

Response to a Climate Science Skeptic

Alan Journet Ph.D. SOCAN Co-facilitator

Kurt Hanke

All based on the phony notion that CO₂ is driving runaway global warming. There were several periods, thousands of years earlier in this interglacial that we live in, where earth's temperature was warmer than it is today, and yet atmospheric CO₂ levels were lower. CO₂ cannot possibly be a potent driver of global warming when this the case! Think about it - if CO₂ is the primary driver of global warming, then during the Medieval period, the Roman period, and thousands of years before that, when temperatures were warmer than today - CO₂ levels should have also been higher than today, but they were not! CO₂ levels back then were lower by at least 100 ppm. In addition, the estimates for the climate sensitivity of CO₂ have dropped rapidly as alarmist climate models deviate more and more from observed data - as the graph below shows. Therefore all the fear mongering about carbon is the scam of the century, and they have suckered you into pushing towards eliminating carbon-based fuels altogether, which means significantly weakening our economy, which is a petroleum-based economy and that is really the end game for these leftist freaks. They hate the US.

These comments essentially make four claims which I will deal with in sequence:

- 1-There were several periods, thousands of years earlier in this interglacial that we live in, where earth's temperature was warmer than it is today*
- 2- Estimates for the climate sensitivity of CO₂ have dropped rapidly*
- 3 -Alarmist climate models deviate more and more from observed data*
- 4-Climate scientists and climate activists are leftist freaks who hate the US.*

1-There were several periods, thousands of years earlier in this interglacial that we live in, where earth's temperature was warmer than it is today

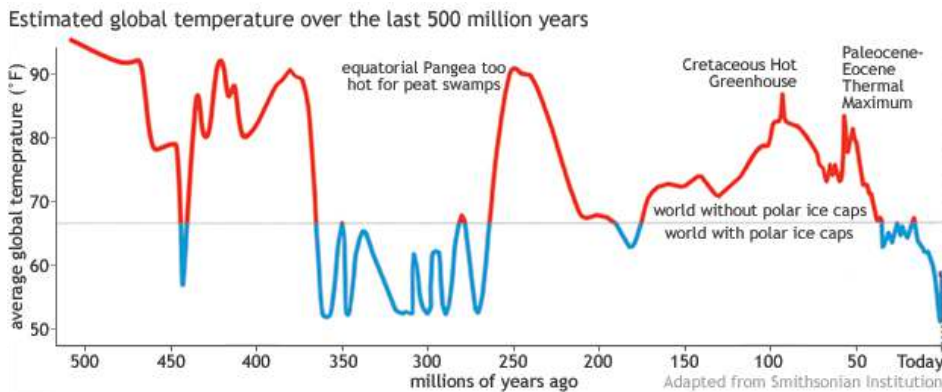


Figure 1. 500 million years of global temperature. Report from NOAA:

<https://www.climate.gov/news-features/climate-qa/whats-hottest-earths-ever-been>

Whenever we explore climate trends, we have to acknowledge historical patterns. The first reality about which many casual visitors to the climate arena are surprised to discover is the long term (hundreds of

millions of years) temperature trend. This is depicted in Figure 1, (for example) which illustrates the last 500 million years. This (NOAA) graph shows a long-term history of so-called hot-house and ice-house phases. Notice three interesting features: (a) the range from ice-house to hot-house phases is 30- 40°F (20 -25°C), (b) we are currently in an ice-house phase and have been here through the major glaciations/interglaciations of the last two million years, (c) the long term average global temperature is much warmer than the planet has experienced throughout these two million years, and (d) at the far right end of the graph, we see recent temperatures rising substantially.

Our best assessment of the cause for these massive fluctuations involves the composition of the atmosphere in terms of greenhouse gases influenced by both geological and biological events such as the evolution of methanogenesis and photosynthesis, and the location of the continents influencing ocean currents.

Glacial Chronology

Time (# years ago)	Name in N. America	Conditions
0-18,000	<i>interglacial</i>	
18-67,000	Wisconsin	<i>glacial</i>
67-128,000	Sangamon	<i>interglacial</i>
128-180,000	Illinoian	<i>glacial</i>
180-230,000	Yarmouth	<i>interglacial</i>
230-300,000	Kansan	<i>glacial</i>
300-330,000	Aftonian	<i>interglacial</i>
330-470,000	Nebraskan	<i>glacial</i>
470-540,000		<i>interglacial</i>
540-550,000		<i>glacial</i>
550-585,000		<i>interglacial</i>
585-600,000		<i>glacial</i>
600-1,800,000	<i>no glacial advances</i>	
1,800,000	<i>Pleistocene begins</i>	

Table 1. Recent Glacial/interglacial periods <https://horseshoecrab.org/evo/ceno/pleisto.html>

