



CO₂ COALITION SCIENCE & POLICY BRIEF

April
2020

Equal Warming, 1900 to 1950 versus 1950 to 2018: Why the UN Knows the First Half was Natural

Mathematics and Statistics Professor Caleb Stewart Rossiter
Helps You “Do the Math” of Logarithms

CO₂ has a logarithmic effect on temperature. Using log math, CO₂ levels from 1950 to 2018 have 5.23 times the impact of levels from 1900 to 1950. That means there was no measurable warming from industrial CO₂ emissions in the earlier period. Recorded temperature rose the same amount in both periods, and rates of extreme weather and sea-level rise were also the same in both. Hence the data to date do not support claims of a CO₂-caused “climate crisis.”

The public often hears about a “consensus” of scientists on climate change. Studies making that claim all concern not the existence of a current or future “climate crisis,” but rather the cause of the half-degree Celsius rise in the average measured global surface temperature since 1950. Here is the key claim in the executive summary of the latest UN IPCC report: “It is *extremely likely* that more than half of the observed increase in global average surface temperature from 1951 to 2010 was caused by the anthropogenic increase in GHG concentrations and other anthropogenic forcings together.” (GHG stands for greenhouse gases, of which CO₂ is by far the most important human source.)

About the Author

Caleb S. Rossiter, Ph.D. was a professor of mathematics and statistics at American University in Washington, D.C. He is currently Executive Director of the CO₂ Coalition.

The IPCC is a political body of UN member governments. It bases its confidence on there being at least a quarter (its half of a half) degree of warming since 1950 on the expert opinion of the government-appointed scientists who draft IPCC reports. Interestingly, the IPCC maintains a deafening silence in its reports about the cause of the equal half degree of observed warming from 1900 to 1950. Why? Probably because that warming was almost entirely natural. UN member governments who promote a “climate crisis” narrative appear to be embarrassed by the UN data that show warming and rates of extreme weather and sea-level rise are the same in both periods, the all-natural earlier one and the latter one it claims was mostly man-made.

The reason the earlier period is almost entirely natural is that there was only a 15.6 parts per million increase in the share of the atmosphere that

is CO₂ from 1900 to 1950, compared to a six-times greater 96.1 ppm increase since 1950, as the world industrialized after World War II.

If the impact of CO₂ on temperature were “linear,” meaning the same impact on temperature for every additional molecule, that would cause the latter period to have 6.16 times more warming than the earlier one. Since the IPCC is confident of only a quarter of a degree from industrial CO₂ for the latter period, it could only attribute a four one-hundredths degree increase in the former period to CO₂, an amount far too small to be measured within the error bands of its estimates.

But specialists agree that the CO₂-temperature relationship is not linear. Like many physical relationships it is logarithmic, meaning that each added CO₂ molecule causes a little less warming than the previous one.

Therefore, doubling CO₂ concentrations from 200 ppm to 400 ppm produces the same surface-temperature increase as doubling again from 400 ppm to 800 ppm, even though the second doubling requires twice as much CO₂ as the first. This is because CO₂ molecules absorb and emit thermal radiation when the frequency with which they vibrate matches the frequency of infrared waves leaving the earth. These frequency bands become “saturated” because previous molecules have already produced close to the maximum possible change. The logarithmic relationship is non-controversial and well-documented with spectroscopy and measurements of radiative flux.

The table on page 3 shows why the warming impact of CO₂ levels was 5.23 times greater from 1950 to 2018 than from 1900 to 1950. Here’s how:

Moving from the left-hand side, the table first finds the relative percentages of CO₂ increase in

the two periods and places those percentages on a doubling scale. Then it applies logarithms to these increases and takes the ratio of the logs for the two periods, finding 5.23. The table includes a simpler, more elegant form of this relationship: $\log(\text{latter increase/earlier increase})$, which of course provides the same 5.23 result.

Finally, on the far right, the table illustrates the diminishing logarithmic return to the increase by tenths of the amount of CO₂ during a doubling. For example, the first tenth of the way accounts for 13.8 percent of warming impact, and the last tenth only 7.4 percent, illustrating the logarithmic relationship.

The policy implication of this mathematical reality is that, indeed, the IPCC is right not to attribute to CO₂ emissions any of the half degree of warming from 1900 to 1950, as the world came out of the Little Ice Age that ended in the 19th century. That warming was entirely natural. As I have testified before Congress, IPCC and U.S. Government data show no increase in rates of sea-level rise, tornadoes, hurricanes, wildfires, and floods from the period of natural warming (1900 to 1950) to the period the IPCC claims is one of largely human-caused warming (1950 to 2018). This calls into question not just claims of current CO₂-driven “climate crisis” but projections of future damage.

Science & Policy Briefs

This series summarizes issues that are addressed in more detail in our White Papers and *Climate Issues in Depth* publications. They are available at www.co2coalition.org.

Temperature Forcing from Atmospheric CO₂, 1900 to 1950 versus 1950 to 2018

	CO ₂ PPM	% Rise	Doubling	Log	Difference	Ratio	CO ₂ Level	Share of Forcing by Tenth of Doubling	By Tenth
1900	295.7							Cumulative	
1950	311.3	0.0527562	1.052756	0.022328	0.11684104	5.23302448	1.1	0.137503524	0.137504
2018	407.4	0.3777477	1.377748	0.13917			1.2	0.263034406	0.125531
							1.3	0.378511623	0.115477
Explanation:									
CO ₂ warming is the same for a doubling.									
That's a logarithmic relationship.									
1950's level is 5.3% over 1900, 2018's level is 37.8% over 1900.									
In logged forcing this is .022 and .139.									
Subtract the double-counted .022 to get .1168,									
and the ratio of the latter and former warming shares is 5.23.									
								(if linear)	
								6.16025641	
									0.099536
									0.093109
									0.087463
									0.082462
									0.078003
							2	1	0.074001
More elegantly, use log(latter/former)									
	Log	Ratio							
latter	0.1168419	5.2330245							
former	0.0223278								
Data on atmospheric CO ₂ levels									
1900	295.7								
1950	311.3								
2018	407.4								
e.g., The first tenth of a doubling of CO ₂ levels provides 13.8% of warming, the last tenth 7.4%									