

Measurement of Pre-Industrial CO₂ Levels

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Abstract

A major part of the focus on human produced CO₂ as the cause of global warming is the claimed increase in atmospheric levels from pre-industrial CO₂ to the present. Ice cores provide the historic record and data collected at Mauna Loa the recent record. Both records are drastically modified to produce a smooth apparently continuous curve. This was apparently necessary to confirm the evidence from many 19th century measures that pre-industrial levels were approximately 270 ppm. These records were adjusted and selected, but a rigorous study of the data confirms that CO₂ levels are generally higher and vary considerably both daily and annually.

Introduction

The hypothesis that global warming and climate change are due to human addition of carbon dioxide (CO₂) to the atmosphere became fact *before research had even begun*. Instead of allowing the scientific method of testing a thesis before it is accepted, scientists who dared to question were effectively silenced and labeled as skeptics and deniers. The scientific method was thwarted and as result major assumptions went essentially unchallenged.

A hypothesis is only valid if the assumptions are correct. Evidence continues to accumulate and show basic assumptions are fundamentally wrong. One holds that an increase in CO₂ causes temperature to increase. The ice core record shows exactly the opposite. A second critical assumption, because it provides the “human signal”, has pre-industrial levels of CO₂ at 280 parts per million (ppm) rising to current levels of 385 ppm.

The Pre-Industrial Level

Ice cores are generally believed to be the primary source for the pre-industrial levels. What most people don't know is that thousands of direct measures of atmospheric CO₂ were made beginning in the Nineteenth Century. Joseph Black had studied the properties of CO₂ in the 1750s and Joseph Priestly published on oxygen in 1775. These events were followed by attempts to measure the various

volumes of atmospheric gases with global measures of CO₂ beginning in 1812. Scientists took the readings with calibrated instruments and precise measurements as the work of Ernst Beck has thoroughly documented in his paper: “180 Years of Atmospheric CO₂ Gas Analysis by Chemical Methods”.¹

In a paper submitted to the Hearing before the US Senate Committee on Commerce, Science, and Transportation, Professor Zbigniew Jaworowski states,

1. *“The basis of most of the IPCC conclusions on anthropogenic causes and on projections of climatic change is the assumption of low level of CO₂ in the pre-industrial atmosphere. This assumption, based on glaciological studies, is false.”*²

Of equal importance Jaworowski states,

The notion of low pre-industrial CO₂ atmospheric level, based on such poor knowledge, became a widely accepted Holy Grail of climate warming models. The modelers ignored the evidence from direct measurements of CO₂ in atmospheric air indicating that in 19th century its average concentration was 335 ppmv[11] (Figure 2). In Figure 2 encircled values show a biased selection of data used to demonstrate that in 19th century atmosphere the CO₂ level was 292 ppmv[12]. A study of stomatal frequency in fossil leaves from Holocene lake deposits in Denmark, showing that 9400 years ago CO₂ atmospheric level was 333 ppmv, and 9600 years ago 348 ppmv, falsify the concept of stabilized and low CO₂ air concentration until the advent of industrial revolution [13].

