

An Important Carbon Discovery - The Keeling Curve

In 1957, a scientist by the name of Charles David Keeling began taking continuous measurements of atmospheric carbon at Mauna Loa, Hawaii. He was the first person to document that levels of atmospheric carbon are increasing. There is a scientific consensus that global temperatures are increasing along with carbon dioxide. Human activities such as deforestation, fossil fuel burning and land-clearing for agriculture, among others, may be contributing to these global trends. Take a look at Figure 3 below which shows the results of Keeling's work at Mauna Loa.

Figure 3: The 'Keeling Curve'

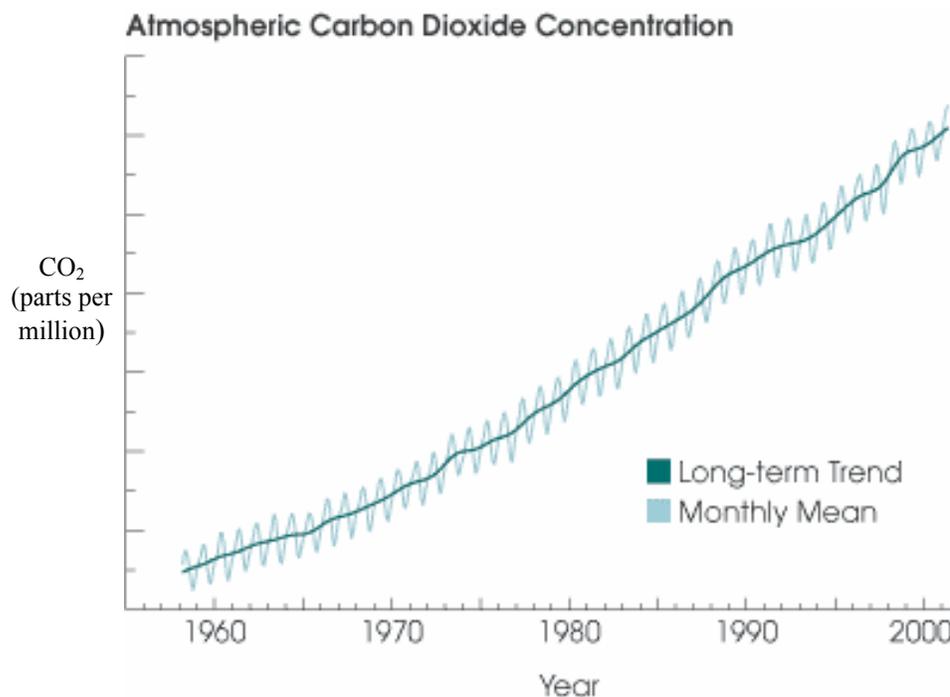


Image from http://earthobservatory.nasa.gov/Library/CarbonCycle/carbon_cycle3.html. Graph by Robert Simmon, based on data from the NOAA Climate Monitoring & Diagnostics Laboratory.

What overall trends are seen in Keeling's graph? Notice that the graph representing the monthly mean oscillates (moves up and down) while the long-term trend shows a gradual increase. The monthly average values indicate that carbon concentrations in the atmospheric reservoir vary. **Why does the amount of carbon dioxide in the atmosphere change?** One clue is to look at how often it goes up and down. Think about seasonal changes in our ecosystems. If you live in the northern hemisphere, the ecosystem looks different during the summer than during the winter. **How is this difference in ecosystem appearance linked to carbon dioxide in Earth's atmosphere? Why do scientists consider Keeling's data, which was collected at a single location in Hawaii, to represent atmospheric carbon in the entire northern hemisphere?**

In the northern hemisphere, photosynthesis increases during a certain time of year. During which season does it increase? Based on the conditions that plants require in order to photosynthesize, can you think of reasons why photosynthesis increases during a particular season? What affect does this have on atmospheric carbon? Take another look at Keeling's curve and try to explain what it shows knowing what you now know about the role of vegetation in carbon cycling.

Scientists are building a consensus about how Keeling's carbon dioxide curve may be linked to global warming. When human activities contribute to the amount of Greenhouse Gases in the atmosphere, we are enhancing the natural Greenhouse Effect. The increase in Earth's surface temperature reveals this trend. Although the change in temperature since the 1800's is not noticeable to most humans (0.6 degrees Celsius), the warming has already begun to have an effect on other living organisms. The habitat ranges of some species have begun to shift as a result, putting some populations in danger of extinction (Krajick, 2004).

Culminating Essay for Topic 2: Biogeochemical Cycles and Carbon

At the conclusion of Topic 2 investigations, write a 500 word essay that responds to all the questions (marked in bold) in the Real World Problem described above. Consider what you learned about carbon and the carbon cycle, as well as the knowledge you gained in Topic 1. Use these understandings and your investigation findings to justify your responses.