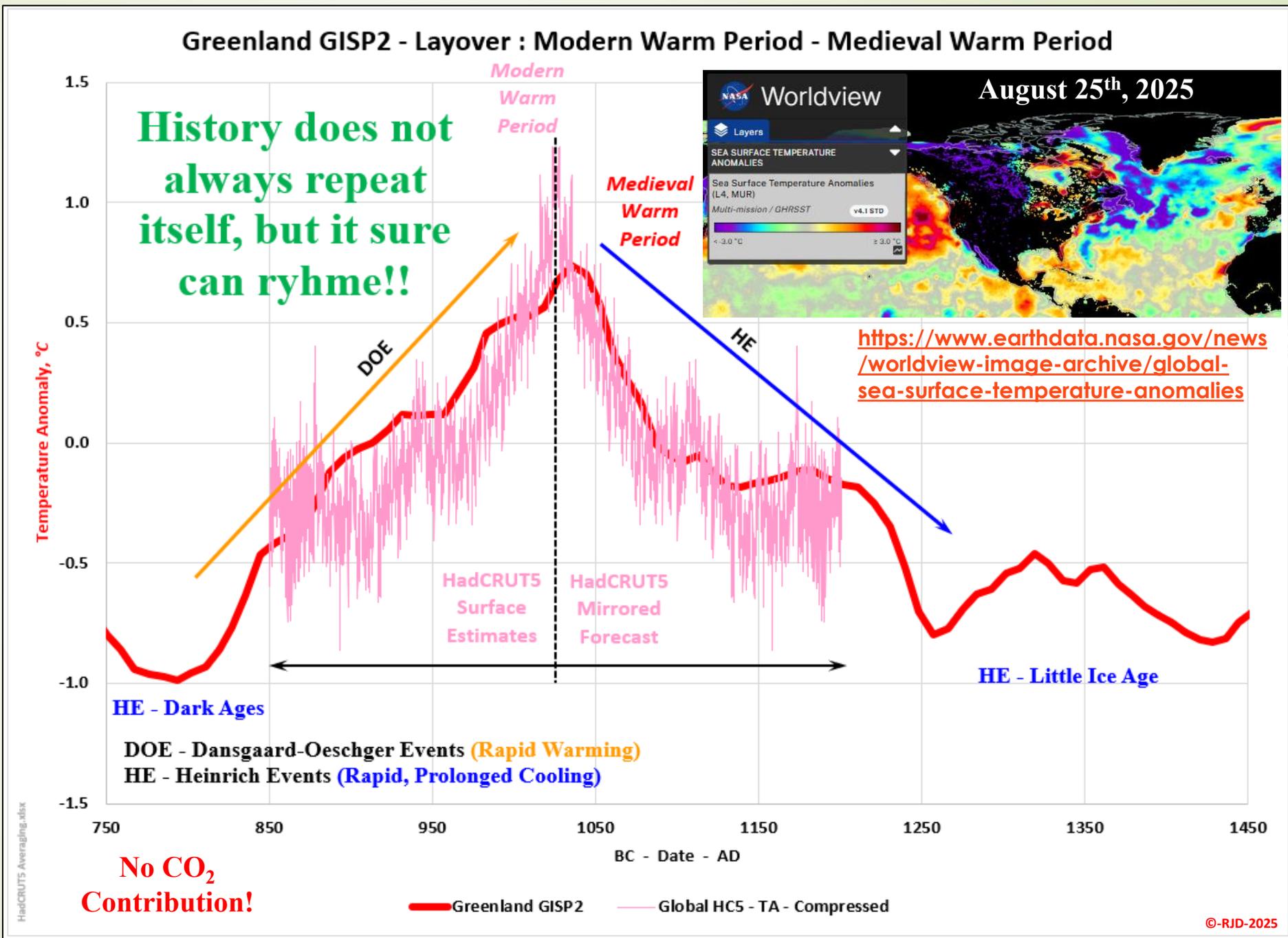
Obviously, the current temperature rise (1850 to 2023/24) is not unusual nor unprecedented. Remember CO2 concentrations are flat over this period (at least in the ice core data).

