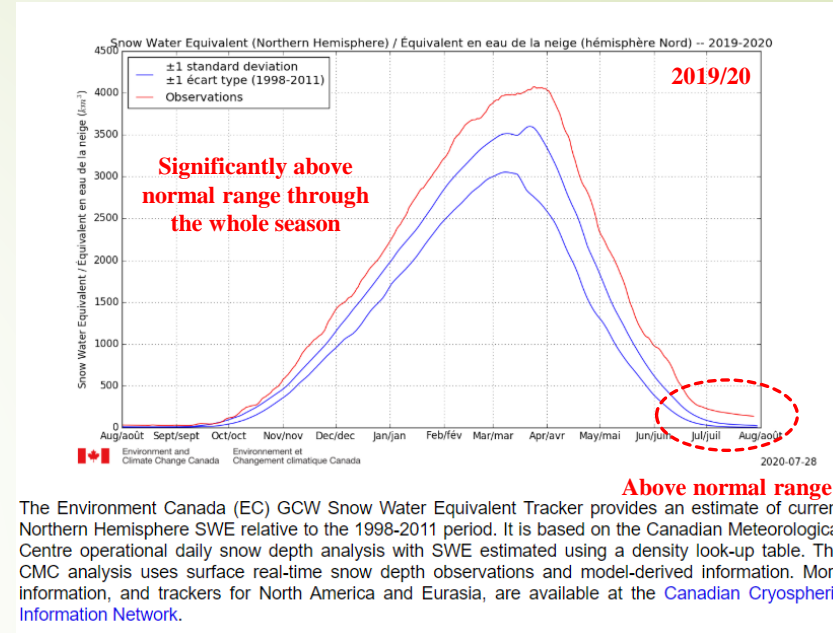
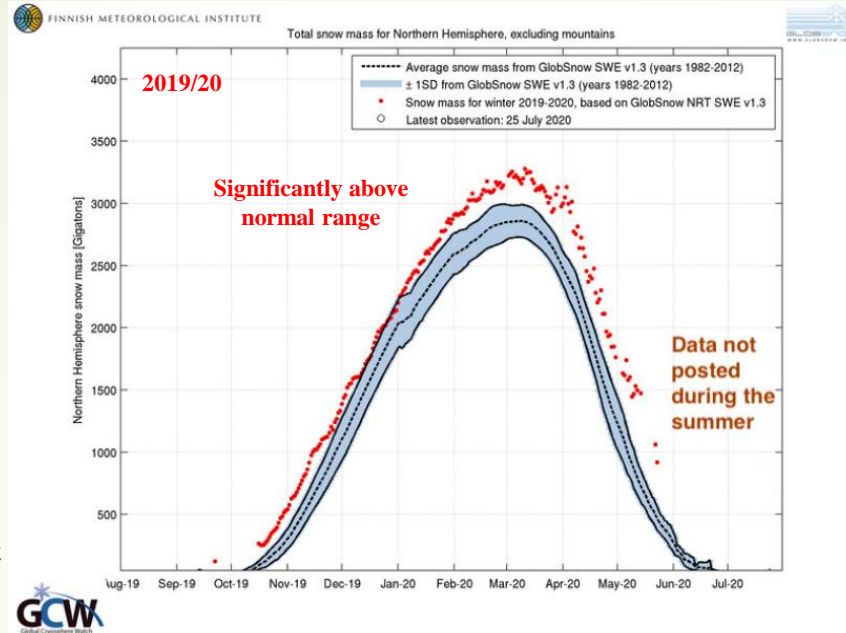


Funny how the very basic Catastrophic Anthropogenic Global Warming (CAGW) alarmist predictions have a way of falling flat on their face. We'll start with snow cover (Northern Hemisphere). My original look can be found in my Open Letter Appendices, with subsequent updates OPS-15 and OPS-24. Al Gore and many others predicted that snow would be a thing of the past (something we could tell our grandkids about, bankrupt ski operations, etc.). Why have we had three years of significantly higher than normal NH (not localized) snowfall (for both areal extent and snow/water equivalent last winter (2019/20)). And we're already above normal for the coming winter for both areal extent and snow/water equivalent (not shown here).

https://globalcryospherewatch.org/state_of_cryo/snow/



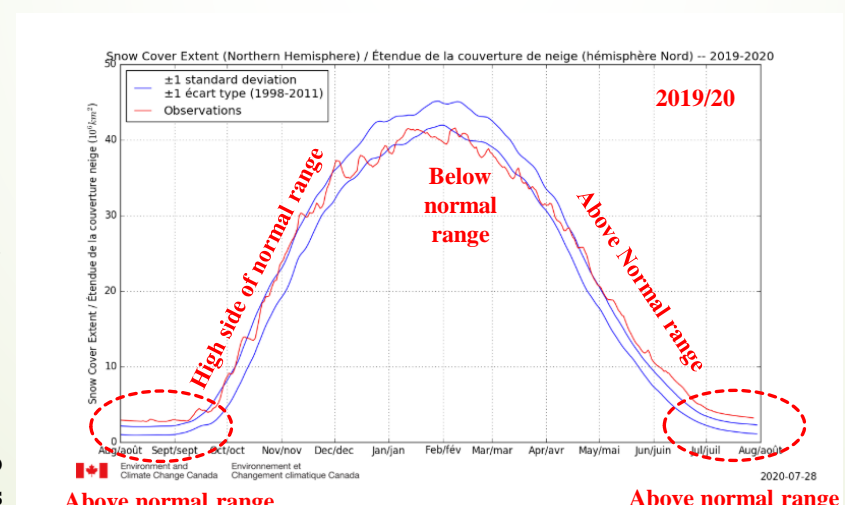
The Environment Canada (EC) GCW Snow Water Equivalent Tracker provides an estimate of current Northern Hemisphere SWE relative to the 1998-2011 period. It is based on the Canadian Meteorological Centre operational daily snow depth analysis with SWE estimated using a density look-up table. The CMC analysis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