Now, when we explore what has been happening during the current ice-house phase, we find a series of glacial and interglacial periods as identified in Table 1 adjacent

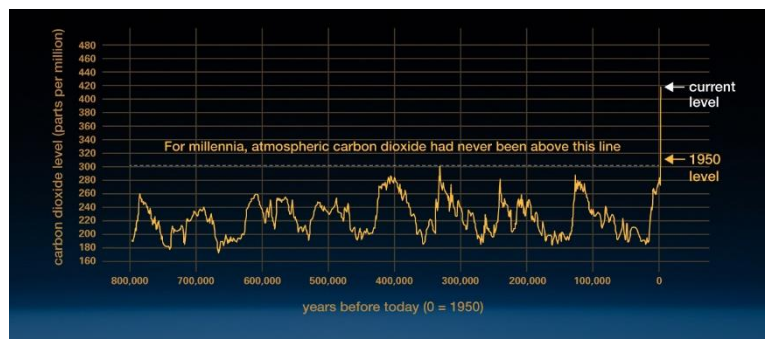


Figure 2 Concentration of carbon dioxide over 800,000 years, from NASA. https://climate.nasa.gov/climate_resources/24/graphic-the-relentless-rise-of-carbon-dioxide/

The trend for atmospheric carbon dioxide concentration over the last 800,000 years, revealed from

ice core analysis where air bubbles are trapped in the ice, certainly depicts a fluctuation in carbon dioxide (Figure 2). Before about 1950, this value never exceeded 300 ppm - parts per million; it is now well over 400 ppm.

Interestingly, the Antarctic ice cores described above also allow us to assess the temperature during that period (Figure 3). This is possible by assessing the isotopic composition of the Oxygen in water molecules (^{16}O and ^{18}O) trapped in the ice which is a function of the temperature at the time. Is it mere coincidence that the atmospheric carbon dioxide concentration and temperature exhibit similar trends? The current climate science consensus is that this is no coincidence. The conclusion that this correlation suggests a causal relationship between atmospheric carbon dioxide and temperature, was initially

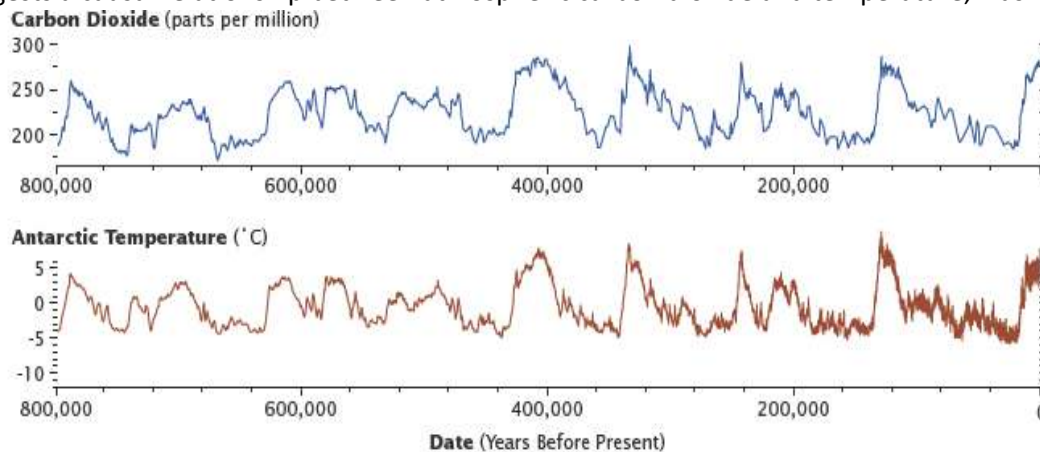


Figure 3 Parallel patterns in temperature and atmospheric carbon dioxide concentration for 800,000 years. <https://earthobservatory.nasa.gov/features/CarbonCycle/page4.php>

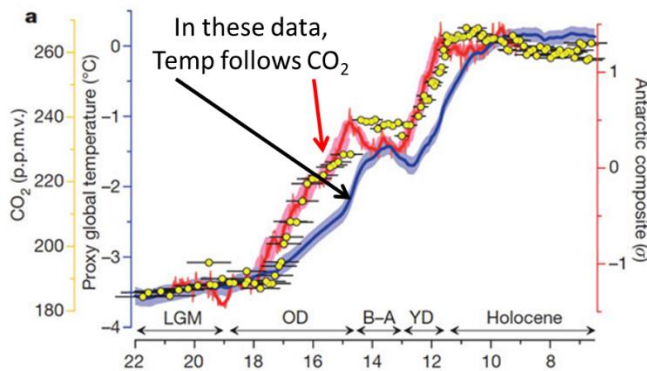


Figure 4. Shakun *et al.* 2012 demonstrated that warming following the Wisconsin glaciation followed carbon dioxide increase.