Natural forcings (not CO2) were responsible for the warming out of the Dark Ages and the subsequent cooling into the Little Ice Age (LIA). Those same natural forcings are still active and are very likely poised to push our planet into the next Heinrich event (a new LIA). The seeds of a new cooling event are already visible in the North Atlantic (as shown on the NASA inset to the right). As winter has set in, the cold anomalies have

subsided somewhat but are still there. The Atlantic Multi-decadal

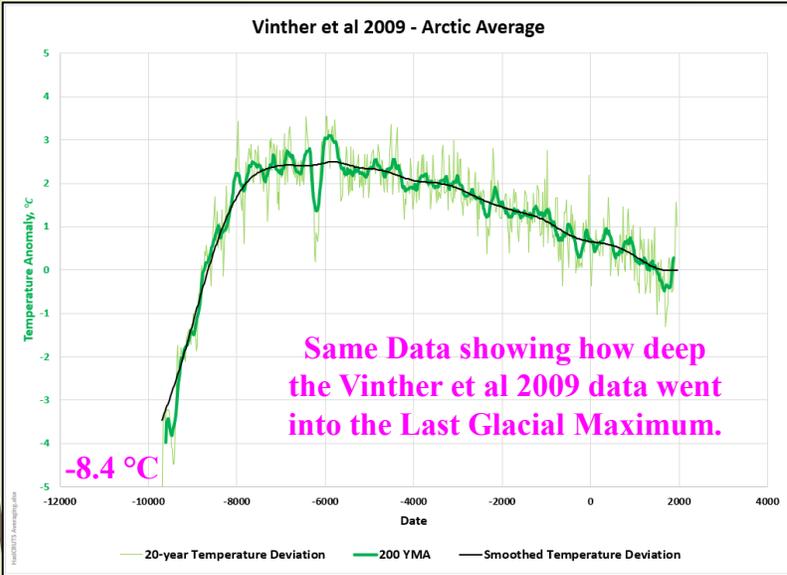
HSC Medieval vs Modern WP

Oscillation (AMO) is headed into its cold phase and the Beaufort Gyre (a huge volume of cold fresh water that is overdue to be released into the North Atlantic). Will these events be enough to abruptly disrupt the Atlantic Meridional Overturning Circulation (AMOC) and plunge the Northern Hemisphere into another Little Ice Age? Time will tell, but it has happened before.



CSS-72i Holocene Stripe Chart – Vinther et al 2009 Arctic Temperatures

The GISP2 data highlights the cyclic variability of the temperature data very well, but that data is localized. The Vinther et al 2009 Arctic Average data provides a broader perspective and is shown here (with the full dataset shown on the left, and a more focused look below). The data is provided in 20-year increments. The bold, dark green curve is the 200 Year Moving Average. The black curve is Vinther's smoothed data (more in line with the Marcott 2013 smoothed data