The sun, (not CO2) is the primary climate driver

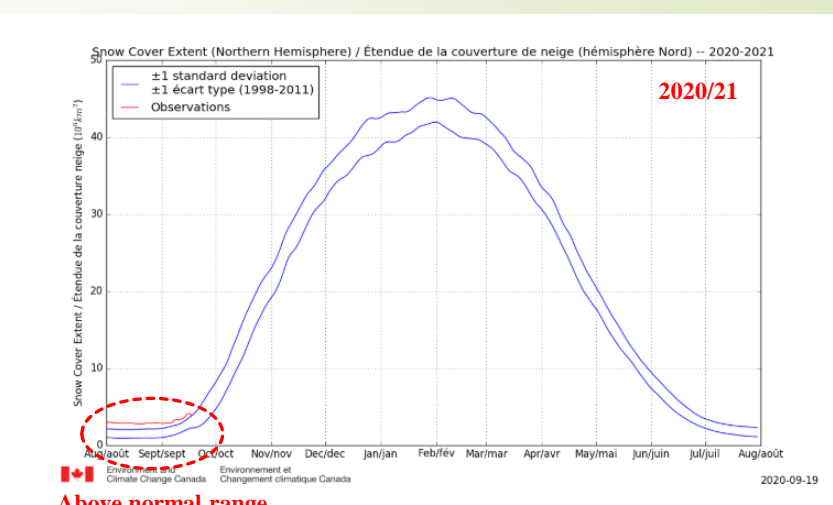
NH Snow Cover

The above normal areal extent and snow/water equivalent through the summer is a new phenomena. That implies a change in albedo. With more snow cover (areal extent), less energy reaches the surface. A significant percentage of the sun's energy is reflected into space without heating the planet (a net cooling effect).

What happens to snow cover this winter, we'll have to wait and see? Solar activity implies another cold, snowy winter. On the short sunspot time scale, we're still in the low between Cycles 24 and 25 (another year or two before any improvement). On the longer cycles (400, 1200, 2000, 3600 years), we are just dropping into a Grand Solar Minimum (GSM) (a cold decade or two that will dominate the shorter time scales (and not in a good way)).

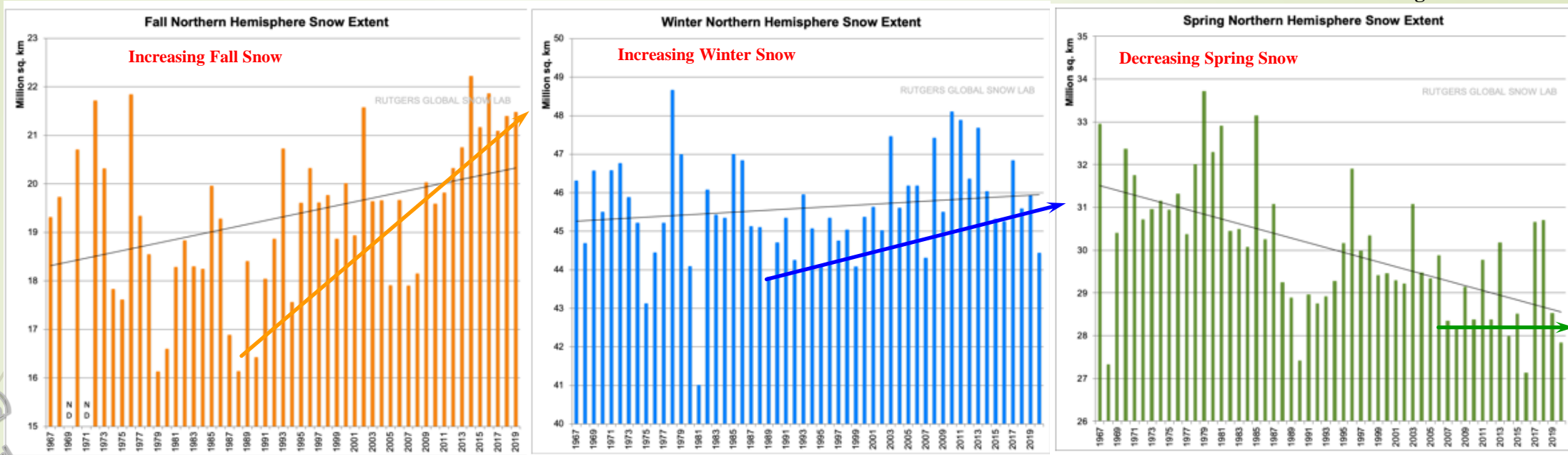


The Environment Canada (EC) GCW Snow Cover Extent Tracker provides an estimate of the current Northern Hemisphere snow cover extent relative to the 1998-2011 period based on the Canadian Meteorological Centre operational daily snow depth analysis. The analysis uses real-time surface snow depth observations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



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

The SH is included below with noticeable snow in South America and some early and late spikes in Australia. However, the SH plays a minor role, since the NH dominates the snow cover on the planet.

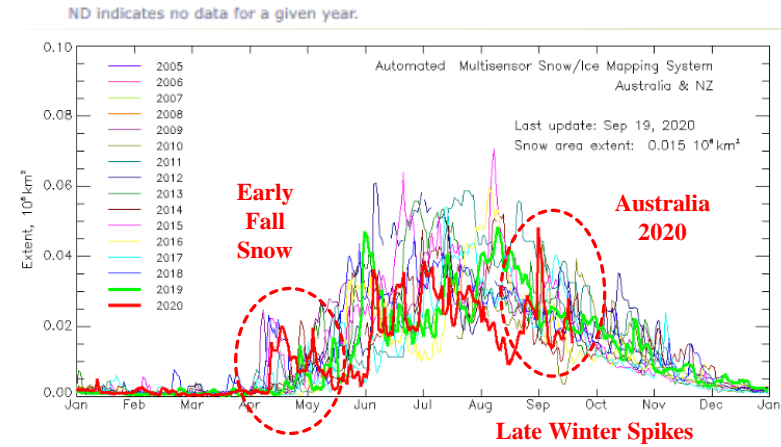
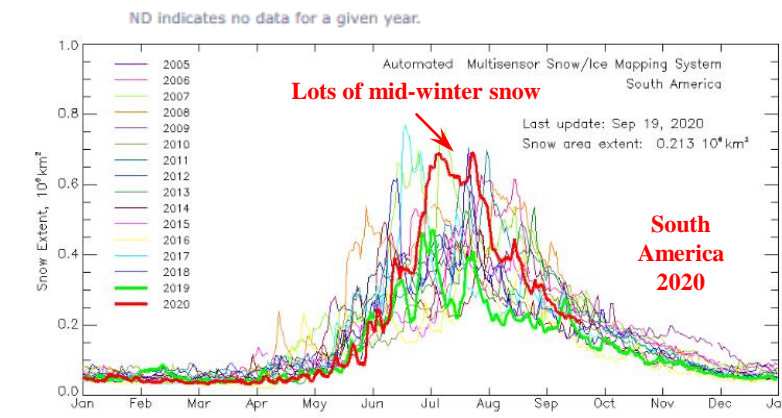


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NH & SH Snow Cover

The historical NH snow extent has been generally increasing since the mid-1960's (not really seeing snow disappearing any time soon). CAGW alarmists are quick to point out the falling NH Spring Snow Extent (although the downtrend is questionable after 2006, flat to slightly up). Some shorter term trendlines have been added to Rutgers's full data set trends. Fall numbers have increased 33% (5.4 million km²) since 1988. Winter numbers are up 4% (1.8 million km²) since 1989.