<http://www.skepticalscience.com/skakun-co2-temp-lag.html>

criticized because warming seems to precede carbon dioxide increase, but this criticism has been refuted by subsequent analyses recognizing the delay that occurs between the time that ice forms and the time that air bubbles are actually trapped in that ice (Parrenin *et al.* 2013). Furthermore, a report by Shakun *et al.* (2012) based on data from sources other than those challenged ice cores, reveals that as we emerged from the latest ice age, it is clear that warming followed the carbon dioxide increase (Figure 4). This study is persuasive because it was based on proxy warming data other than those from ice cores so was not susceptible to

the discrepancy resulting from the date when air bubbles were trapped. As is so often the case with climate science critics, there is a tendency to capture dated criticisms but not keep up with current research that refutes criticism or data that supersede and negate the claims.

The most likely explanation for the cycle in glaciations and interglaciations depicted in Table 1 is the Milankovitch Earth orbital cycle comprising three sub-cycles: a 100,000-year cycle in the shape of Earth's orbit around the sun (Eccentricity of the orbit), a 41,000-year cycle in the angle of the Earth's tilt in relation to the sun (Obliquity of the ecliptic) and a 26,000-year cycle in the direction of the tilt (Precession of the equinoxes). This complex of cycles is discussed by Buis 2020a who suggests that in combination, these cycles influence solar radiation reaching the Earth's surface and concludes by stating: "... the theory that they drive the timing of glacial-interglacial cycles is well accepted."

The impacts of these three cycles are presented in Figure 5 from NASA where lines deviating upwards represent warming and lines down represent cooling. Note the horizontal axis runs from the right to the left and that the three cycles individually and in combination depict a cooling as of now (time 0). This implies that the driving force behind our glacial / interglacial sequence is pushing us into another glaciation.

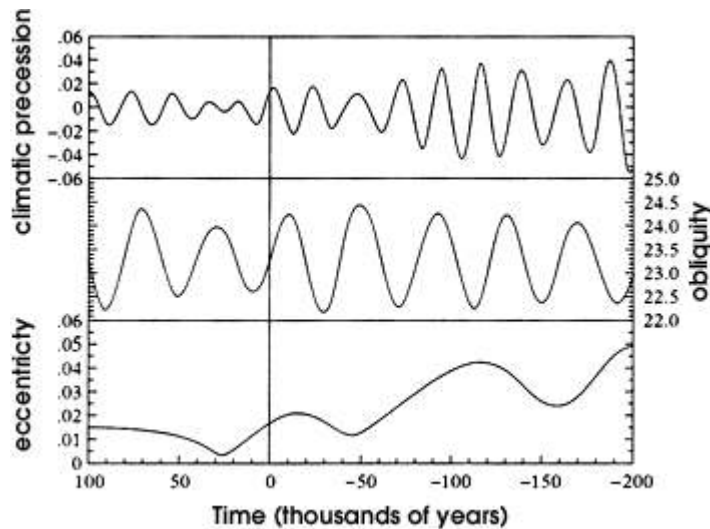


Figure 5. The temperature trends imposed by the three Milankovitch sub-cycles.

https://earthobservatory.nasa.gov/features/Milankovitch/milankovitch_3.php

The fact that rather than experiencing cooling our planet is warming suggests that emissions of greenhouse gases as a result of human behavior have caused over 100% of the warming. This is because they have not only induced warming but have also negated the cooling that should have been occurring.

Interestingly, an assessment published in the journal *Nature* (Ganopolski *et al.* 2016) suggested that our greenhouse gas emissions will likely delay the next glacial period [indicated by the Milankovitch trend] some 50,000 to 100,000 years

Most relevant to claim # 1 about periods that earlier global temperature have been greater than today is Figure 6 from Osman *et al.* (2021) available in Kelley (2021). This depicts the temperature trend from the depth of the last ice age showing that: "global mean temperature has slightly but steadily warmed, by ~0.5 °C, since the early Holocene (around 9 thousand years ago)." Not only does the graph depict no substantial Holocene warming and certainly no warming greater than today, but also it depicts no warming during the Roman Period - which the period incorporating the 5 or 6 centuries B.C. Indeed, it is clear that temperatures over the last few decades exceed any temperature evident since the Wisconsin Ice Age.

