Carbon Dioxide and a Warming Climate are not problems.

By Andy May[1] and Marcel Crok[2]

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Abstract

Prior to the mid-19th century, Earth was in the grip of the Little Ice Age. Since then, temperatures have on average trended upward. At the same time, human emissions of carbon dioxide (CO_2) have increased, and the interest of scientists has turned to consider the extent of the relative contributions of anthropogenic CO_2 and natural forces to warming.

The IPCC Sixth Assessment Report (AR6) Working Group II (WGII) claims that human-caused climate change or global warming is dangerous. According to the report, "Human-induced climate change … has caused widespread adverse impacts and related losses and damages to nature and people, beyond natural climate variability. … The rise in weather and climate extremes has led to some irreversible impacts as natural and human systems are pushed beyond their ability to adapt (*high confidence*)."[3]

The AR6 WGI and WGII reports measure climate change as the global warming since 1750 or 1850. The period before these dates is commonly referred to as the "pre-industrial period."[4] The Little Ice Age, a phrase rarely used in AR6,[5] extends from about 1300 to 1850. It was a very cold and miserable time for humanity, with a lot of well documented extreme weather in the historical record from all over the Northern Hemisphere. It was also a time of frequent famines and pandemics. Arguably today's climate is better than then, not worse.

None-the-less, the IPCC claims that extreme weather events are worse now than in the past, however observations do not support this. Some extreme weather events, such as the land area under extreme drought,[6] is decreasing, not increasing. Globally the incidence of hurricanes shows no significant trend.[7]

Observations show no increase in damage or any danger to humanity today due to extreme weather or global warming.[8] Climate change mitigation, according to AR6, means curtailing the use of fossil fuels,[9] even though fossil fuels are still abundant and inexpensive. Since the current climate is arguably better than the pre-industrial climate and we have observed no increase in extreme weather or climate mortality, we conclude that we can plan to adapt to any future changes. Until a danger is identified, there is no need to eliminate fossil fuel use.

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[1] Clintel Foundation Email: andy.may@att.net
[2] Co-founder and director of the Clintel Foundation
[3] (IPCC, 2022, p. 9)
[4] The observations used to characterize the pre-industrial period are taken from 1850-1900, as these are the earliest global measurements available. (IPCC, 2021, pp. 5, footnote 9)
[5] (IPCC, 2021, pp. 295, footnote c)
[6] (Lomborg, 2020)
[7] (Lomborg, 2020) and (IPCC, 2013, p. 216)
[8] (Crok & May, The Frozen Climate Views of the IPCC, An Analysis of AR6, 2023, pp. 140-161) and (Scafetta N. , 2024)
[9] (IPCC, 2022b, pp. v, 6-13) and (Scafetta N. , 2024)

Key words: IPCC, AR6, climate change, global warming, fossil fuels, CO_2, adaptation, mitigation, Little Ice Age, pre-industrial.

1. Introduction

The planet's surface has warmed since 1850, this is illustrated in figure 1.