References
Appendices
OPS-15
OPS-24



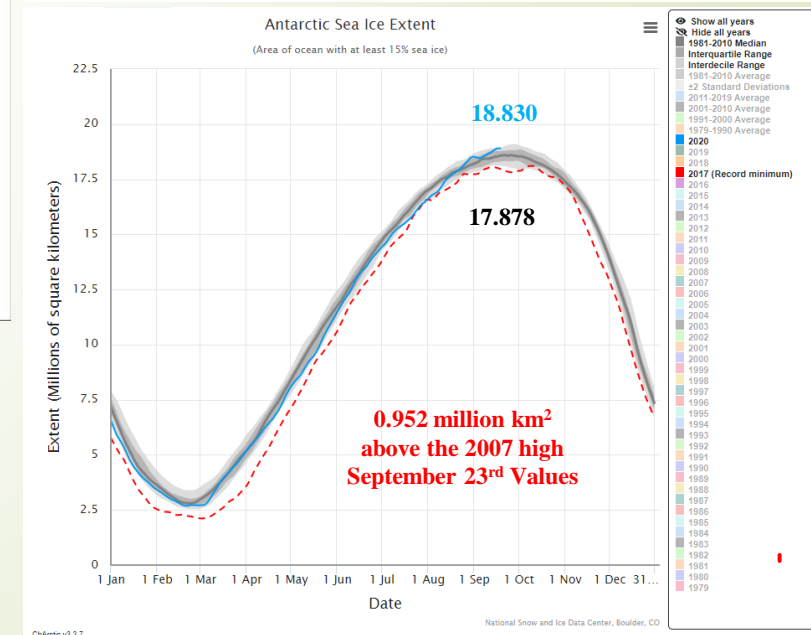
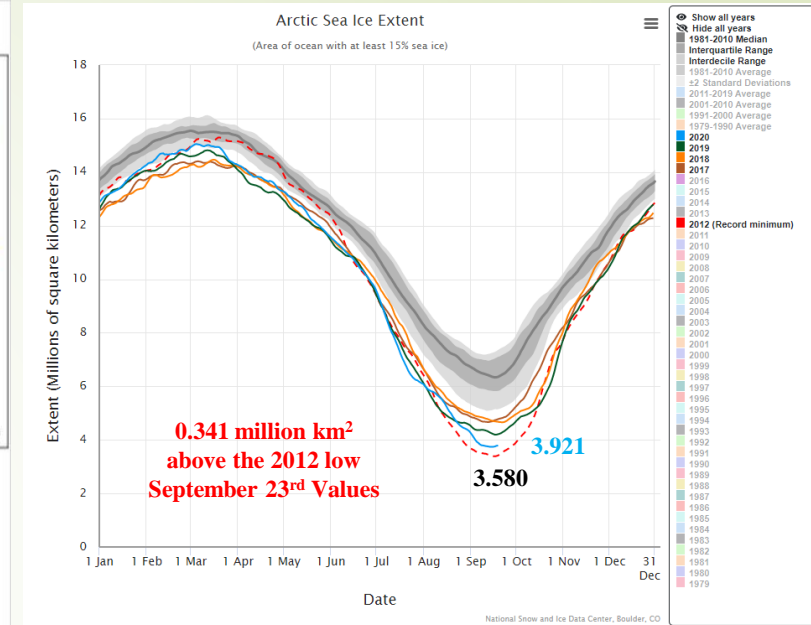
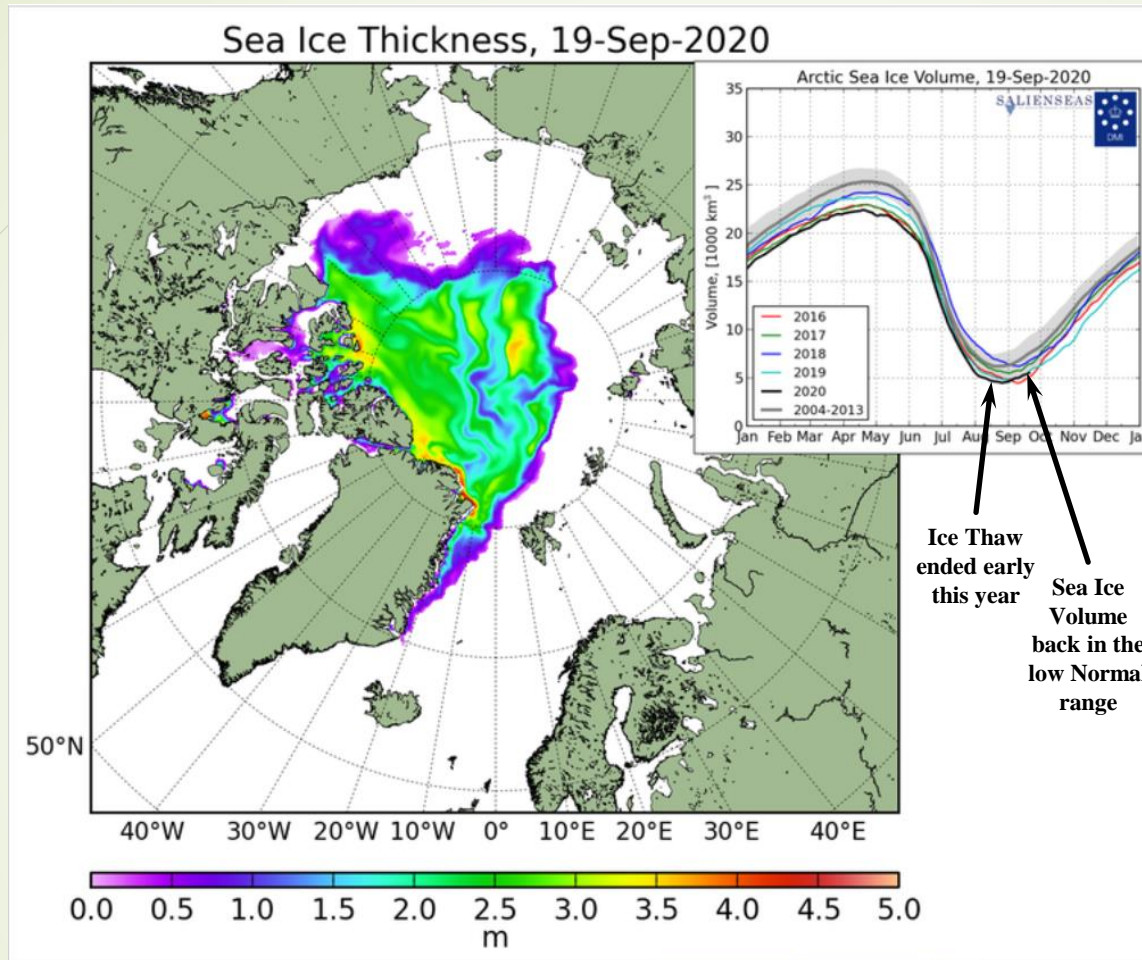
The GMASI Snow Trackers are derived from combined observations of METOP AVHRR, MSG SEVIRI, GOES Imager and DMSPP SSMIS. The Global Multisensor Snow/Ice Cover Map (GMASI) algorithm is fully automated. It is a NOAA/NESDIS product. (Courtesy of Peter Romanov)