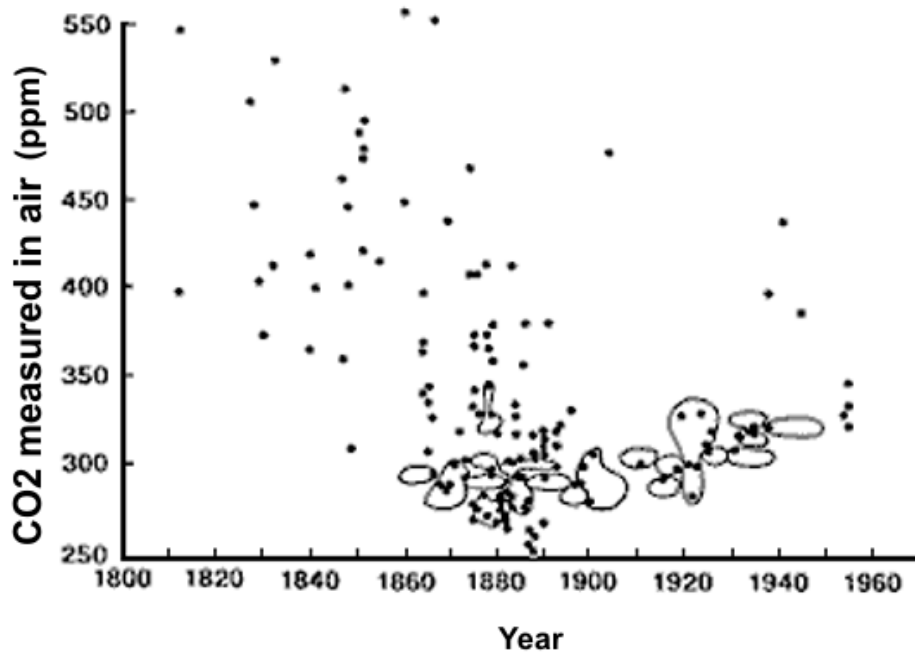
I take issue with Jaworowski’s claim the modelers ignored the 19th century readings. I recall the significant paper at the time published by T.R.Wigley introduced information about the 19th century readings to the climate science community. (Wigley, T.M.L., 1983 “*The pre-industrial carbon dioxide level.*”

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1. 180 Years of Atmospheric CO₂ Gas Analysis by Chemical Methods
By Ernst-Georg Beck, Energy & Environment, Volume 18 No. 2 2007,
Multi-Science Publishing Co. Ltd.
 2. “Climate Change: Incorrect information on pre-industrial CO₂” Statement written for the Hearing before the US Senate Committee on Commerce, Science, and Transportation by Professor Zbigniew Jaworowski March 19, 2004 Available at <http://www.mitosyfraudes.org/Calen5/JawoCO2-Eng.html>

Climatic Change 5, 315-320). It did what many others have done in taking a wide range of readings, eliminating only high readings and claiming the pre-industrial level was approximately 270 ppm. I suggest this is what influenced the modelers because Wigley was working with them through the Climatic Research Unit (CRU) at East Anglia.

The 19th Century data revisited

There are 90,000 samples from the 19th century and the graph shows those carefully selected by G. S. Callendar to achieve his estimate. It is clear how only low readings were chosen.



You can also eyeball how the slope and trend is changed by the selected data compared to the entire record.

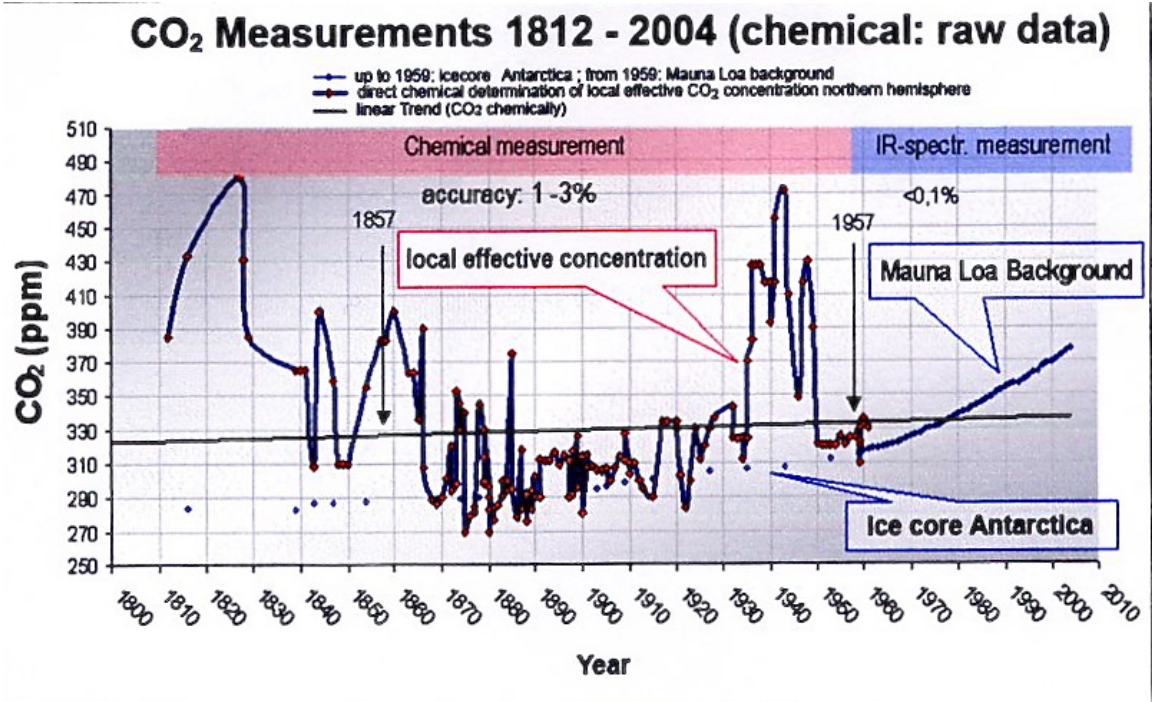
Jaworowski's research was recently confirmed by the work of Ernst-Georg Beck. A recent article in *Energy and Environment* examined the readings in great deal and validating their findings. In a devastating conclusion Beck states,