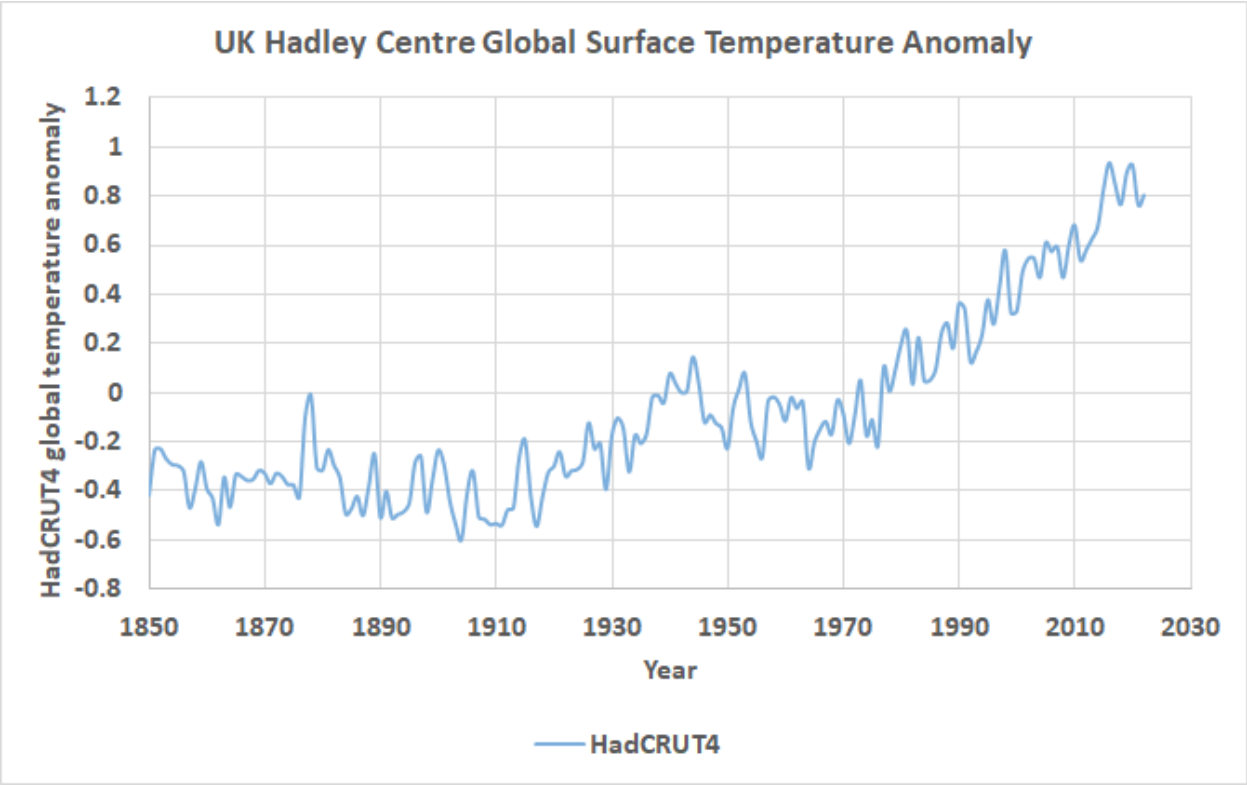

Figure 1. The UK Met Office Hadley Centre HadCRUT4 global average temperature anomaly in degrees Celsius from a 1961 to 1990 baseline.

In figure 1 we can see that the HadCRUT4[10] global surface temperature anomaly overall has increased a little over one degree Celsius since 1850. The anomaly decreased from 1850 to 1910, then increased rapidly to 1945, then decreased to 1976, then increased to 2016 and has been flat since 2016. The overall increase since 1850 has popularly been called "global warming" or "climate change."

That the globe is warming cannot be disputed, although the amount of surface warming is scientifically disputed, due to disagreements on how to process and combine the measurements.[11] The latest IPCC (The U.N. Intergovernmental Panel on Climate Change) Sixth Assessment Report, called "AR6," claims that it is "*very likely*" (90% confident) that human greenhouse gas emissions were the "main driver" of tropospheric warming since 1979. They further claim that natural drivers changed temperatures since

[10] All the various global surface temperature records have problems. I use HadCRUT4 mostly because the newer HadCRUT5 record is too extreme. See here.

[11] (Soon, Connolly, Connolly, & O'Neill, 2018) and (Scafetta & Ouyang, 2019)

1750 between about 0.1 and -0.1°C (solar from -0.04 to 0.04, volcanic -0.03 to 0.01), with both natural forces averaging to roughly zero over the whole period.[12]

Essentially, they claim that all the climate changes were due to human influence and that nature played a minimal role over the entire study period.

2. The physical science case for dangerous anthropogenic climate change

AR6 claims that climate change is human-caused and that it will cause increased extreme weather events, droughts, floods and wildfires. They believe these climate changes will adversely affect the environment, human wellbeing, food production, and human health.[13]

The idea that human-caused climate change is potentially harmful requires demonstrating two things. Firstly, we need evidence that humans are a significant contributor to climate change and global warming and secondly, the resulting climate change must be shown to be dangerous.

Most of the evidence presented to show humans are causing climate change is from climate models, but the models have been shown to run hot relative to observations.[14] The most cited observational evidence that humans are contributing to climate change is the "atmospheric fingerprint" proposed in the second IPCC report[15] based on work by Benjamin Santer and others.[16] David Karoly[17] and others have pointed out that if solar variability were causing climate change, both the stratosphere and the troposphere would be warming, but this is not what we observe. The stratosphere is cooling, and the lower troposphere and Earth's surface are warming. The middle troposphere warms along with the lower troposphere, but at a slower rate. This pattern of stratospheric cooling and tropospheric warming is called the fingerprint of human-caused warming.

The idea makes some sense. In the troposphere where water vapor and clouds are abundant, additional CO_2 should cause some warming since the additional radiation emitted by CO_2 is less likely to make it to space, and more likely to be absorbed by water vapor molecules or clouds. But there is almost no water vapor in the stratosphere and few clouds, so there additional CO_2 emissions mostly go straight to space and have an overall cooling effect.