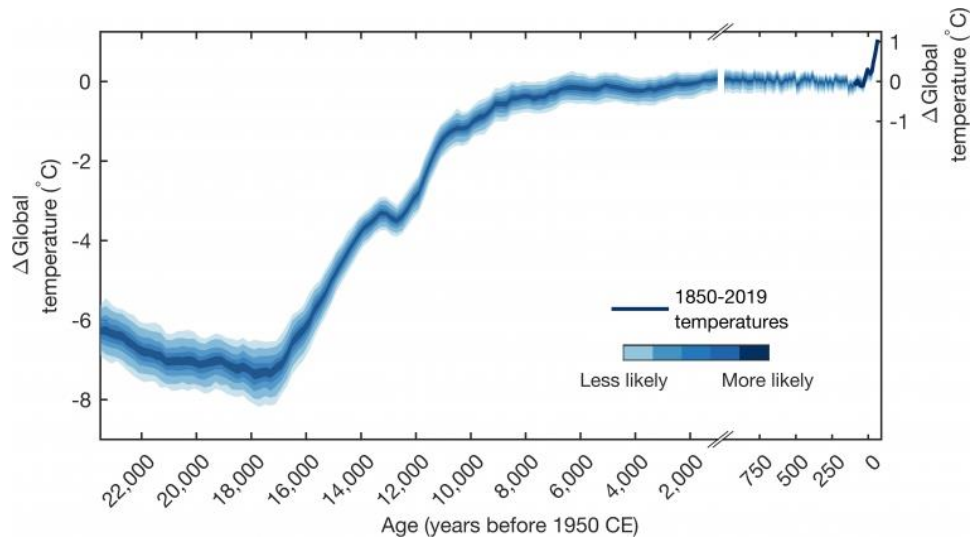


Figure 6. Global temperature since the depth of Wisconsin Ice Age reported by Osman *et al.* (2021): <https://news.arizona.edu/story/global-temperatures-over-last-24000-years-show-todays-warming-unprecedented>

Davies (2020) presented data from studies on temperature trends over the last two millennia (Figure 7). This depicts temperature from 0 to 2016 and reveals a Medieval Warm Period well below 2016 data.

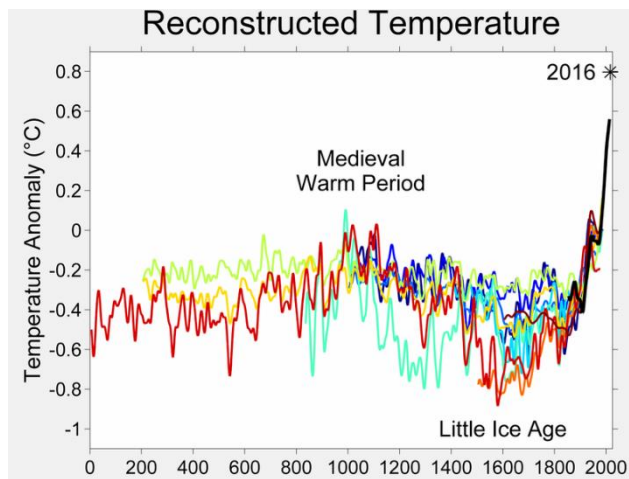


Figure 7. Reconstruction of 2000 years of global temperature.

https://commons.wikimedia.org/wiki/File:2000_Year_Temperature_Comparison.png

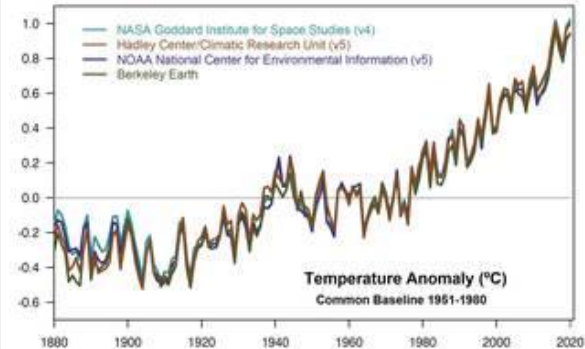


Figure 8. 1880-2019 global temperature according to NASA (turquoise), The British Met Office (brown), NOAA (purple), and Berkeley Earth (black). <https://www.nasa.gov/feature/esnt/2022/six-questions-to-help-you-understand-the-6th-warmest-year-on-record>

Meanwhile, global temperature from 1880 to 2019 according to four sources (NASA, British Met Office, NOAA, and Berkeley) is depicted in Figure 8 where we can see that the temperature has risen well beyond the 2016 status indicating even further that the Medieval Warm Period does not come close to current temperatures. If one were looking at these data in the 1990s, one might be excused for thinking that the Medieval Warm Period was warmer than 'today,' but the data have clearly superseded any such claim.

Figure 8 also reveals that the most profound warming trend has occurred during the second half of the twentieth century and particularly since about 1980.