Modern greenhouse hypothesis is based on the work of G.S. Callendar and C.D. Keeling, following S. Arrhenius, as latterly popularized by

the IPCC. Review of available literature raise the question if these authors have systematically discarded a large number of valid technical papers and older atmospheric CO₂ determinations because they did not fit their hypothesis? Obviously they use only a few carefully selected values from the older literature, invariably choosing results that are consistent with the hypothesis of an induced rise of CO₂ in air caused by the burning of fossil fuel.

So the pre-industrial level is some 50 ppm higher than the level put into the computer models that produce all future climate predictions. The models also incorrectly assume uniform atmospheric global distribution and virtually no variability of CO₂ from year to year.

Beck found, “Since 1812, the CO₂ concentration in northern hemispheric air has fluctuated exhibiting three high level maxima around 1825, 1857 and 1942 the latter showing more than 400 ppm.” Here is a plot from Beck comparing 19th century readings with ice core and Mauna Loa data.



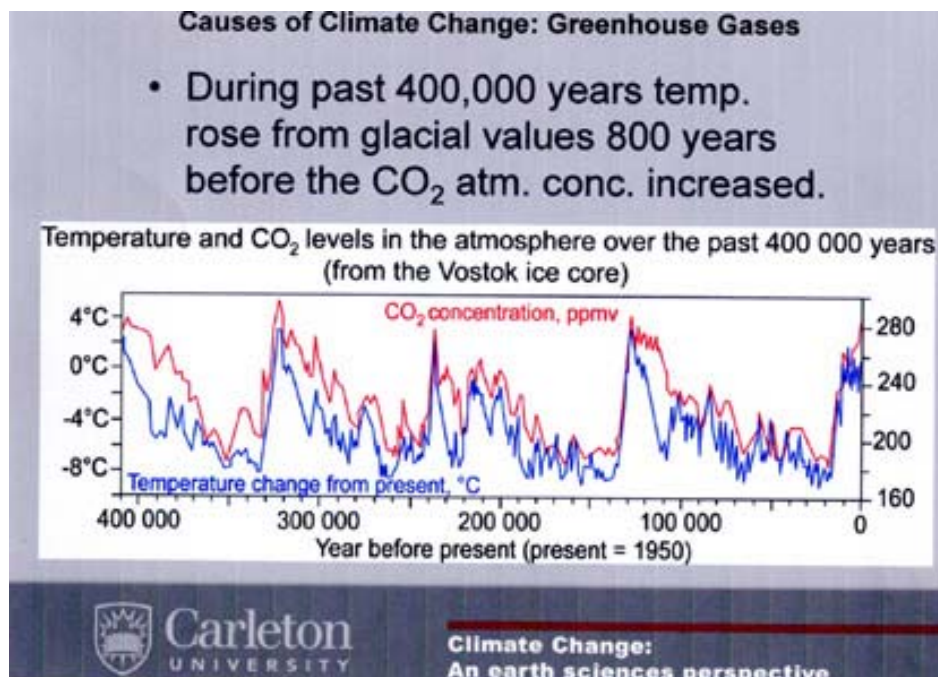
The variability is very important because the ice core record is shown as a very smooth curve. Eliminating extreme readings and then applying a long term smoothing average achieved this. This is also done with the Mauna Loa and all current atmospheric readings, which can vary up to 600 ppm in the course of a day,