However, the idea that this pattern "points towards a discernible human influence on global climate"[18] is very controversial. There are alternative explanations for the observed stratospheric cooling, David Karoly suggested that "decreases in ozone amount in the stratosphere"[19] may account for the cooling. A short article in *Nature*, in 1996, provides a fair summary of the whole "atmospheric fingerprint" controversy, that is still accurate today. Following is a quote from the paper, written by Neville Nicholls:

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[12] AR6 page 5: "… natural drivers changed global surface temperature by –0.1°C to +0.1°C, and internal variability changed it by –0.2°C to +0.2°C." also see (IPCC, 2021, p. 961)
[13] (Scafetta N. , 2024) and (IPCC, 2022)
[14] (McKitrick & Christy, 2018), (McKitrick & Christy, 2020), and (Scafetta N. , 2024)
[15] (IPCC, 1996, p. 439)
[16] (Barnett, Santer, Jones, Bradley, & Briffa, 1996), (Santer B. , et al., 1996a), and (Santer B. , et al., 1995)
[17] (Karoly, 1987), (Karoly, 1989), and (Karoly, 2021b)
[18] (IPCC, 1996, p. 439)
[19] (Karoly, 1987)

> "The study of Santer et al., and those reported in the IPCC Second Assessment, show that an anthropogenic component of global climate change - the 'anthropogenic fingerprint' - may be appearing in the observed data. It must be pointed out, however, that this signal is the complicated pattern of change resulting from the combined effects of stratospheric ozone depletion and increased concentrations of greenhouse gases and sulphate aerosols. It does not mean that the effect of any one of these factors has been detected.
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> Many uncertainties remain in this work and are acknowledged by Santer et al. and in the IPCC Second Assessment."[20]

More recently the statistical methodology used to justify the "anthropogenic fingerprint" has been questioned by Ross McKitrick. It appears that the statistical underpinnings of the anthropogenic fingerprint are seriously flawed.[21]

There is also the problem of the middle troposphere, especially in the tropics. Climate models show it warming more than observations.[22] It has been well established by Ross McKitrick and John Christy[23] that most CMIP/IPCC climate models and the model average overestimate warming in the tropical middle troposphere by a statistically significant amount. The IPCC AR5 report showed that if the anthropogenic CO_2 effect is not included in the model, the model results in the tropical middle troposphere move closer to the observations.[24]

Chapter 3 of AR6 lists the evidence that humans influence Earth's climate, but the "atmospheric fingerprint" just described is the only observational evidence and it is controversial. The rest of the evidence presented is from comparing geographical patterns of weather components, such as warming, cooling, or precipitation, to climate models. This is a problematic procedure when McKitrick and Christy, and AR6 itself, have shown that the models are not valid in the tropics, and probably globally, when compared to observations. The work of McKitrick and Christy is acknowledged in AR6, and they admit their overestimation of surface and ocean temperatures remains in the current AR6 models.[25] All their examples, such as higher humidity in the upper troposphere, Arctic ice loss, spring snow cover, or temperature extremes could have natural causes and may not exceed natural variability. The full range of natural variability is not known.

Since general circulation climate models and the modern CO_2 and greenhouse gas warming hypothesis were developed in the 1960s and 70s[26] many natural climate oscillations have been discovered. These long-term climatic oscillations and the resulting "climate regime shifts"[27] strongly suggest that natural

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[20] (Nicholls, 1996)
[21] (McKitrick R. , 2021) and (McKitrick R. , 2022)
[22] (IPCC, 2021, p. 444)
[23] (McKitrick & Christy, A Test of the Tropical 200- to 300-hPa Warming Rate in Climate Models, Earth and Space Science, 2018) (McKitrick & Christy, 2020)
[24] (IPCC, 2013, p. 892)
[25] (IPCC, 2021, p. 443) "Since AR5, additional studies based on CMIP5 and CMIP6 models show that this warming bias in tropospheric temperatures remains."
[26] (Manabe & Wetherald, 1975) and (Charney, et al., 1979)
[27] (Vinós, 2022, pp. 186-189), (Mantua, Hare, Zhang, Wallace, & Francis, 1997)

forces, possibly driven by cyclic changes in the Sun,[28] are causing some of the recent global warming observed since 1920, or even earlier.[29] It is beyond the scope of this paper to detail all the natural ocean oscillations discovered and described in the past few decades, but one of the major, and most important, oscillations is the Atlantic Multidecadal Oscillation (AMO), first named by Richard Kerr in 2000[30] but formally described by Stephen Gray and colleagues in 2004.[31] The AMO has a very strong climatic signal and has been around since at least 1567AD, so it clearly does not have a human cause.[32] The AMO, which is based on North Atlantic sea-surface temperatures is plotted in figure 2. The upper plot shows the raw AMO data (the North Atlantic sea surface temperatures) and the lower shows the AMO detrended (linear fit subtracted from the temperatures to produce the standard AMO "index").