The Arctic and Antarctic sea ice extents are indicative of average temperatures at the poles. Based on this year's Arctic sea ice extent, the Arctic has been warmer. But not as much as the areal extent implies, since the Arctic sea ice volumes are still in the normal range (albeit at the low end). An additional plot of Global Sea Ice Extent is included on the next slide.

Based on data up to 2014, the anomaly trend has been generally flat. The last few years will have dropped the anomaly back into the negative. The dropping temperatures associated with the GSM we are just entering will (in my opinion) bring the global ice anomalies back into the positive range.

NH & SH Sea Ice

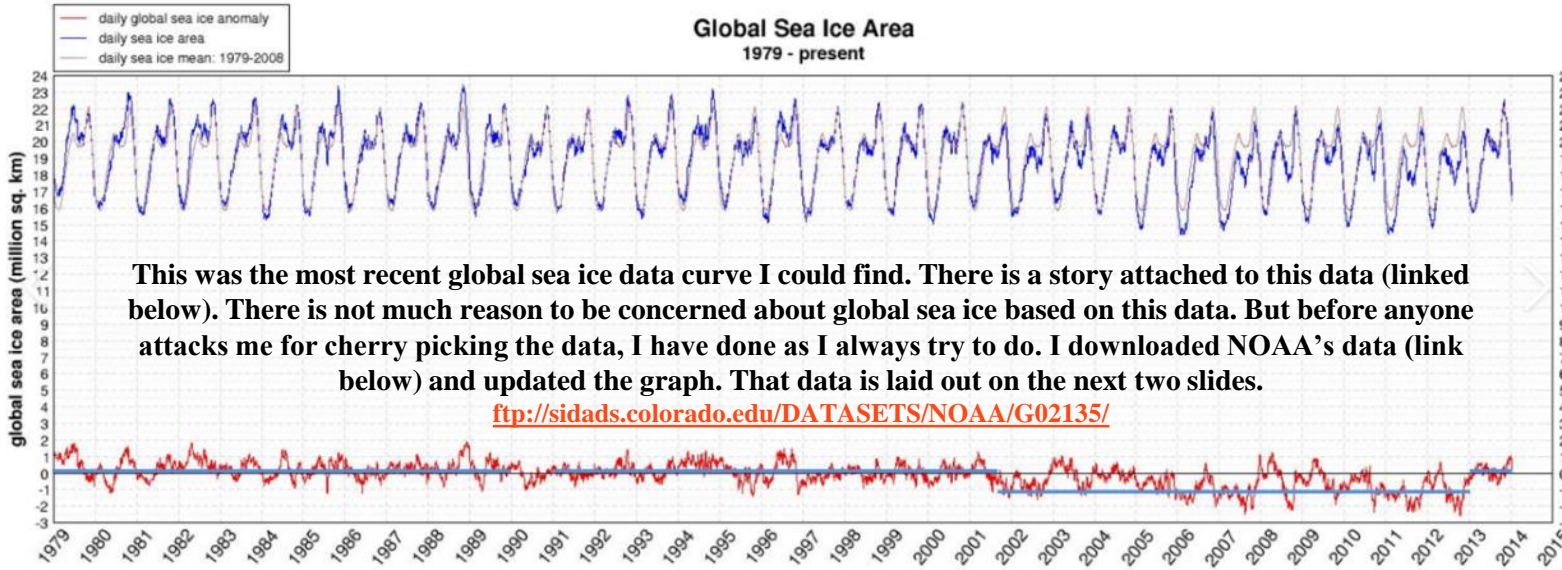
The sun, (not CO₂) is the primary climate driver!



The Arctic sea ice areal extent minimum has been significantly below the normal range for several years, trending towards but still 0.34 million km² above the 2012 year low. However, the Arctic sea ice volume is still in the low normal range.

The Antarctic sea ice areal extent maximum is at the high end of the normal range, 0.953 million km² above the 2007 year high. Strange that we haven't been hearing any news reports outlining the high Antarctic sea ice areal extents?

Sea Ice Extent - <https://nsidc.org/arcticseaicenews/charctic-interactive-sea-ice-graph/>
 Sea Ice Volume - <http://ocean.dmi.dk/arctic/icethickness/thk.uk.php>



