

How Much Do You Know About Carbon Dioxide?

by meteorologist Jim Woodmencey

Recently I had a conversation with an environmental scientist about weather and climate. It surprised me to discover during our discussion that his knowledge about the role of carbon dioxide within the atmosphere was somewhat limited.

Almost everyone knows something about carbon dioxide, or CO₂. At a minimum, we should know that CO₂ is a by-product of burning fossil fuels, that CO₂ also occurs naturally in the atmosphere, and that CO₂ is a greenhouse gas. Beyond that, how much does the average person really know about CO₂? Well, to test your knowledge, I have a little quiz and a tutorial for you.

I'll ask you the same three questions that my environmental scientist friend was unable to answer correctly. Here we go:

- 1) What is the most abundant greenhouse gas in the atmosphere?**
- 2) What is the biggest source of CO₂ on Earth?**
- 3) What does a catalytic converter do in your car?**

If you think you nailed it, you can skip the rest of the class. Unsure on any of the above? Then read on.

Most Abundant Greenhouse Gas

Contrary to popular belief, CO₂ is not the most abundant greenhouse gas. The atmosphere is made up of approximately 78-percent Nitrogen, 21-percent Oxygen, and less than 1 percent is Argon. The remainder is made up of trace amounts of other gases. Some of those trace gases are greenhouse gases, like carbon dioxide and methane. CO₂ makes up around 0.042 percent of the atmosphere and methane (CH₄) accounts for 0.00017 percent.

Water vapor, however, is the most abundant greenhouse gas in the atmosphere. Water vapor, or H₂O, is the gaseous phase of water and the amount contained in the atmosphere is variable on any given day. H₂O ranges from 0.4 percent in dry locations up to as much as 4 percent in the most humid, tropical locales.

Water vapor is what makes clouds, and more cloudiness will hold in more heat at the earth's surface. We know this intuitively from experiencing warmer overnight low temperatures when it's cloudy at night. Versus clear skies overnight, which produce colder mornings.

Biggest Source of CO₂

It's not power plants or factories, it's not our collective exhalations - we emit carbon dioxide every time we exhale - the biggest source of carbon dioxide is the ocean. Oceans contain more carbon than the atmosphere and land biosphere combined, approximately 93 percent of our CO₂ is stored in the oceans.

(Side note: The average person exhales about 2.3 pounds of CO₂ per day. People who exercise vigorously can expel 8 times that amount! There are approximately 7 billion people in the world, which generates approximately 2.94 billion metric tons of CO₂ per year. Add to that every other living animal on the planet and the number grows higher. Energy related CO₂ emissions world-wide total about 34 billion metric tons. In other words, humans alone produce about 8.6 percent of what energy emits into the atmosphere.)

Colder oceans will absorb CO₂ from the atmosphere, whereas warmer oceans will release CO₂ into the atmosphere.

Since the mid-1990's, global sea surface temperatures have been in a warming phase. Looking further back in time, it is interesting to note that cold and warm phases of the oceans coincide very closely with colder and warmer periods of land temperatures.

When you consider the Earth is 70-percent ocean and 30-percent land, it is easy to understand how the oceans are a big player in controlling our planet's weather, temperatures, and climate.

It may also be worth noting, according to the IPCC, Inter-Governmental Panel on Climate Change, approximately 97 percent of global CO₂ comes from natural sources and 3 percent from human sources.

What a Catalytic Converter Does

In the late 1970's, the EPA, Environmental Protection Agency, required all new automobiles to have catalytic converters installed. A catalytic converter converts Carbon Monoxide (CO) into Carbon Dioxide (CO₂). Essentially, converting a poisonous gas into to a non-poisonous gas. This has had a profound effect on making emissions from automobiles infinitely less toxic to our atmosphere.

The trade-off for getting cleaner air from burning fossil fuels, is that it adds more Carbon Dioxide. Oceans and plants can absorb a portion of what we emit, but not all of it, especially at a time when the oceans are in a warmer phase.

Carbon, or more specifically Carbon Dioxide (CO₂), is portrayed as the primary culprit of global warming and/or climate change. It is part of the equation, however, the conundrum among scientists is how much of the increase in CO₂ that we have seen recently is due to natural causes and how much is man-made.

We cannot change the natural part of the CO2 cycle; however, we can be conscious about decreasing the man-made part.

If you made it this far, you now know a little more about CO2 and our atmosphere.

Jim is the chief meteorologist at mountainweather.com and has been forecasting the weather in Jackson Hole and the Teton Range for over 30 years.