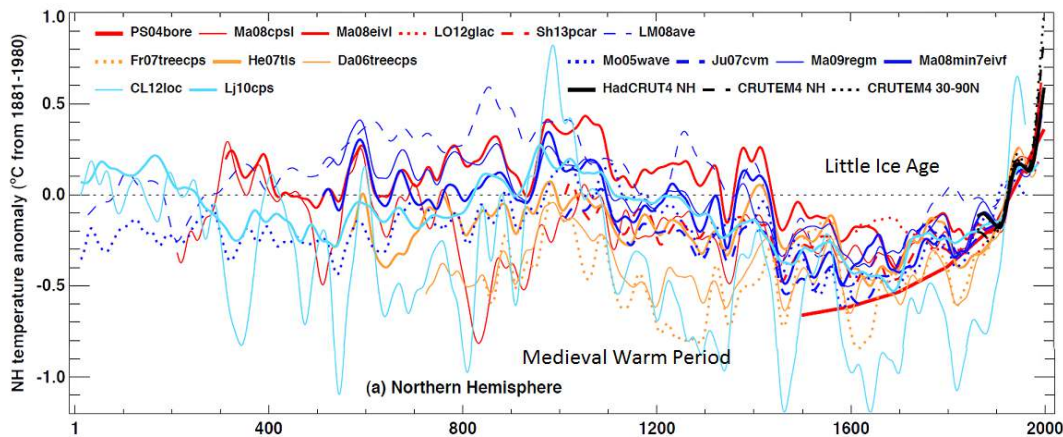


Figure 9. Northern hemisphere temperature trend for 2000 years from The Physical Basis, IPCC AR5, 2013.

https://www.ipcc.ch/site/assets/uploads/2018/02/WG1AR5_all_final.pdf

This pattern is further underlined in Figure 9 which depicts Northern hemisphere temperature trends for the last 2000 years up to about 2,000. The colored lines represent different climate center data. Note that only one of these lines (light blue) reveals data during the Medieval Warm Period that exceeded the then current value. Again, given the warming that has happened this century, this data set reveals how bogus is the claim that the Medieval Warm Period was warmer than now. It's important to identify whether reports of historical patterns are local, regional, hemispherical or global since the trends may be different; a local, regional or hemispherical trend does not necessarily imply a global trend.

2- Estimates for the climate sensitivity of CO2 have dropped rapidly

This claim becomes essentially moot when the first claim is demonstrated as bogus. However, it is worth noting that nowhere in climate science literature does anyone claim that the only factor causing warming or climate shifts over the hundreds of millennia of our planet's existence is atmospheric carbon dioxide. First, carbon dioxide is but one of several gases with global warming potential, and second, other factors than atmospheric gases are involved as well, such as the Milankovitch cycle discussed briefly above and the location of continents and oceanic currents. When skeptics build a case on the premise that carbon dioxide is the only relevant factor, they reveal that they have absolutely no understanding of the complexity of the climate science discussion and, furthermore, have not even bothered to skim the surface of that literature. The claim posted above and addressed here suggests an individual who is skimming ignorant and uninformed nonsense and gleaning what in it they find that supports that world view. Of course, when such individuals quote the bogus claims without citing sources, it is impossible to check the credibility of the sources and the basis for the reported claims.

Nevertheless, let's consider the basic claim regarding the Earth's Equilibrium Climate Sensitivity (ECS) to carbon dioxide i.e., the temperature consequence of increasing the atmospheric concentration of the

gas, often defined in terms of the temperature consequence of doubling the CO₂ concentration. In the absence of sources to justify the claim that recent evidence has caused estimates of that sensitivity to decrease it's difficult to offer an evaluation. However, Buis (2020b) reported on a review of the issue and concluded that there is not a reduction in the ECS but a narrowing of the range. Sherwood *et al.* (2020) concluded that the earlier ECS of 1.5 – 4.5°C should be narrowed to 2.6 – 3.9°C. Note that while the upper limit is lower, the lower limit is higher, thus one could just as reasonably argue that recent estimates have raised the climate sensitivity assessment. In fact, the mid-point of the new range is 3.25, compared to the mid-point of the old range which is 3.0. Again, it's equally reasonable to argue climate sensitivity assessment has increased. Since the industrial revolution (1750) the concentration of carbon dioxide has risen from about 280 ppm to over 400 pm, an increase of some 50%. If a doubling of the CO₂ leads to an increase of 2.6 – 3.9°C the reported increase of about 2.2°C from 1750 is quite greater than about the 1.5°C. that would be expected from a 50% increase. This negates the claim that the Earth Equilibrium Climate Sensitivity is declining

If we now consider atmospheric greenhouse gas concentrations over the last 2000 years (Figure 10), we find they are entirely consistent with the increasing temperature reported for the same period (Figure 7). Since there was no remarkable warming during the Roman Period, it is unsurprising to find no great increase in greenhouse gas concentrations around year 0 on the chart.