There are several key features displayed in figure 2. First, we observe that the secular trend in the AMO of 0.3°C is about 30% of the warming observed globally in the 20th century.[33] Next we observe that the

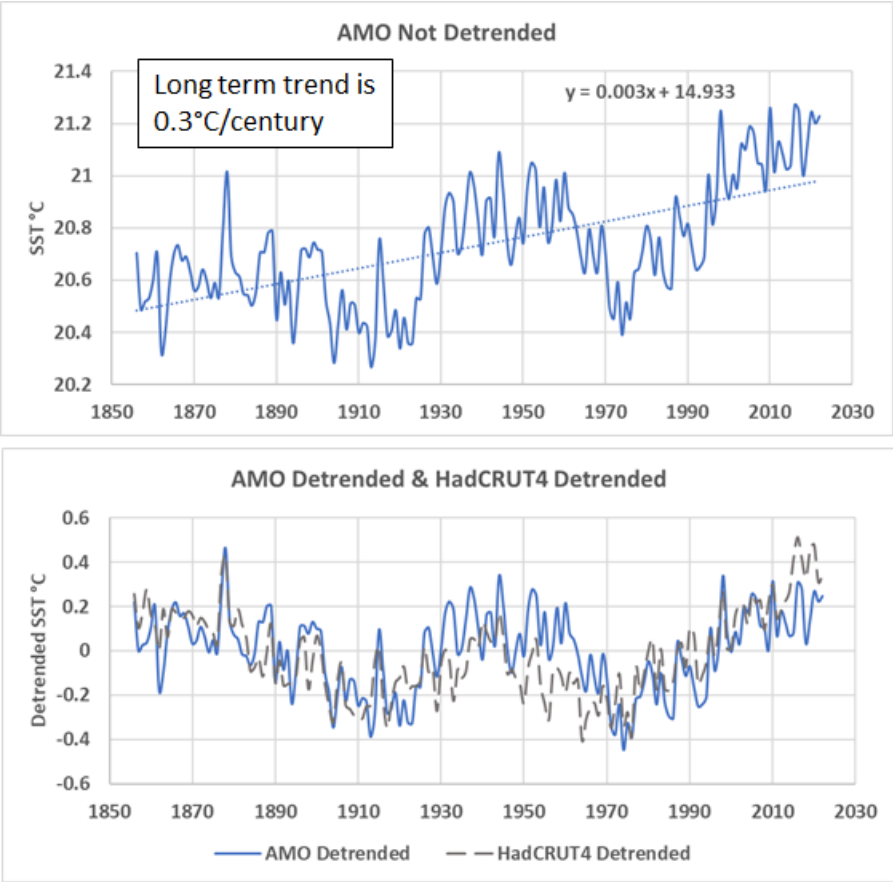

Figure 2. The Atlantic Multidecadal Oscillation (AMO) plotted in its raw form (top) and as a detrended index (bottom plot). The HadCRUT4 global temperature average record has also been detrended and overlain, as a gray dashed line, on the detrended AMO. Data from NOAA.

[28] (Vinós, 2022, p. 191)
[29] (Vinós, 2022, pp. 160-192)
[30] (Kerr, 2000)
[31] (Gray, Graumlich, Betancourt, & Pederson, 2004)
[32] (Gray, Graumlich, Betancourt, & Pederson, 2004)
[33] (Chylek, Klett, Lesins, Dubey, & Hengartner, 2014) and (Moore, Halfar, Hajeed, Adey, & Kronz, 2017)

warming period from 1980 to 2005 coincides with an upturn in the AMO index. The AMO index has been traced to 1567AD, thus it is a natural oscillation. These observations cast some doubt on the AR6 claim that all 20th century warming is due to human influence and there is no net natural impact.[34] The second feature we will point out in figure 2 is that the full AMO climate cycle is 60-70 years, and it matches the estimated global temperature changes in the 20th century. To make this comparison easier, the HadCRUT4 record from figure 1 is also detrended and overlain as a gray dashed line in the lower plot of figure 2. What if the so-called human-caused warming from 1976 to the present day was boosted by a natural cycle? It would mean that the IPCC calculation of the impact of human greenhouse gases was too high,[35] just as their calculation of tropical tropospheric warming is too high, something they admit in AR6.[36]

3. What is the evidence of current damage due to CO_2 or global warming?

Currently it is very hard to find any unusual weather or weather-related disaster that can be blamed on climate change, whether natural or human-caused, despite constant news media claims to the contrary. AR6 can only point to an increase in heat waves.[37] Weather-related disasters occur every year. But the trends in the cost, as a fraction of GDP, or human suffering and death due to them are, respectively, flat or rapidly declining as explained by Roger Pielke Jr.[38] and Bjorn Lomborg.[39]

Globally, most damage (around 90%) from extreme weather by far is due to flooding and severe storms, such as tropical cyclones.[40] The most damaging extremes, hurricanes, floods, and (weather-related) droughts have not changed globally on climatic time scales (>30 years).[41] The earth has warmed by slightly more than one degree Celsius, and the CO_2 concentration has gone up, but the most dramatic, destructive, and deadly extreme weather events have not changed significantly or have declined.[42] Further, 52 of 53 studies of disaster losses due to extreme weather were unable to attribute the events to human causes, and the one study[43] that did claim human attribution was flawed.[44]

