

# As CO<sub>2</sub> concentrations near ominous benchmark, daily updates begin

Stephanie Paige Ogburn, Environment and Energy Publishing, 4-24-13

Most people can mark their time on Earth by significant world events: the landing of a man on the moon, say; the dismantling of the Berlin Wall; or, more negatively, the 9/11 attacks.

Another significant event is impending. Scientist Ralph Keeling wants this generation to remember when atmospheric concentrations of carbon dioxide reached 400 parts per million, because of humans.

"I hope that many people out there in the decades to come will say, 'Gosh, I will remember when it crossed 400,'" he said.

That's why Keeling and his employer, the Scripps Institution of Oceanography at the University of California, San Diego, have launched a website that will provide daily updates on atmospheric CO<sub>2</sub> concentrations, measured at Hawaii's Mauna Loa Observatory.

The idea is that providing a daily update, versus a weekly or monthly one, will provide an index of sorts for people to track, and perhaps provide an entry point for students and the general public to raise interest in how humans are altering the Earth's atmosphere. Scientists say it passed a relatively safe level, 350 ppm, in 1990. Despite international efforts to stop the rise, the concentration has steadily grown.

They have also launched a Twitter account, @Keeling\_curve, that will tweet the concentration every day.

While there are many efforts to measure atmospheric CO<sub>2</sub> concentrations around the world, this particular measurement, from the top of Mauna Loa, collected by a man named Keeling, has historical significance.

## Following his father's yardstick

In 1956, Charles David Keeling was the first scientist to take measurements of CO<sub>2</sub>. At the time, almost nothing was known about carbon dioxide concentrations in the atmosphere.

"When my father started these measurements back in the late '50s, there was a question of whether carbon dioxide was going up at all," Ralph Keeling said.

A few years of measurements showed that it most certainly was and that it followed a seasonal cycle. When plants are growing, in the summer months, they take up more carbon dioxide and reduce the atmosphere's concentration of CO<sub>2</sub>.

In the fall, when vegetation decays and dies, releasing carbon dioxide, the amount in the atmosphere increases. Atmospheric concentrations typically peak in May, then head downward in the summer.

But even as the yearly cycle continued, creating what many refer to as a sawtooth on a graph of CO<sub>2</sub> concentrations, the average concentrations in the atmosphere were steadily rising.

"It basically was the alarm bell that really woke up the scientific community," Keeling said.

This graph is now known as the Keeling curve, after the scientist who pioneered that measurement, and is the longest continuous record of CO<sub>2</sub> concentrations in the world. Ralph Keeling has followed in his father's

footsteps as a climate change researcher, heading up the Scripps CO2 program.

Researchers like to collect CO2 concentrations in places where there isn't a lot of vegetation or industrial activity to affect the measurements. That's why Mauna Loa and a number of other ocean-based sites are popular, said Pieter Tans, a senior scientist at the National Oceanic and Atmospheric Administration's Earth System Research Laboratory.

### **Arctic leads the world**

Tans works on a NOAA-run measurement of CO2, also at Mauna Loa, and on a global set of measurements from about 40 sites that, when averaged, provide a worldwide picture of CO2 concentrations. Every year, the global average has been increasing by about 2.5 ppm, he said.

NOAA updates its Mauna Loa data weekly, on Sundays and monthly, and its global curve gets updated every month.

"We've compared our monthly means to Scripps for many years, and the differences are very small," Tans said. Other CO2 observations taken at Mauna Loa have also been very close, which shows the measurements are credible, he added.

Mauna Loa is a fairly good approximation for what global concentrations are, although it is slightly higher than the global average because it is in the Northern Hemisphere, which generally has higher CO2 concentrations.

The Arctic already experienced a monthly average concentration above 400 ppm, last May. It typically gets to a peak concentration above that of the rest of the world due to winds blowing CO2 up north in the spring.

This year, NOAA monitoring sites in the Arctic have already reached a 400 ppm monthly average, even before that May peak, Tans said.

There is a small chance that this May, the average at Mauna Loa could reach more than 400 ppm. But Tans thinks it is more likely this will happen in May 2014.

And then: "At some point, the global average will go over 400, likely another year after that," he said.

Tans applauded Keeling's effort to create a website with updated daily information, saying the more scientists can educate the public that the increase of CO2 is due to human activities, the better.

"I want us to do more outreach than we typically do. So these websites are one way."