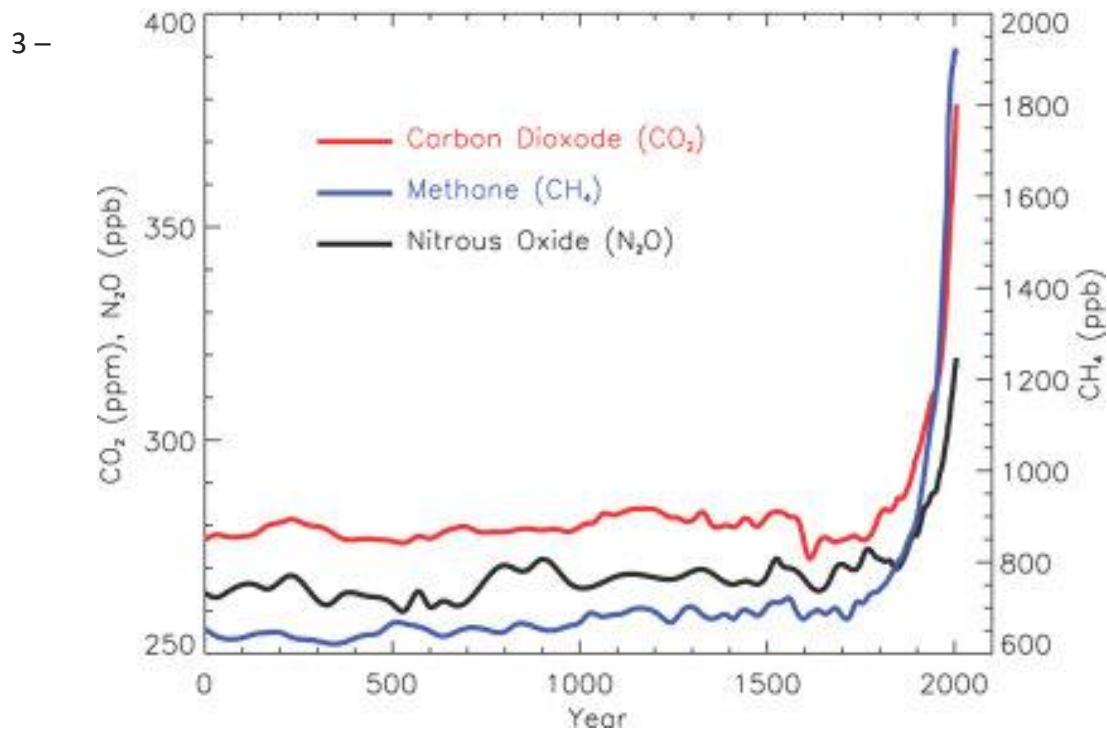


Figure 10. Atmospheric greenhouse gas concentrations for 2000 years.

<https://nca2009.globalchange.gov/2000-years-greenhouse-gas-concentrations/index.html>

One critical question that always must be asked concerns where reported historic temperature data represent; are they regional, hemispheric or global? A second question concerns the attributed cause

for historic warming. To reiterate, there is no climate scientist who claims greenhouse gas concentrations are the only cause for fluctuating atmospheric temperatures. First, in addition to carbon dioxide, we know that the gases methane and nitrous oxide (among others) are also major greenhouse gases. Indeed, the non-carbon dioxide gases cause some 40% of the warming (NOAA 2022). The Medieval Warm Period, for example, is attributed to extended increased solar irradiation (causing warming) and decreased volcanic eruptions (which would have caused cooling).

3. Alarmist climate models deviate more and more from observed data

The claim that observed temperature data indicates that climate models exaggerate the threat has been made time again – but always without data to support the claim. However, because climate models have been available for several decades, we can test them against actual observations. When we apply this reasonable test, we find, time and again, the models are either consistent with, or underestimate, the threat. Climate scientists model more than just temperature (Figure 11, - 13). As discussed below, they also look, for example, at actual September Arctic Sea ice extent reduction (Figure 14) and actual sea level rise (Figure 15).

Figure 11 depicts a test of models by running them over recent historic times when temperature data are known. The modeled data (all models in orange) are compared to NASA observed data (GISTEMP – blue), British Met Office (HADCRUT – brown) and NOAA (black). As can be seen, the observed data are very close to the modeled expectations in this case when models include greenhouse gas emissions resulting from human activity. Figure 12 then depicts what happens when