While there are places in AR6 where they claim the frequency of heavy precipitation events has increased and they try (using models and weather pattern analysis) to show these are related to human greenhouse gas emissions, they do acknowledge that there is "*low confidence* in the human influence on

[34] (IPCC, 2021, p. 5)
[35] (Scafetta N. , 2024)
[36] (IPCC, 2021, pp. 443-444), "The AR5 assessed with low confidence that most, though not all, CMIP3 and CMIP5 models overestimated the observed warming trend in the tropical troposphere during the satellite period 1979–2012, … CMIP6 models show that this warming bias in tropospheric temperatures remains."
[37] (IPCC, 2021, p. 1856)
[38] (Pielke, 2020)
[39] (Lomborg, 2020)
[40] (Pielke, 2020)
[41] (Klotzbach, Bowen, Pielke, & Bell, 2018), (Crok & May, 2023, pp. 142-157), and (Pielke, 2019)
[42] (Crok, Extreme views on disasters, 2023)
[43] (Grinsted, Ditlevsen, & Christensen, 2019)
[44] (Pielke, 2020) and (Crok & May, 2023)

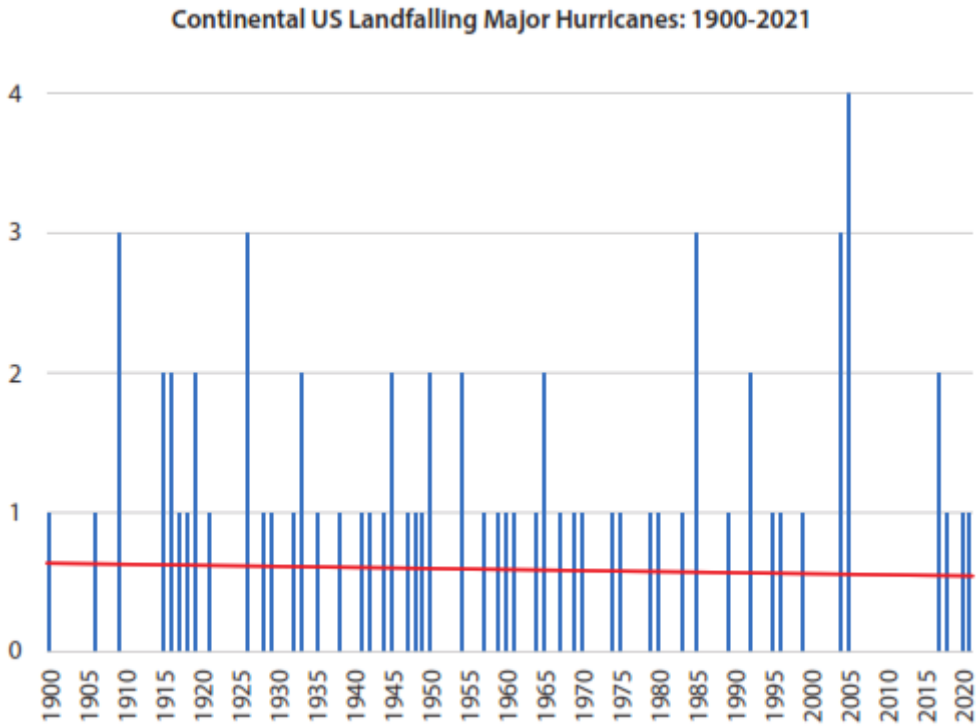

Figure 3. Number of major continental US landfalling hurricanes. This graph was updated from Klozbach 2018 by Roger Pielke Jr. The illustration is from Crok and May 2023.

the changes in high river flows on the global scale… [and] there is *low confidence* in attributing changes in the probability or magnitude of flood events to human influence ..."[45]

In the same section of AR6, they write: "…it remains uncertain whether past changes in Atlantic [tropical cyclone] activity are outside the range of natural variability." [46] A plot of US landfalling major hurricanes is shown in figure 3.

As figure 3 shows, the number of major U.S. hurricanes is declining. The total number of hurricanes striking the U.S. is also declining.[47] In fact, the global weather losses, due to all extreme weather, are declining as a percentage of global GDP.[48]

Bjorn Lomborg has shown that climate and weather-related deaths have declined an astonishing 99% since 1920.[49] This is very significant since non-climate and non-weather related deaths due to other natural disasters (earthquakes, tsunamis, volcanos, etc.) have only seen a modest decline over the same period.[50] In other words, even though the world population has risen more than four times since 1920,

[45] (IPCC, 2021, p. 1569)
[46] (IPCC, 2021, p. 1588)
[47] (Crok, 2023)
[48] (Pielke, 2019)
[49] (Lomborg, 2020)
[50] (Lomborg, 2020)

there are many fewer extreme weather deaths today than then. This suggests (perhaps proves?) that humanity has adapted well to climate changes since 1920.

