

Coronavirus response barely slows rising carbon dioxide

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Credit: Susan Cobb/NOAA Global Monitoring Laboratory

Atmospheric carbon dioxide measured at NOAA's Mauna Loa Atmospheric Baseline Observatory peaked for 2021 in May at a monthly average of 419 parts per million (ppm), the highest level since accurate measurements began 63 years ago, scientists from NOAA and Scripps

Institution of Oceanography at the University of California San Diego announced today.

Scripps Oceanography scientist Charles David Keeling initiated on-site measurements of carbon dioxide, or CO₂, at NOAA's weather station on Mauna Loa in 1958. NOAA began measurements in 1974, and the two research institutions have made complementary, independent observations ever since.

In May 2021, Scripps Oceanography calculated a monthly average of 418.92 ppm. NOAA's measurements at the mountaintop observatory averaged 419.13 ppm. The average in May 2020 was 417 ppm. Twice so far in 2021, daily levels recorded by Scripps Oceanography have [exceeded 420 parts per million](#). All of these levels represent the highest concentrations of CO₂ in the atmosphere ever experienced by humans.

"The ultimate control knob on atmospheric CO₂ is fossil-fuel emissions," said Scripps geochemist Ralph Keeling, who took over the measurement series named the Keeling Curve after his father's death in 2005, "but we still have a long way to go to halt the rise, as each year more CO₂ piles up in the atmosphere. We ultimately need cuts that are much larger and sustained longer than the COVID-related shutdowns of 2020."

Pieter Tans, a senior scientist with NOAA's Global Monitoring Laboratory, noted that CO₂ is by far the most abundant human-caused [greenhouse gas](#), and persists in the atmosphere and oceans for thousands of years after it is emitted.

"We are adding roughly 40 billion metric tons of CO₂ pollution to the atmosphere per year," said Tans. "That is a mountain of carbon that we dig up out of the earth, burn, and release into the atmosphere as CO₂—year after year. If we want to avoid catastrophic climate change, the highest priority must be to reduce CO₂ pollution to zero at the

earliest possible date."

CO₂ pollution is generated by emissions from carbon-based fossil fuels used for transportation and electrical generation, by cement manufacturing, deforestation, agriculture, and many other practices. Along with other greenhouse gases, CO₂ traps outgoing heat from the planet's surface that would otherwise escape into space, causing the planet's atmosphere to warm steadily.

While the year-to-year increase of 1.8 ppm in the May CO₂ peak was slightly less than previous years, CO₂ measurements at Mauna Loa for the first five months of 2021 showed a 2.3 ppm increase over the same five months of 2020, close to the average annual increase from 2010 to 2019. There was no discernible signal in the data from the global economic disruption caused by the coronavirus pandemic

The highest monthly mean CO₂ value of the year typically occurs in May, just before plants in the northern hemisphere start to remove large amounts of CO₂ from the atmosphere during the growing season. In the northern fall, winter, and early spring, plants and soils give off CO₂, causing levels to rise through May.

Charles David Keeling was the first to observe this seasonal rise and subsequent fall in CO₂ levels every year. Keeling was also the first to recognize that despite the seasonal fluctuation, CO₂ levels were rising every year. In fact, every single year since the start of the measurements CO₂ has been higher than the preceding year.

Perched on a barren volcano in the middle of the Pacific Ocean, the Mauna Loa observatory is a benchmark sampling location for CO₂. It's ideally situated for sampling well-mixed air, undisturbed by the influence of local pollution sources or vegetation, producing measurements that represent the average state of the atmosphere in the

northern hemisphere.

The Mauna Loa data, together with measurements from sampling stations around the world, are incorporated into NOAA's Global Greenhouse Gas Reference Network, a foundational research dataset for international climate scientists and a benchmark for policymakers attempting to head off the impacts of climate change

The atmospheric burden of CO₂ is now comparable to where it was during the Pliocene Climatic Optimum, between 4.1 and 4.5 million years ago, when CO₂ was close to, or above 400 ppm. During that time, [sea level was about 78 feet higher than today](#), the average temperature was 7 degrees Fahrenheit higher than in pre-industrial times, and [studies indicate](#) large forests occupied areas of the Arctic that are now tundra.

In February, the United States officially rejoined the [Paris Agreement on climate change](#), an international treaty signed by 196 countries that have committed to limiting global warming and avoiding its potentially destabilizing impacts.

Yet, as the measurements from Mauna Loa show, despite decades of negotiation, the global community has been unable to meaningfully slow, let alone reverse, annual increases in atmospheric CO₂ levels.

"So far, most of these proposals are just vaporware," said Tans. "The solution is right before our eyes. Solar energy and wind are already cheaper than fossil fuels and they work at the scales that are required. If we keep stalling like we have done, then it will be too late."

Provided by University of California - San Diego

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