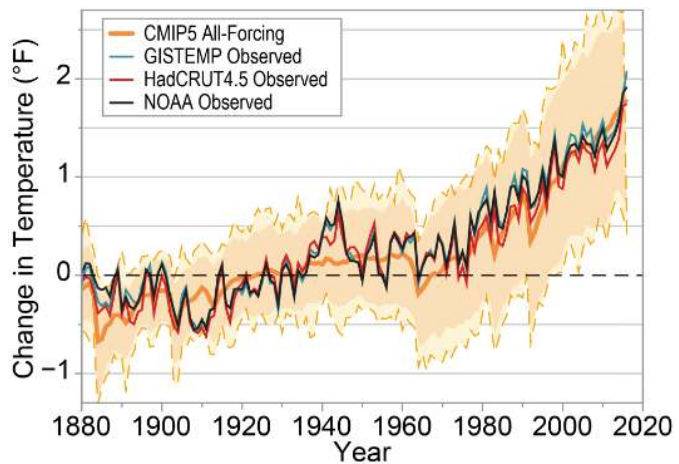


Figure 11. Comparing modeled temperature data with observed data 1880 ->

<https://science2017.globalchange.gov/chapter/3/>

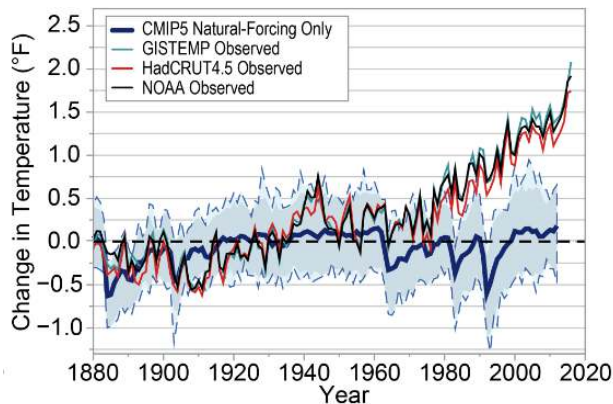


Figure 12. Comparing modeled temperature data with observed data excluding human influences 1880 ->

<https://science2017.globalchange.gov/chapter/3/>

human-induced greenhouse gas emissions are excluded from the simulations. Now, the observed data (same color code as above) are compared with modeled data (in blue) the modeled data show a substantial discrepancy from observed data. By comparing these two graphs we have strong evidence that the models produce simulated values that are very close to the actual data **only** when they include greenhouse gas emissions resulting from human activities.

The comparison of observed global temperature with models indicates a very close parallel. Meanwhile, Figure 13 compares models and actual data from 1970 onwards. Again, it is evident that observed values are generally consistent with modeled simulations

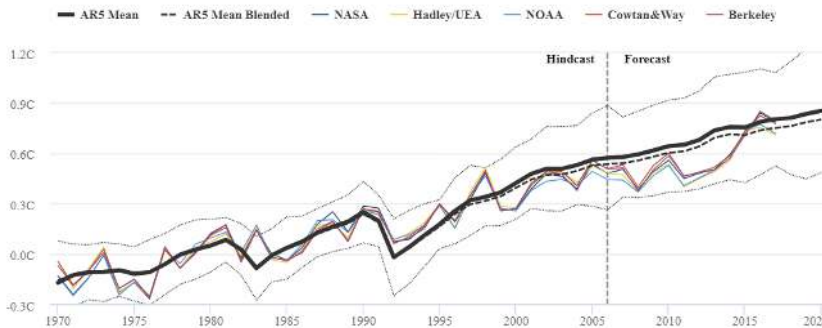


Figure 13. Comparison of modeled temperature and actual temperature 1970→ from Intergovernmental Panel on Climate Change discussed in a Carbon Brief report: - <https://www.carbonbrief.org/analysis-how-well-have-climate-models-projected-global-warming/>

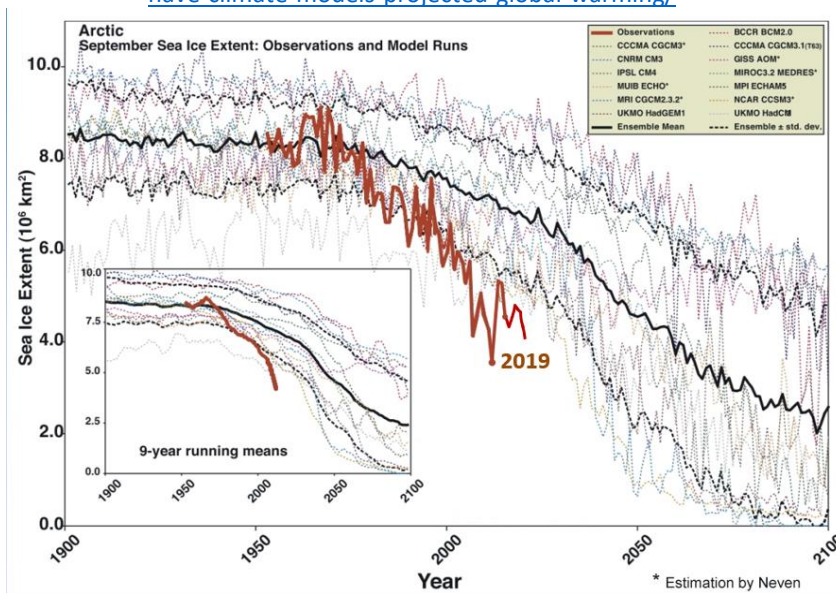


Figure 14. A comparison between modeled minimum Arctic sea ice extent and observed trends – observed data augr data. <https://news.mongabay.com/2018/09/20/blogosphere-sea-ice-enthusiast/>

minor discrepancy in the near-term past, more recent values are quite consistent. Meanwhile, Figure 16 from the same source suggests observed data exceeded modeled data up to the present and will do so into the future. Note that the

Arctic sea ice exhibits an annual cycle from a peak at the end of the Northern hemisphere winter (March) to a trough at the end of our summer (September).