as the Mauna Loa portion of the curve in the diagram shows. When smoothing is done on the scale of the ice core record a great deal of information is lost. Elimination of high readings prior to the smoothing makes the loss even greater. Beck explains how Charles Keeling established the Mauna Loa readings by using the lowest readings of the afternoon. He also ignored natural sources a practice that continues. Beck presumes Keeling decided to avoid these low level natural sources by establishing the station at 4000 m up the volcano. As Beck notes “Mauna Loa does not represent the typical atmospheric CO₂ on different global locations but is typical only for this volcano at a maritime location in about 4000 m altitude at that latitude. (Beck, 2008, “50 Years of Continuous Measurement of CO₂ on Mauna Loa” *Energy and Environment*, Vol 19, No.7.)

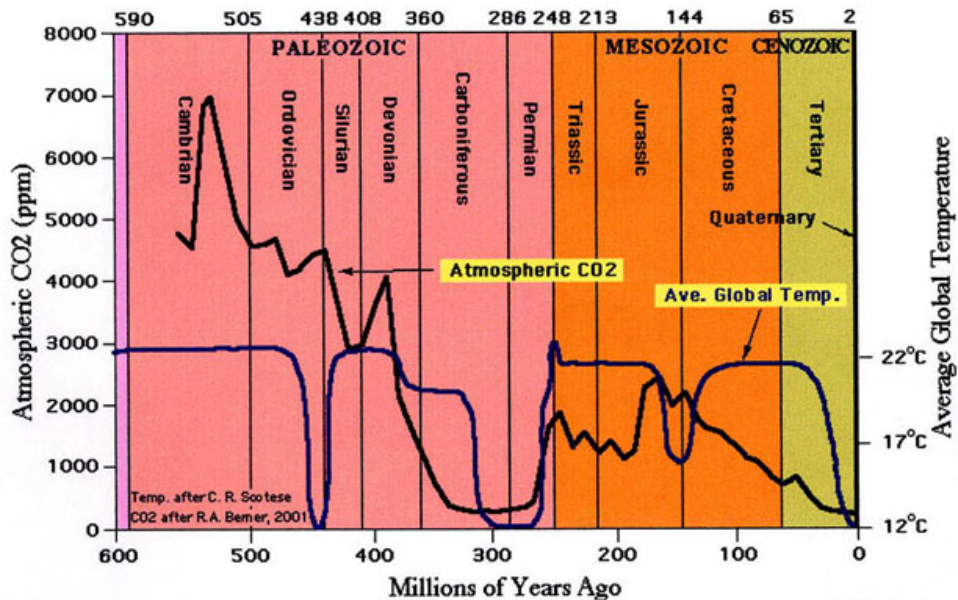
Keeling’s son continues to operate the Mauna Loa facility and as Beck notes, “owns the global monopoly of calibration of all CO₂ measurements. Since the young Keeling is a co-author of the IPCC reports they accept the version that Mauna Loa is representative of global readings and that they reflect an increase since pre-industrial levels.

The Ice Core record

A normal plot of Antarctic ice core data gives a sense of the degree of smoothing. The following is one used by Professor Patterson in his public presentation. The graph covers 400,000 years in a plot just a few centimeters long.



Jaworowski estimates the readings are at least 20% low. Here is a plot of CO₂ levels for 600 million years using geologic evidence and shows the current level of 385 ppm is the lowest in the entire record and only equaled by a period between 315 and 270 million years ago.



Late Carboniferous to Early Permian time (315 mya -- 270 mya) is the only time period in the last 600 million years when both atmospheric CO₂ and temperatures were as low as they are today (Quaternary Period).