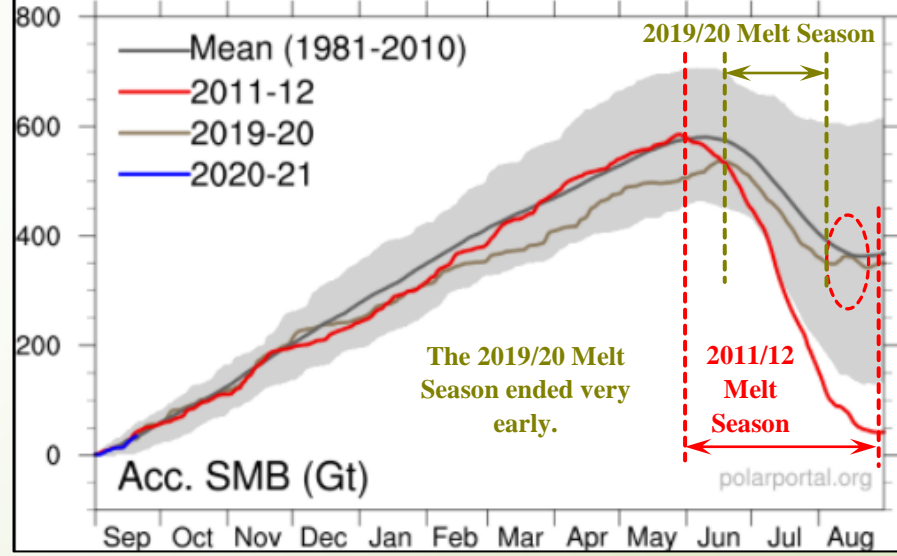
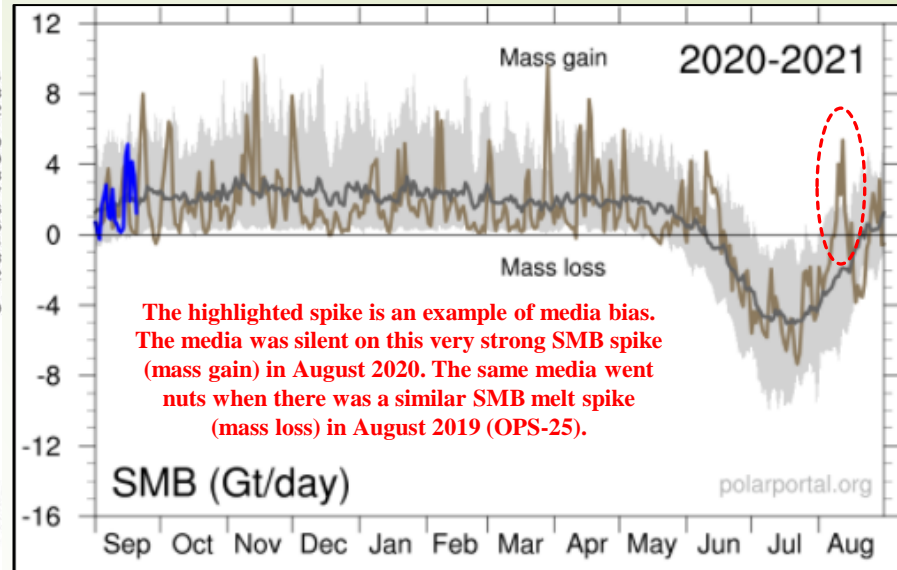
This was the most recent global sea ice data curve I could find. There is a story attached to this data (linked below). There is not much reason to be concerned about global sea ice based on this data. But before anyone attacks me for cherry picking the data, I have done as I always try to do. I downloaded NOAA's data (link below) and updated the graph. That data is laid out on the next two slides.

<http://sidads.colorado.edu/DATASETS/NOAA/G02135/>

The Global Sea Ice Area fluctuates up and down, but the Global Sea Ice Anomaly has remained relatively flat (with much smaller fluctuations). There is a small downward trend but that can easily be reversed (and dramatically) when the Grand Solar Minimum (GSM) really kicks into gear over the next decade or two. Everyone needs to remember that all this data is very recent. During the Holocene Optimum and other warm Holocene periods (Minoan, Roman and Medieval Optimums), the global sea ice volumes were significantly lower. The sea ice, like global temperatures is subject to a wide variety of climate cycles (solar and ocean, primarily). The values have been higher and lower than current levels.

Global Sea Ice Greenland SMB

Greenland's updated Surface Mass Balance (SMB) is shown to the right. The 2019/20 freeze/thaw season can be described as generally normal even though we're living through the hottest years EVER! I addressed this point in more detail with OPS-25. However, the August 2020 mass gain (highlighted to the right) was unusual and noticeable on both SMB plots. The 2019/20 melt season was also unusually short (half of the 2011/12 melt season (3 Months)). Note, the 2011/12 melt season was the largest in the last 40 years but still had a net SMB gain of 40 Gigatons.



The sun, (not CO2) is the primary climate driver!

More detail?
climatechangeandmusic.com

Greenland Surface Mass Balance (DMI) - <http://polarportal.dk/en/greenland/surface-conditions/>
Global Sea Ice Area - <http://notrickszone.com/2014/01/17/recovery-in-2013-global-sea-ice-was-above-average-for-first-time-in-9-years-now-similar-to-1986/>

From OPS-25
Both 2016-17 and 2017-18 had above average SMB gains despite the media narrative that every year is the hottest year EVER! 2017-18 had a very mediocre melt season.

How has the Snow and Ice on the Planet been Holding Up – Global Sea Ice

This plot updates NOAA's Global Sea Ice Extent to the end of September 2020. There is a lot of data plotted here but the implications are simple.

Antarctic sea ice has been increasing (1978-2020)

Arctic sea ice has been decreasing (1978-2020)

Global sea ice has been decreasing (1978-2020)

So we've established that the Global Sea Ice has been declining over this period. But apart from the post 2014 drop in Sea Ice anomaly (not due to CO₂), the SI anomaly was relatively flat. The data also must be taken in context. These forty-two years are relatively meaningless on climate time scales.