4. Additional CO_2 and global warming benefits and costs

It seems that trends (if trends can be found at all) in the most severe and damaging weather events (tropical cyclones and flooding) cannot be definitively attributed to human greenhouse gas emissions, and in any case may be declining in frequency over the industrialized period.[51] There is no doubt that climate change, whether natural or human-caused, will have adverse effects for some people in some locations. However, this overlooks the fact that climate change will benefit other people in different locations. As with any analysis, both the benefits and the costs must be examined; and AR6 clearly only examines the downside risks of climate change.[52] The lack of an analysis of the benefits of climate change damages their credibility as an unbiased observer of the science of climate change.

5. Comparing past temperatures to modern temperatures

In AR6 they try and estimate an average global surface temperature from many thousands of years ago using 1,319 proxy temperature records from around the world,[53] then they compare these uncertain proxies, many of which only respond to temperature changes in one season, and have a median temporal resolution of one temperature per 164 years,[54] to the tens of thousands of modern thermometers we have today that each provide as many as 200 or more measurements per day. The quality of proxy temperatures used for the pre-thermometer period varies greatly, yet the AR6 Chapter 2 authors use them to build a single record of global average temperature and compare it to the modern period.[55]

Temporal resolution cannot be increased, but it can be decreased. It is more sensible, and more valid, to reduce modern resolution so it can be compared to carefully selected proxies at the proxy locations. Two proxy records stand out, one is the high-resolution Greenland ice core proxies carefully analyzed by Bo Vinther[56] and another is the well-located Makassar Strait proxy analyzed by Yair Rosenthal.[57] The Greenland ice cores are from the Arctic and the Makassar Strait data is from the tropical Southern Hemisphere. These proxies are 9,500 miles apart.

Rosenthal estimates his record is accurate to ±0.35°C and Vinther's accuracy is probably comparable. The temporal resolution of both records is 20 to 50 years. The two records are compared to the present-day average temperature anomaly in the Makassar Strait from 2006-2016[58] in figure 4.

The Makassar Strait between Borneo and Sulawesi is part of the Indonesian Throughflow, which is a major conduit for the exchange of water between the Pacific and Indian Oceans. The temperature proxy plotted in figure 4 is from a foraminifer that lives at 500 meters and *represents* temperature changes at

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[51] (Klotzbach, Bowen, Pielke, & Bell, 2018), (Pielke, 2020), and (Lomborg, 2020)
[52] (Crok, 2023) and (Lomborg, 2020)
[53] (AR6, figure 2.11, p 316 and (Kaufman, McKay, & Routson, 2020))
[54] (Kaufman, McKay, & Routson, 2020). Also see (Kaufman & McKay, 2020b) (Link)
[55] (AR6, figure 2.11)
[56] (Vinther, 2009)
[57] (Rosenthal, 2013)
[58] (Gouretski, 2019), The University of Hamburg WAGHC database.

that depth. It *represents* the temperature of the Indonesian Intermediate Water, which is linked to and influenced by surface conditions in the high northern latitudes of the Pacific Ocean.[59] In figure 4 the Holocene Climatic Optimum from about 8050BC to 5600BC and the Neoglacial Period, from 5200BC to about 1850AD, as well as the Little Ice Age (LIA) are identified. Notice that the two proxies, although 9,500 miles apart have the same shape, and both suggest that temperatures at their locations were 2.5 to 3°C warmer during the Holocene Climatic Optimum than during the Little Ice Age. CO_2 increases during the Neoglacial Period and cannot explain the cooling trend, a fact that is now called the Holocene temperature conundrum.[60]