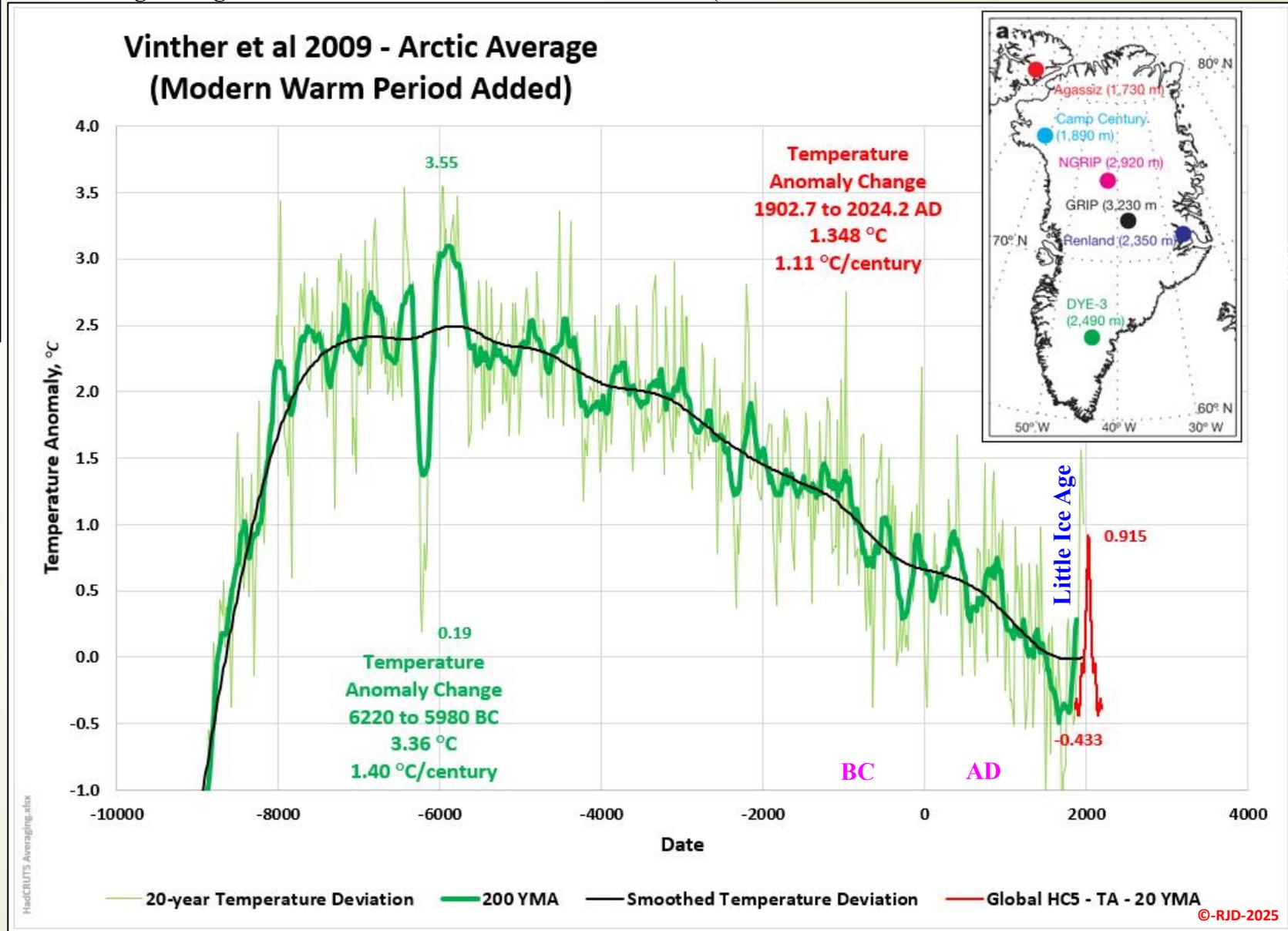


presented in the first Stripe chart (slide CSS-72a)). The DO-H model (20 YMA) has been added to the plot for comparison purposes. Is the current 20 YMA DO warming any different than the many other historical warmings shown here? No, not in magnitude or frequency. In fact, many of the temperature fluctuations are larger than the current temperature rise since 1850. The current global temperature average is roughly 15 C. That