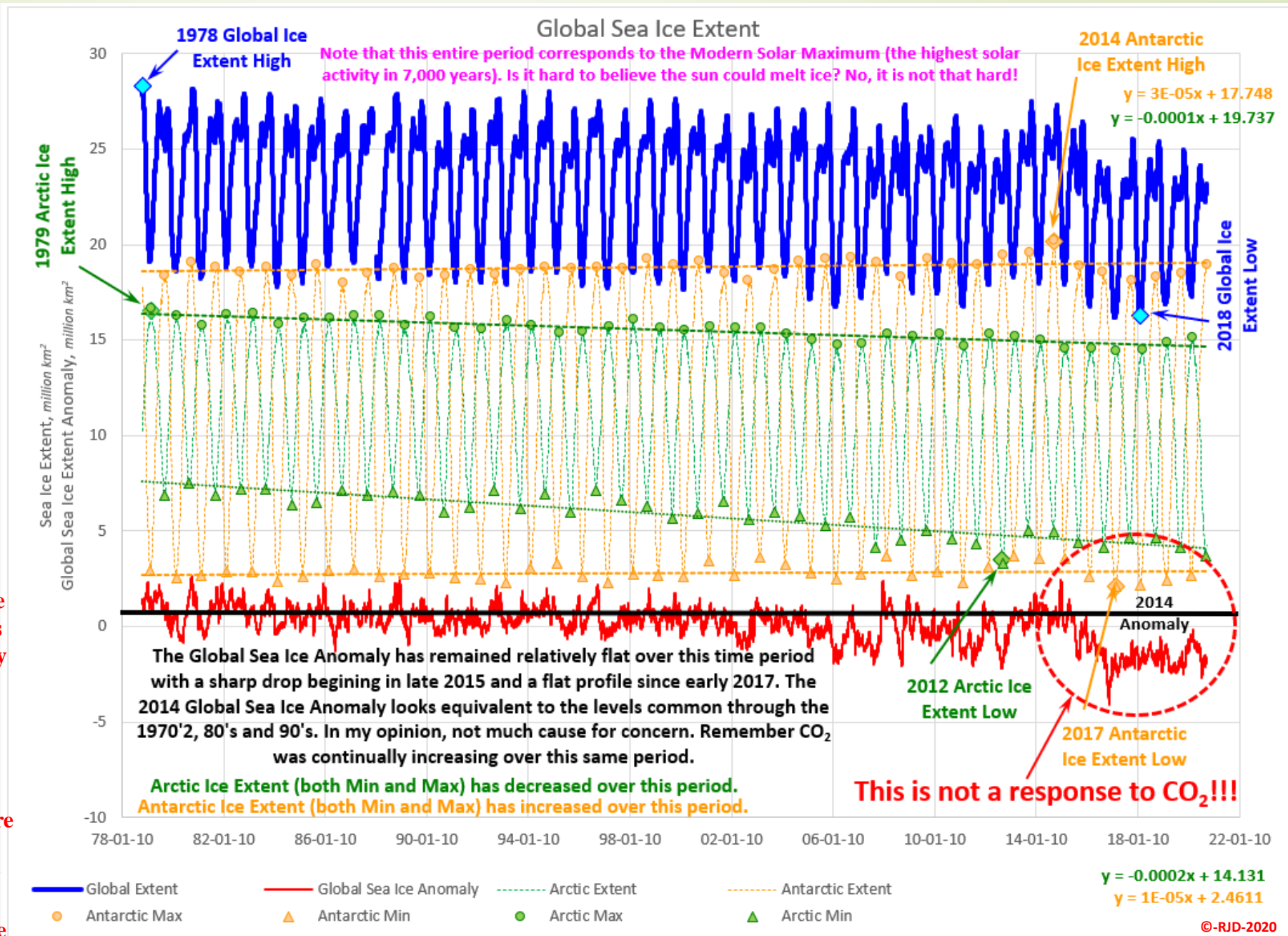
Solar activity levels (and global temperatures) were higher on the planet during the Holocene Optimum 8,000 – 10,000 years ago (and CO₂ had nothing to do with those higher temperatures (OPS-26,27 and CSS-1,2 and 4)).

Solar Activity Levels – OPS-8, 21

Is it not possible that the high solar activity levels over this period just may be contributing to the declining Sea Ice area? Why were there forests growing (and people living) during the Holocene Optimum where the current glaciers are receding? Solar activity drove temperatures throughout the Holocene and will continue to do so.

Global Sea Ice

The sun (not CO₂) is the primary climate driver!



How has the Snow and Ice on the Planet been Holding Up – Global Sea Ice/UAH Temperature

This plot highlights the general mirror trend between the Global Sea Ice anomaly and the University of Alabama Huntsville (UAH) Lower Troposphere Temperature Anomaly. Logically, when the temperature rises, the Global Sea Ice anomaly goes down (and vice versa). What the plot doesn't show is much CO₂ contribution to the warming or sea ice loss. The ocean cycles (an indirect solar forcing) are more prevalent on these short time scales.

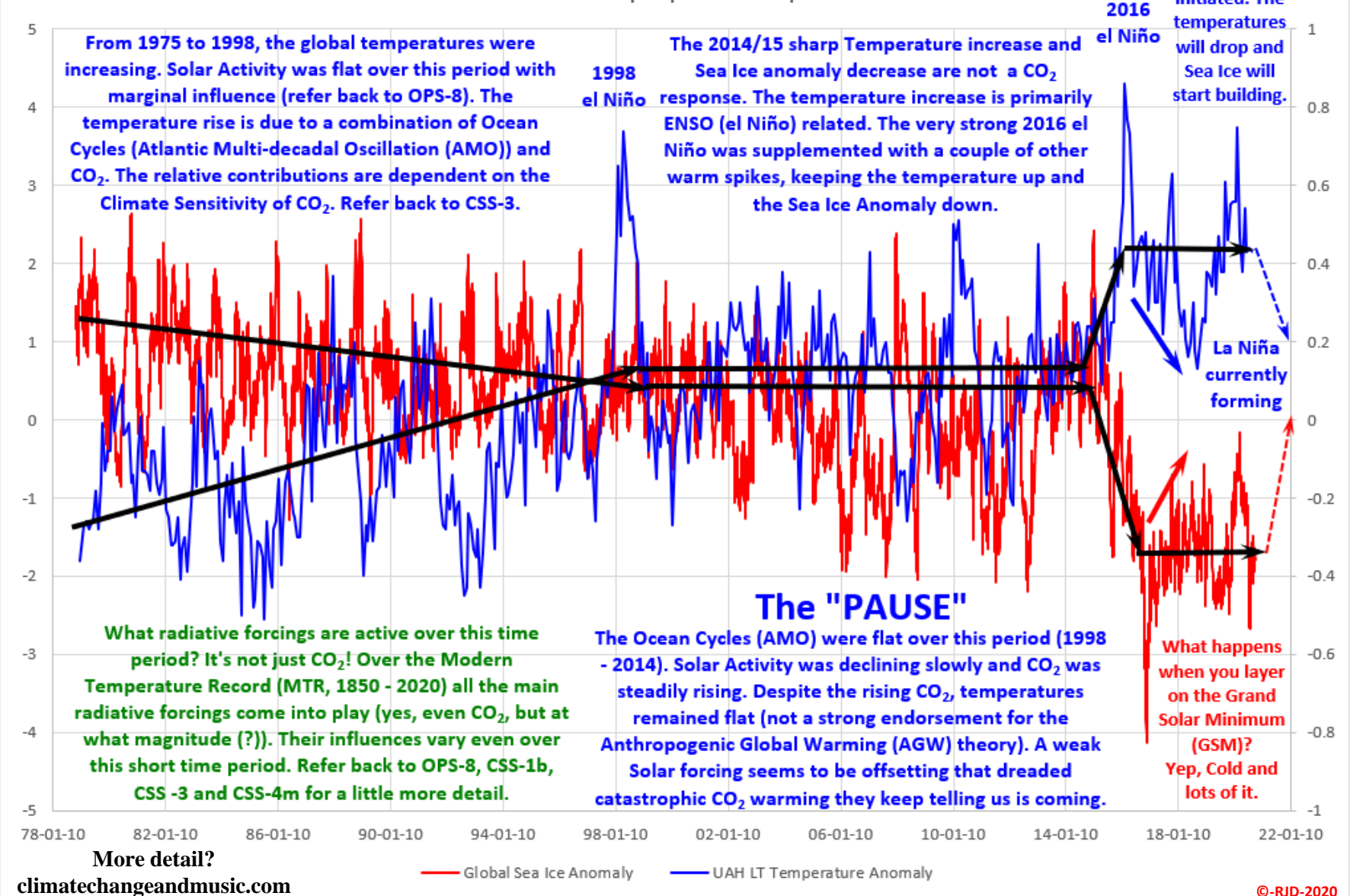
During the "PAUSE", a very minor decline in solar activity was enough to offset whatever warming CO₂ may have been providing (note the AMO was relatively flat, refer to OPS-8). The higher temperatures since 2014 are almost entirely ocean cycle related. CO₂ has continued to rise but the incremental warming possible over that short time period is negligible. Solar Activity was still gradually declining (2015-2020).