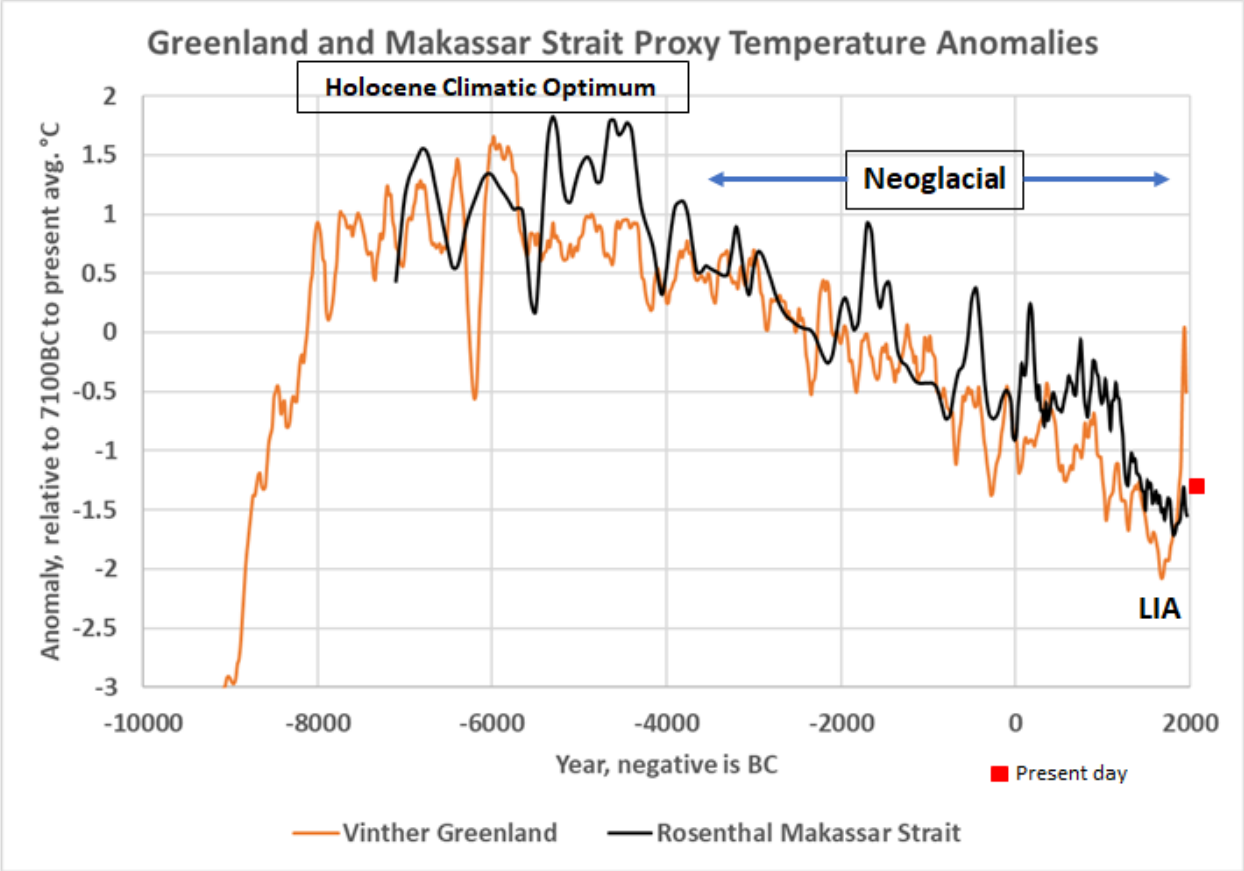

Figure 4: Figure 5. Greenland ice core (Vinther, et al., 2009) and Makassar Strait, Indonesia intermediate water (500 meters) temperature proxy (Rosenthal, Linsley, & Oppo, 2013) anomalies since the Holocene Climatic Optimum. The present day average temperature anomaly in the Makassar Strait at 500 meters depth from 2006 to 2016 is marked with a red box.

In the tropics the Sun is nearly directly overhead, at the local noon, all year around. Additional CO_2 is unlikely to cause much tropical warming, and geological data suggests that tropical temperatures have not changed very much for the past 500 million years.[61] Further, natural processes limit the maximum

[59] (Rosenthal, Linsley, & Oppo, 2013)
[60] (Liu, et al., 2014), "This global cooling is puzzling because it is opposite from the expected and simulated global warming trend"
[61] (Scotese, Song, Mills, & Meer, 2021), "The temperature remains nearly constant in the tropics (0° - 15° latitude)." and (Lindzen, 1994), "climate changes in the past history of the Earth were primarily associated with almost unchanged equatorial temperatures and major changes in the equator-pole distribution."

temperature over the ocean to a maximum of about 30°C.[62] When the earth warms, it warms in the higher latitudes, the tropics will not change much as long as the oceans exist. One of the problems with speaking about "global average surface temperature" changes is it can lead one to think that when it rises, it rises everywhere in the world the same amount, which is not true and has never been true.[63]

6. The Little Ice Age

In the Northern Hemisphere, and in at least a few locations of the Southern Hemisphere, the Little Ice Age was very cold in the winter and sometimes very hot during the summer. During the depths of the Little Ice Age the weather was so horrible that civilizations collapsed all over the world, including in China, Europe, and Russia.[64] These collapses were caused by poor weather, which led to poor crops and to famine.

There was no summer during 1675, and it was the second coldest summer in the past 600 years in North America according to proxy evidence. The winter of 1657-1658 was particularly brutal. Massachusetts Bay and the Delaware River both froze over, allowing people and deer to cross on the ice. The Baltic Sea froze so hard that horses and loaded wagons could cross from Gdansk, Poland to the Hel Peninsula over 10 miles north of the city. Yet, the following summer was excessively hot in Italy and Greece. In India the monsoon failed that year, resulting in a devastating famine.[65]

Between 1660 and 1680, more typhoons struck southern China at Guangdong Province, than at any other time in recorded history. In 1666, a hailstorm hit England and some of the hailstones were a foot in circumference—softball size. Glaciers advanced all over the world and in 1601 the advancing Mer de Glace in Chamonix, France swallowed two entire villages.[66]