- Now, when we compare modeled Arctic reduction in September's sea ice extent with the actual data (Figure 14) we find a substantial discrepancy, but not in the direction the skeptics claim. As the graph demonstrates, the models indicate that ice extent should have been diminishing, but nowhere near at the rate we have experienced.

Finally, let's explore the rising sea level (Figure 15). This graph depicts actual sea level rise compared to historical reconstructed and modeled values up to 2000. While there is a

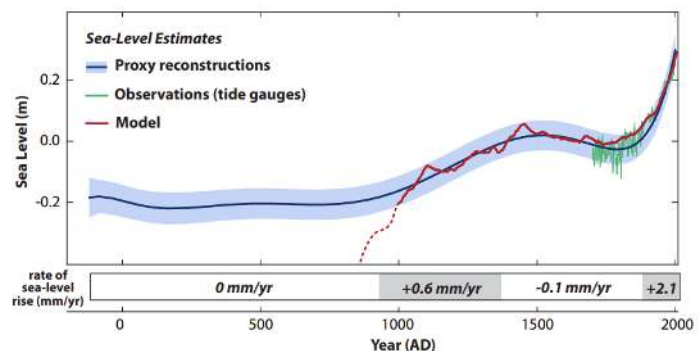


Figure 15. Comparison of actual and modeled sea level rise. <https://nap.nationalacademies.org/download/13389>

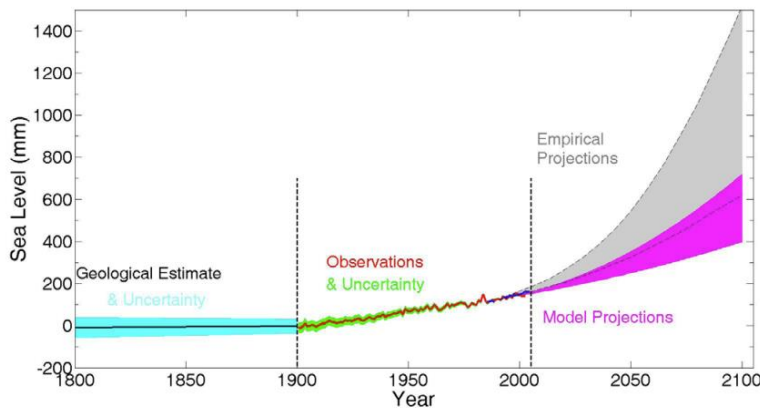


Figure 16. Historical and expected sea level rise compared to models. <https://nap.nationalacademies.org/download/13389>

empirical projected 2100 sea level rise of 1400 millimeters, while maybe seeming small, converts to over 4.5 ft. The claim that models exaggerate global temperature trends simply reflects wishful thinking. This claim is totally rejected by the data.

4 That is really the end game for these leftist freaks. They hate the US.

When we receive news that we find disturbing or inconvenient, it is easy - though usually fruitless – to seek some reason for rejecting the news on the basis of who is bringing it. Let me offer a personal example: In 1995 I was diagnosed with Acute Myeloid Leukemia and given two months to live in the absence of aggressive treatment. After four rounds of this aggressive chemotherapy, bone marrow transplant and total body irradiation, I survived. The diagnosis and prognosis were frightening and inconvenient – to say the least. Instead of blaming and vilifying the oncologist and the team who provided that diagnosis, prognosis, and treatment recommendation as ‘medical freaks’ or the like, I trusted their expertise, investigated the disease and its treatment, and subjected myself to their recommended treatment. After several inconvenient months, I found myself happily in remission and have been so ever since. The researchers who study our climate are just as committed to their science as are medical researchers investigating cancer, its causes, and treatments. Whether they lean politically left or politically right does not influence the relevance and accuracy of their collective judgment.

It is often a characteristic of frail humanity that we accuse the bringer of inconvenient news of being possessed by negative feelings towards us, feelings that cause them to single us out.

The closing remarks in the above skeptic diatribe indicate an author who is not seeking a calm rational discussion of the issues. Rather, they suggest a behavior becoming more common in the political, though happily not the scientific arena, where individuals accuse their target of exactly the attributes they are exhibiting. In this case the simple-minded claim is that climate scientists and climate activists are filled with hate when, as is evident to even the most casual observer, it is the author who is filled with hate.

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