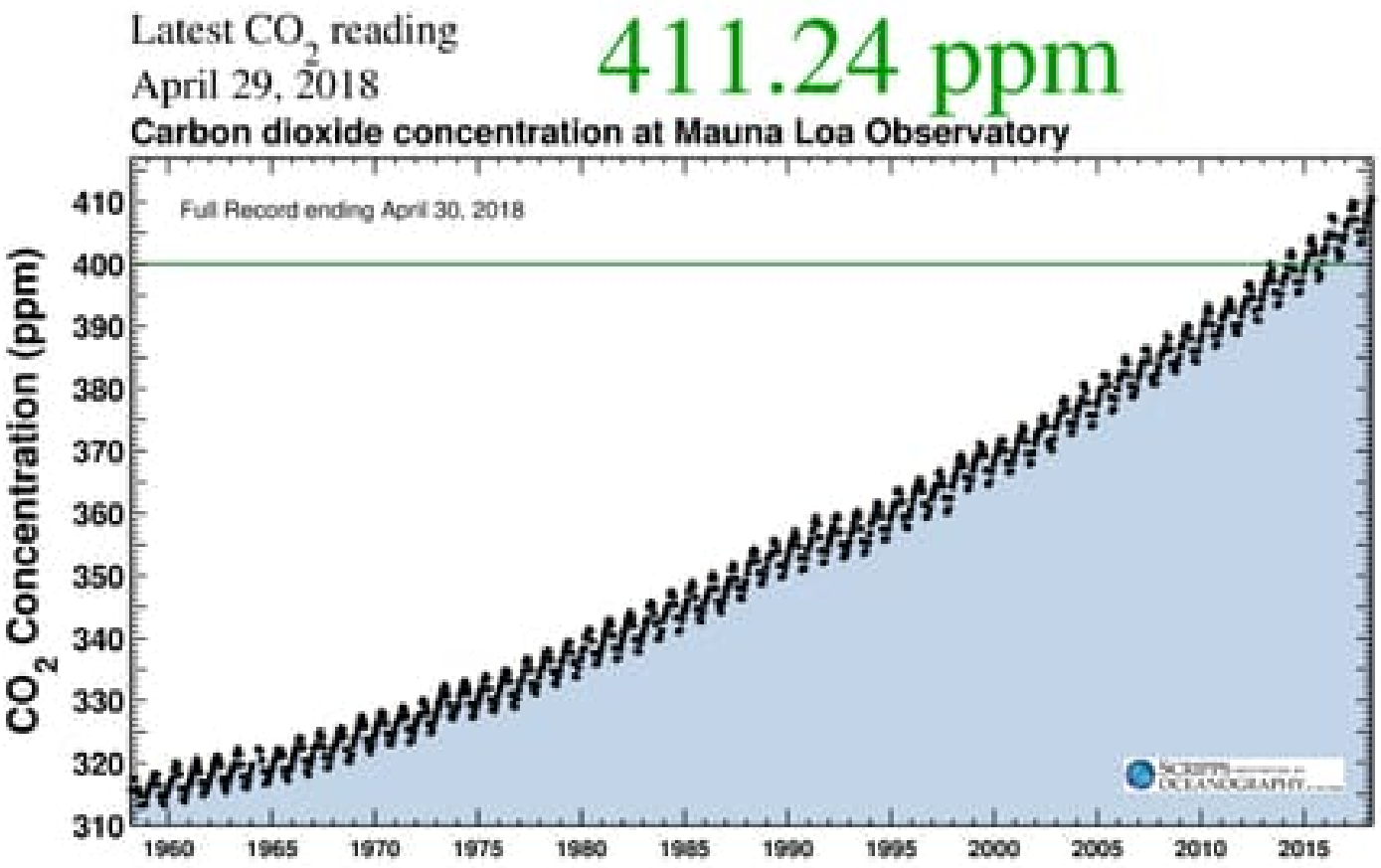
Energy and Environment

Earth's atmosphere just crossed another troubling climate change threshold

By Chris Mooney May 3 Email the author



Recent CO2 measurements at Mauna Loa Observatory in Hawaii. (Scripps Institution of Oceanography)

For the first time since humans have been monitoring, atmospheric concentrations of carbon dioxide have exceeded 410 parts per million averaged across an entire month, a threshold that pushes the planet ever closer to warming beyond levels that scientists and the

international community have deemed "safe."

The reading from the Mauna Loa Observatory in Hawaii finds that concentrations of the climate-warming gas averaged above 410 parts per million throughout April. The first time readings crossed 410 at all occurred on April 18, 2017, or just about a year ago.

Carbon dioxide concentrations — whose "greenhouse gas effect" traps heat and drives climate change — were around 280 parts per million circa 1880, at the dawn of the industrial revolution. They're now 46 percent higher.

As you can see in the famed "saw-toothed curve" graph above, more formally known as the Keeling Curve, concentrations have ticked upward in an unbroken progression for many decades. But they also go up and down on an annual cycle that's controlled by the patterns and seasonality of plant growth around the planet.

The rate of growth is about 2.5 parts per million per year, said Ralph Keeling, who directs the CO2 program at the Scripps Institution of Oceanography, which monitors the readings. The rate has been increasing, with the decade of the 2010s rising faster than the 2000s.

"It's another milestone in the upward increase in CO2 over time," Keeling said of the newest measurements. "It puts us closer to some targets we don't really want to get to, like getting over 450 or 500 ppm. That's pretty much dangerous territory."

"As a scientist, what concerns me the most is not that we have passed yet another round-number threshold but what this continued rise actually means: that we are continuing full speed ahead with an unprecedented experiment with our planet, the only home we have," Katharine Hayhoe, a climate scientist at Texas Tech University, said in

a statement on the milestone.

Planetary carbon dioxide levels have been this high or even higher in the planet's history — but it has been a long time. And scientists are concerned that the rate of change now is far faster than what Earth has previously been used to.

In the mid-Pliocene warm period more than 3 million years ago, they were also around 400 parts per million — but Earth's sea level is known to have been 66 feet or more higher, and the planet was still warmer than now.

As a recent federal climate science report (co-authored by Hayhoe) noted, the 400 parts per million carbon dioxide level in the Pliocene "was sustained over long periods of time, whereas today the global CO_2 concentration is increasing rapidly." In other words, Earth's movement toward Pliocene-like conditions may play out in the decades and centuries ahead of us.

Even farther back, in the Miocene era between 14 million and 23 million years ago, carbon dioxide concentrations in the atmosphere are believed to have reached 500 parts per million. Antarctica lost tens of *meters* of ice then, probably corresponding to a sea level rise once again on the scale of that seen in the Pliocene.

Farther back still, at the Eocene-Oligocene boundary around 34 million years ago, Antarctica is believed to have had no ice at all, with atmospheric carbon dioxide concentrations of 750 parts per million.

These data points help show why it is that scientists believe that planetary temperatures, sea levels and carbon dioxide levels all tend to rise and fall together — and thus, why Earth is now headed back toward a period like the mid-Pliocene or even, perhaps, the Miocene, if

current trends continue.

Keeling said that the planet, currently at 1 degree Celsius (1.8 degrees Fahrenheit) above preindustrial levels, is probably not yet committed to a warming of 1.5 or 2 degrees Celsius, but it's getting closer all the time — particularly for 1.5 C. "We don't have a lot of headroom," he said.

"It's not going to be a sudden breakthrough, either," Keeling continued. "We're just moving further and further into dangerous territory."

Chris Mooney covers climate change, energy, and the environment. He has reported from the 2015 Paris climate negotiations, the Northwest Passage, and the Greenland ice sheet,

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