Egypt in the 1670s had many very severe winters and people began to wear fur coats, something that had never happened in Egypt before. In the 1680s, the Sahel in Africa suffered a severe drought and Lake Chad reached the lowest level ever recorded.[67]

The winter of 1691-1692 was very severe, starving wolves entered Vienna, Austria and attacked men and women in the streets. All the canals in Venice froze over and the mouth of the Nile River was choked with ice for a week. The cold of the 1690s caused a major famine in northern Europe and half the population of Finland died, as well as 15% of the population in Scotland. Mixed in with the cold years were occasional summers of intense heat and drought, such as the summers of 1693 and 1694 when the heat was unbearable in both England and Italy. The climate of today is much better than it was then.[68]

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[62] (Sud, Walker, & Lau, 1999) and (Newell & Dopplick, 1979)
[63] The fact that warming is more extreme in higher latitudes and mild near the equator is well accepted in the scientific literature, but often missing in popular news media articles. See (Scotese, Song, Mills, & Meer, 2021).
[64] (Parker, 2012)
[65] (Parker, 2012), (Behringer, 2010), and (Homewood, 2022)
[66] (Behringer, 2010, pp. 89-90)
[67] (Parker, 2012)
[68] (Behringer, 2010)

7. CO_2 and global warming benefits

Besides the improvement in climate from the Little Ice Age, a part of the "pre-industrial period," additional CO_2 has benefited humanity by greening the planet as shown by Zaichun Zhu's study of the greening Earth from the journal *Nature Climate Change*.[69]

Dippery, et al. conducted controlled experiments that showed using the CO_2 concentration from the last glacial maximum, plants grow very slowly. Yet, at a CO_2 concentration of 350 ppm growth is robust. At a future concentration of 700 ppm much more growth is achieved.[70]

Zhu reports that 21-46% of the global vegetated area is now greener and less than 4% is browner. His simulations show that 70% of the greening is due to additional CO_2. Other modeled components of the increased greening are climate change or warming, additional nitrogen (fertilizer), and additional cultivated land due to warming.

Generally, observations, and modeling show that adding CO_2 to the atmosphere benefits plant life, which in turn makes our lives better. Crops have also benefited from additional CO_2. Craig Idso has estimated that the agricultural benefit of additional CO_2 was $3.2 trillion from 1961-2011.[71]

While observations show that warming and additional CO_2 have benefited humanity to date, this is no guarantee that it will be the case in the future. The situation must be continuously monitored, but it seems extreme to take drastic steps to eliminate fossil fuels until we see some sign that warming and additional atmospheric CO_2 are a problem.

8. Conclusions

Clearly, there are two sides to climate change. It will be a problem in the future for some people in some places and a benefit for others in other places. Climate changes, it always has and always will. Is it changing more now than in the past? Or are we comparing current climate change to some fantasy world where climate never changes?

Warmer temperatures and more CO_2 will mean more food at a lower price for nearly everyone, but in some areas, drought will increase and in others additional precipitation will cause flooding. However, with modern technology and cheap energy, we can build aqueducts to bring water to dry areas and build dikes and seawalls to protect areas prone to flooding. Sea level rise is currently a very modest two millimeters per year, it may be accelerating at about 0.02 millimeters per year per year,[72] but the rise in the next century will be less than a foot, about a third of the normal average ocean daily tide.[73]

Currently fossil fuels supply about 80% of our energy, reducing this to zero rapidly will devastate the world economy and cause widespread suffering, especially for the poor. Should we do nothing? If so, the President's Council of Economic Advisors and the U.S. Office of Management and Budget projects that three degrees of global warming will cause a decline of less than one percent in U.S. GDP.[74] Modern

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[69] (Zhu, Piao, & Myneni, 2016)
[70] (Dippery, Tissue, Thomas, & Strain, 1995)
[71] (Idso, 2013)
[72] (Hansen, 2023)
[73] (Hansen, 2023)
[74] White House Office of Management and Budget (Budget, 2023) and (Koonin, 2023)

global warming, since 1950, has reduced GDP by less than 0.5%, a trivial amount given that the economy has grown 800% in that time.[75] Using IPCC scenarios, Lomborg estimates that economic growth will decline from 450% to 434% over the 21st century.[76] Will anyone notice?

The infrastructure to replace fossil fuels does not exist and likely cannot be built in a short time. Current realistic estimates of future energy use suggest that fossil fuels will still supply half our energy in 2050 and beyond.[77] Yet, no credible evidence exists that this is a problem or will become a problem. Recent research into climate change has suggested that nature plays some role, and certainly greenhouse gas emissions may play some role as well. What we do not know is how much of climate change is human-caused and how much is natural. No drastic changes to our economy are justified until we can figure this out.

Supplementary information: The spreadsheets to make figures 2 and 4 can be downloaded here.

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