La Niña will cool the planet on its own. Now layer in the temperature drops associated with the Grand Solar Minimum (GSM) we are just entering, the AMO/PDO cooling phases and the Beaufort Gyre¹ Arctic fresh-water release (overdue) and we have some very cold years/decades ahead of us. And our political leaders are sadly, oblivious!

¹Yale study: <https://e360.yale.edu/features/how-a-wayward-arctic-current-could-cool-the-climate-in-europe>

The temperature increase (over this period) is 1.37 °C/century. Not a dangerous increase! Even if CO₂ was responsible for all the warming! It is NOT!!

Global Sea Ice Anomaly
UAH Lower Troposphere Temperature



Global Sea Ice UAH Temp

The sun, (not CO₂) is the primary climate driver!

The Catastrophic Anthropogenic Global Warming (CAGW) alarmist crowd has willingly (criminally(?)) chosen to ignore virtually all radiative forcings that are not anthropogenic (i.e.: CO₂ primarily). Obviously, CO₂ has not been driving temperatures pre-MTR. To assume that the natural forcings (solar and ocean cycles) are not active during the MTR and will not be active in the future (post-MTR) is just stupid (i.e.: idiotological, I mean ideological). This plot is a simplified version of my Climate Short Story (CSS-4). Bottomline, the MTR temperature rise of roughly 1 °C is neither unusual nor unprecedented. The CAGW alarmist (environmental activist) viewpoint is a narrative not a theory. And without empirical data, that narrative is and will remain pseudoscience.

The climate is complicated. CO₂ has not been a primary climate driver over the first few billion years of this planet's history. CO₂ has not been the only (let alone primary) climate driver over the MTR. And CO₂ will not be the only (let alone primary) climate driver in the future. The snow/ice will come and go as solar activity dictates, not as the IPCC programmers decree!

Holocene Temperature/CO₂

The sun, (not CO₂) is the primary climate driver!

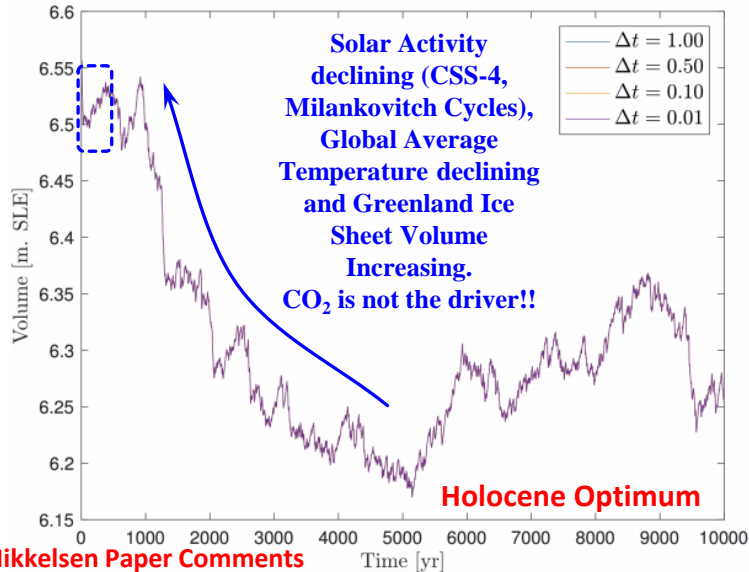
Global Average - Temperature-CO₂ Relationship



CSS-5h How has the Snow and Ice on the Planet been Holding Up – Glacial Ice

Time step size Δt used for numerical integration

To determine an adequate time step size Δt to use for numerically integrating Eq. 1, we first generate a time series of fluctuating temperatures $\{T_i\}$ as described by Eq. (8) in the main article. With $\{T_i\}$ as input, and a similar initial condition as the simulations shown in Fig. 2 in the article, Eq. 1 is numerically integrated for varying Δt using the Euler scheme. Δt is varied in such a way that the temperature is the same for each whole year, regardless of the time step size. The results of varying Δt from 0.01 year to 1 year are shown in Fig. 1. As the resulting graphs of the ice sheet volume $V(t)$ practically coincide, we consider a time step size of one year to be sufficient.



Mikkelsen Paper Comments

<https://tc.copernicus.org/articles/12/39/2018/tc-12-39-2018-supplement.pdf>

Figure 1. Varying the integration stepsize Δt from 1 year to 0.01 years for a simulation with $T = 0$, such that the (random) fluctuating temperature T_i is the same for each whole year. A visual inspection confirms qualitatively that the graphs for varying Δt coincide and we do not further analyze the consequences of varying Δt .

Holocene Glacial Ice

This slide has a few examples of glacial ice volumes over the Holocene. I haven't found a good source for the data behind these type of plots, but they all point to the same general conclusion. The last few hundred years have been characterized by retreating ice volumes (highlighted by the blue dashed line in each plot). Happy to receive a link to data on Glacial Ice Volumes (preferably Global) from skeptics or alarmists alike.

<https://www.researchgate.net/publication/322316861> Influence of temperature fluctuations on equilibrium ice sheet volume

Additional Paper Citations on the Greenland Ice Sheet are available at the link below.

<https://notrickszone.com/2019/08/05/for-nearly-all-of-the-last-10000-years-greenland-ice-sheet-and-glacier-volume-was-smaller-than-today/comment-page-1/>

The Greenland Ice Sheet had been adding ice volume for around 4,000 years. The highlighted small drop in ice volume (that began long before human emissions could have been a significant factor), is suddenly a "Climate Emergency"? No, it is not an emergency, it is not alarming, it (like the Modern Temperature Record (MTR, 1850 - 2020) temperature rise out of the Little Ice Age (LIA)) is neither unusual nor unprecedented.