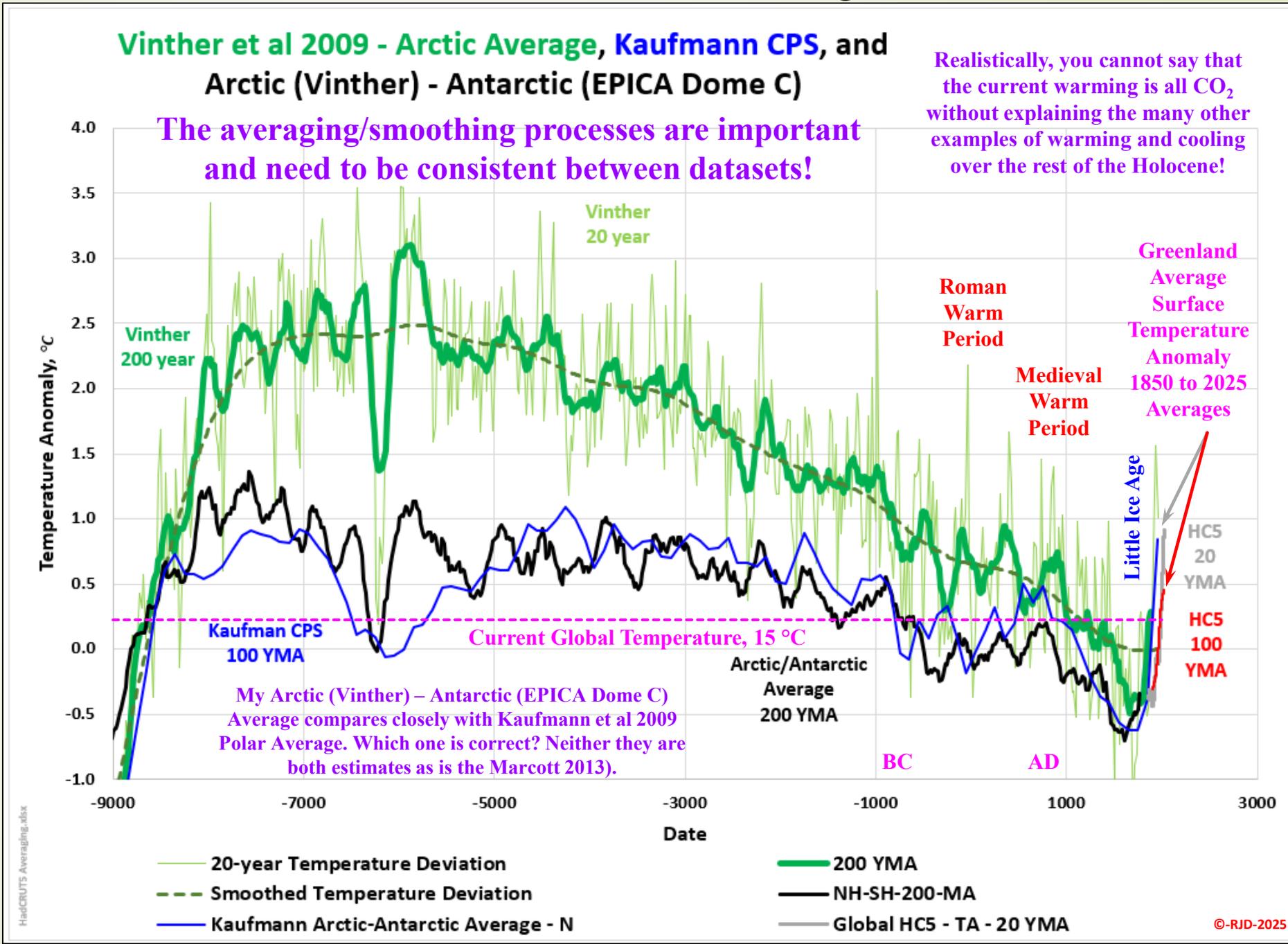
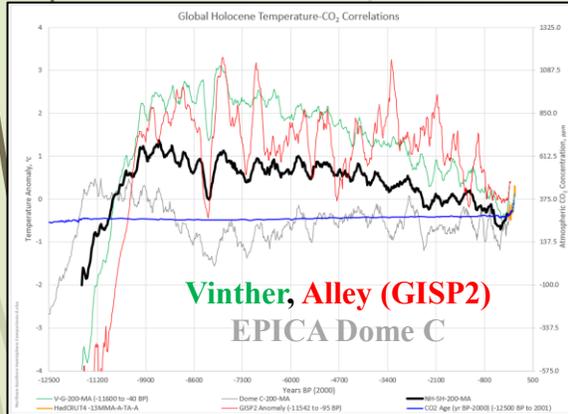
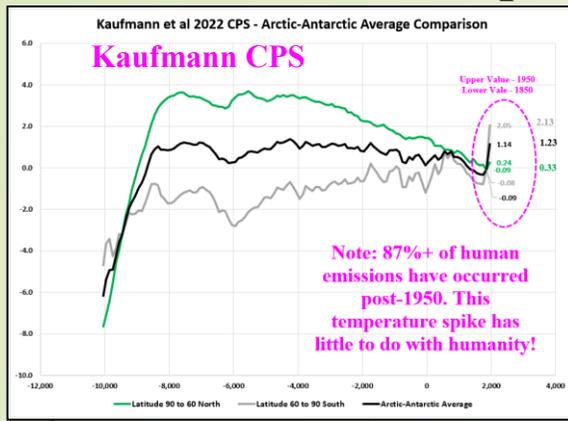
temperature is shown on the stripe charts and lines up with the Medieval and Roman Warm Periods (both of which were warmer than current temperatures). If anything, the temperature increase on the stripe charts is likely overstated a little. Remember these temperatures are representative of the actual Greenland temperatures and not an arbitrary multiple of the global average temperatures. The temperature rise I used in my original stripe chart represents Greenland's temperature rise well.

HSC Vinther Arctic Temperatures

temperature rise since 1850. The current global temperature average is roughly 15 C. That temperature is shown on the stripe charts and lines up with the Medieval and Roman Warm Periods (both of which were warmer than current temperatures). If anything, the temperature increase on the stripe charts is likely overstated a little. Remember these temperatures are representative of the actual Greenland temperatures and not an arbitrary multiple of the global average temperatures. The temperature rise I used in my original stripe chart represents Greenland's temperature rise well.



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



Vinther et al 2009 - Arctic Average, Kaufmann CPS, and Arctic (Vinther) - Antarctic (EPICA Dome C)

The averaging/smoothing processes are important and need to be consistent between datasets!

Realistically, you cannot say that the current warming is all CO₂ without explaining the many other examples of warming and cooling over the rest of the Holocene!

HSC Vinther, Kaufmann Polar Average

Averaging the Kaufmann CPS data using the same procedure I used produced similar results (shown above and to the right in different formats). The Kaufmann CPS reconstruction is an upper limit; the other four Kaufmann reconstruction options have much lower temperature increases. The temperature rise on my stripe chart could be slightly higher, but the difference is not material and certainly not as pronounced as that shown by the Marcott option.

My Arctic (Vinther) – Antarctic (EPICA Dome C) Average compares closely with Kaufmann et al 2009 Polar Average. Which one is correct? Neither they are both estimates as is the Marcott 2013).