

Brief Summary of Science for the Climate Debate

Carbon dioxide (CO₂) is a plant food. The CO₂ concentration in the atmosphere has been increasing for the last 150+ years thanks to human activity, due to extracting and consuming fossil fuels, as well as land use changes. The added CO₂ has benefited and continues to benefit natural systems and agriculture. Scientists estimate that 15% of the current agricultural production comes from elevated CO₂.

For most of Earth's evolutionary history, the CO₂ concentrations were much higher than they are today or that they can reach in the foreseeable future. For example, the CO₂ concentration in the Jurassic period was 3-6 times higher than it is today. The so-called "pre-industrial atmosphere" was anomalously impoverished in CO₂.

Our sun is the main source of energy on the Earth's surface. Heat is removed from the Earth's surface and lower atmosphere through multiple mechanisms, including convection and radiation. Earth radiates in the infrared spectrum. Gases with molecules having three or more atoms are infrared-active: their molecules can absorb and emit radiation in specific parts of the infrared spectrum. The main infrared-active gas in the Earth atmosphere is water vapor. CO₂ plays a very minor role, except during ice ages. Further, it has a very narrow absorption/emission spectrum, and it is almost saturated even at low CO₂. The amount of infrared radiation, temporarily absorbed by CO₂ molecules in the atmosphere, grows nearly logarithmically (i.e., very slowly) with increases in CO₂ concentrations.

Thus, the anthropogenic increase in atmospheric CO₂ concentration has an extremely small warming effect, which is negligible compared with natural temperature fluctuations in any region. Even larger mean warming would be beneficial for human societies and the biosphere, especially as a buffer against natural temperature drops.

A greenhouse is a man-made construction, minimizing air convection that removes heat from the ground and thus increasing the inside air temperature. Most greenhouses are artificially enriched with CO₂ to facilitate plants' growth. CO₂ plays no role in heat retention in a greenhouse.

The sea level has been rising since the last glacial episode, which ended about 20,000 years ago. In the last few thousands of years, the sea level has been rising at the rate of 0.2-1.0 inch per decade, and no acceleration has been detected in the last several decades. There are different opinions on whether discernible global warming would accelerate or decelerate sea level rises.

The oceans are alkaline, which is the opposite of acidic. The freshwater in most locations is slightly acidic.

Humans exhale CO₂ with each breath.

Attributing hurricanes, droughts, and extreme weather events to anthropogenic carbon dioxide emissions, or to any known global anthropogenic activity, has no scientific basis. It has antecedents in the medieval witch hunts that included accusations of “weather cooking.”

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Leo Goldstein, January 2017

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