Original Paper (Mikkelsen et al 2018)

<https://www.researchgate.net/publication/227530115> Ice-borne prehistoric finds in the Swiss Alps reflect Holocene glacier fluctuations

The Holocene Millennial Climate Cycle as Expressed in the Schnidejoch Ice Field

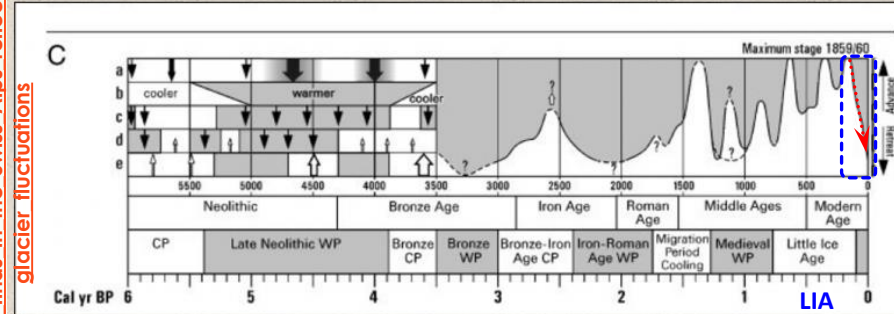
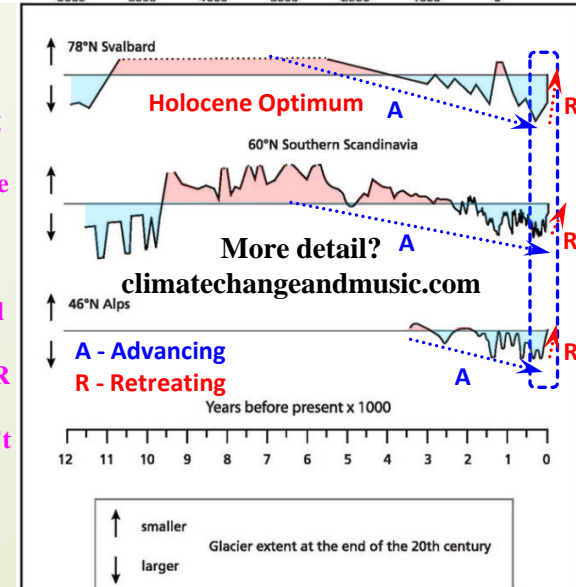
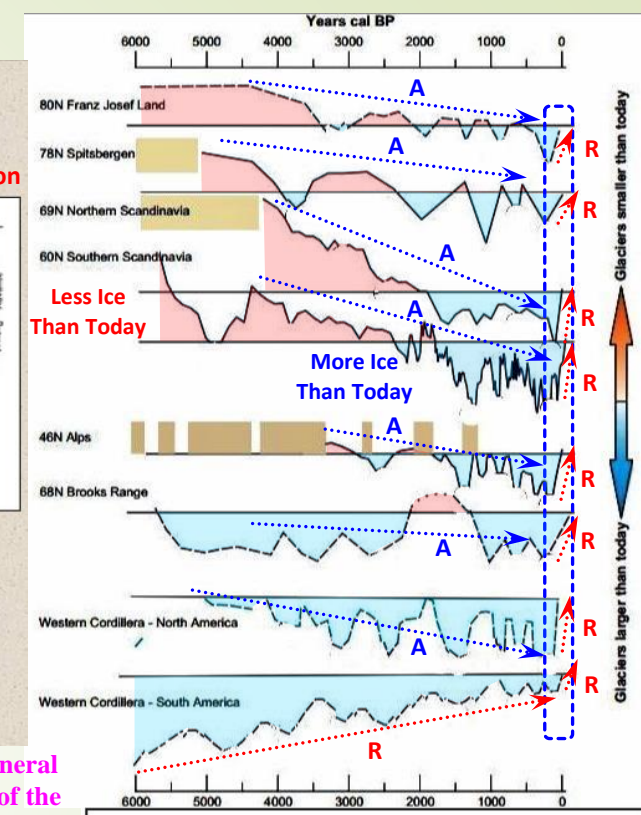


Figure 3. (A) ^{14}C dates (95% probability interval) of archaeological finds and a selection of artefacts from Schnidejoch: (1) casing for hunting gear, (2) leather leggings, (3) shoe, (4) arrow, (5) belts (made of twigs), (6) bronze needle, (7) wool (Roman tunic), (8) shoe nails and (9) coins. (B) Number of data points indicating Grimsel glacier shorter than present (i.e. 1985 reference level; data from Jörin et al. (2006)). (C) Compilation of glacier advances (light arrows), retreats (heavy arrows), cold/moist (CP, light) and warm/dry (WP, shaded) phases in the greater Alpine area: on the left 6000–3500 cal. yr BP, (a) Jörin et al., 2006, (b) Trachsel, 2005 (compilation of 26 sites), (c) Hormes et al., 2001, (d) Furrer, 2001, (e) Nicolussi and Patzelt, 2000; on the right 3500 cal. yr BP to present: Great Aletsch Glacier, Holzhauser et al., 2005. (D) Milankovic forcing showing the greater insolation during mid-Holocene summers (June) at Northern Hemisphere mid-latitudes (Berger, 1978)

Grosjean, M., Suter, P. J., Trachsel, M. and Wanner, H. 2007. Ice-borne prehistoric finds in the Swiss Alps reflect Holocene glacier fluctuations. *J. Quaternary Sci.*, Vol. 22 pp. 203–207. ISSN 0267-8179.

The Global glacial ice follows the same general pattern as Greenland (with the exception of the Western Cordillera in South America, a small portion overall). Coming off the Holocene Optimum (when glaciers were much smaller or non-existent), glaciers were generally advancing for 4,000 to 5,000 years. Why you might ask? It wasn't CO_2 (which was roughly constant over the Holocene). Remember 80% of mankind's CO_2 emissions occurred after 1950. Natural forcings (i.e.: the sun) was responsible for the cooling global temperatures and glacial advance. Glacial Ice (unsurprisingly) has been receding as the temperature rose out of the LIA. Again, the MTR glacial recession is neither unusual nor unprecedented. Note, the natural forcings haven't stopped just because CO_2 concentrations are higher (except in the IPCC computer models).



The sun, (not CO_2) is the primary climate driver!