Temperature after C.R. Scotese
CO₂ after R.A. Berner, 2001 (GEOCARB III)

There are other problems with the ice core record. It takes years for air to be trapped in the ice so the question is what is actually being trapped and measured? Meltwater moving through the ice especially when the ice is close to the surface can contaminate the bubble. Bacteria form in the ice releasing gases even in 500,000-year-old ice at great depth. (“Detection, Recovery, Isolation and Characterization of Bacteria in Glacial Ice and Lake Vostok Accretion Ice.” Brent C. Christner, 2002 Dissertation. Ohio State University). Under the pressure below 50m ice changes from brittle to plastic and begins to flow. The layers formed with each year of snowfall gradually disappear as the ice melts and are compressed. A considerable depth of ice covering a long period of time is required to obtain a single reading at depth. Jaworowski also identifies the problems with contamination and losses during drilling and core recovery process.

<http://naturalselection.Ocatch.com/Files/ancientice.html>

Other evidence from Stomata

Further evidence of the effects of smoothing and the artificially low readings the ice cores yield are provided by measurements of CO₂ from another source. Stomata are the small openings on leaves and they vary directly with the amount of atmospheric CO₂. A comparison of a stomata record with the ice core record for a 2000-year period illustrates the issue. Stomata are like the direct atmospheric measures discussed by Beck, but unlike the trapped bubbles in the ice core, which take decades to form.

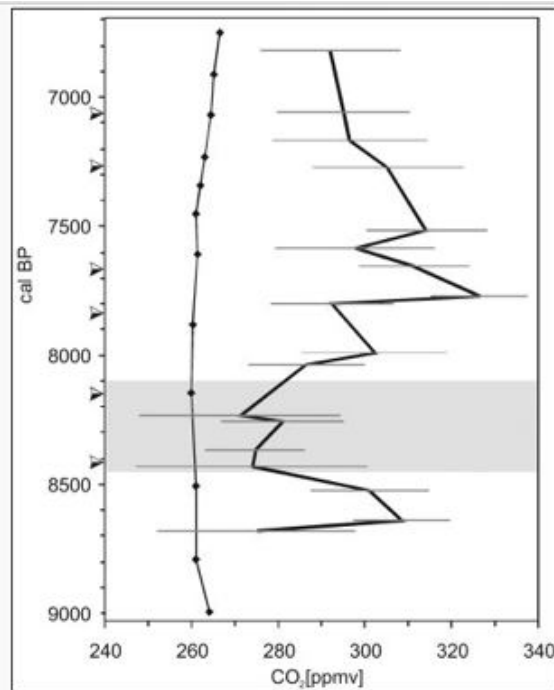


Fig 2.

Reconstructed CO₂ concentrations for the time interval between ≈8,700 and ≈6,800 calendar years B.P. based on CO₂ extracted from air in Antarctic ice of Taylor Dome (left curve; ref. 2; raw data available via www.ngdc.noaa.gov/paleo/taylor/taylor.html) and SI data for fossil *B. pendula* and *B. pubescens* from Lake Lille Gribssø, Denmark (right curve; see Table 1). The arrows indicate accelerator mass spectrometry ¹⁴C chronologies used for temporal control (Table 1). The shaded time interval corresponds to the 8.2-ka-B.P. cooling event (3–12). Quantification of mean CO₂ concentrations is based on the rate of historical CO₂ responsiveness of the European tree birches (Fig. 1); ±1σ CO₂ estimates are derived from the standard deviation of the SI mean values.

Stomata data show the higher readings and variability when compared to the excessively smoothed ice core record and aligns quantitatively with the 19th century measurements as Jaworowski and Beck assert. The average level for the ice core 2000-year record shown is approximately 265 ppm, while it is at least 300 ppm for the stomata record.

Conclusion

The pre-industrial CO₂ level was not significantly lower than current levels. Neither they nor the present readings are high relatively to the geologic record. The entire output of computer climate models begins with the assumption that pre-industrial levels were measurably lower. Elimination of this assumption further undermines the claim that the warming in the industrial era period was due to human addition of CO₂ to the atmosphere. Combined with their assumption that CO₂ causes temperature increase when all records show the opposite then it is not surprising that IPCC predictions of temperature increase are consistently wrong.