



Greenhouse Gases by the Numbers



Name _____

Class _____

Scientists have a long record of the amount of carbon dioxide in the atmosphere.

2 million years ago - 20th century = Ice Cores

Ice cores taken from various locations in Antarctica contain ice that is hundreds, thousands and even millions of years old. Scientists can figure out the age of the ice and extract the air trapped inside. The air trapped in ice contains the same amount of carbon dioxide as it did when the ice froze. This gives us a long historic record of carbon dioxide.

1958 - 1974 = Charles Keeling, Scripps Institution of Oceanography

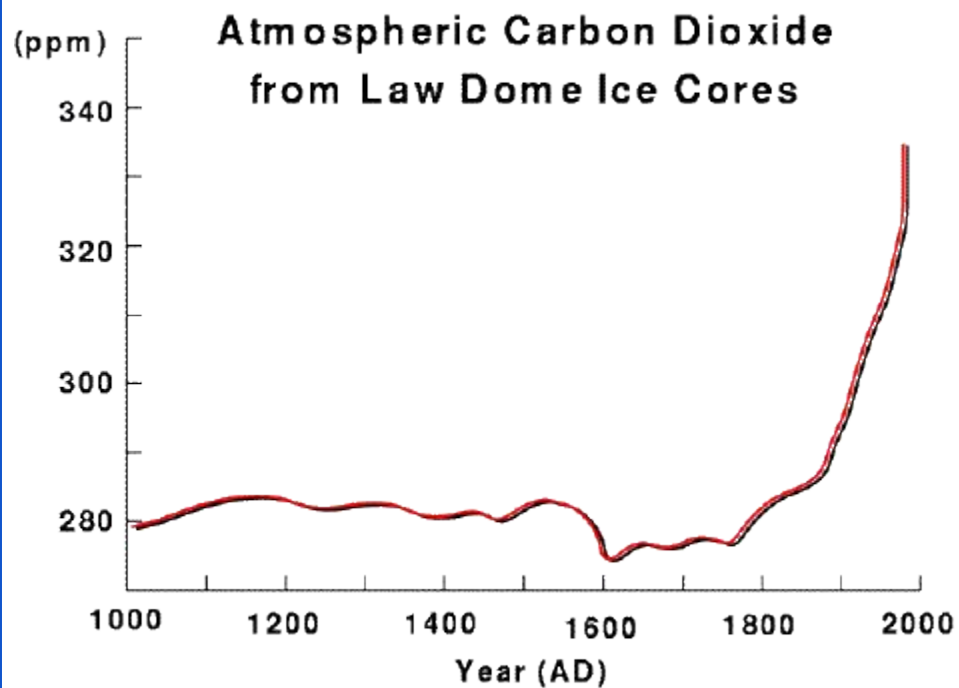
Charles Keeling spent decades measuring the amount of carbon dioxide in the atmosphere on top of Mauna Loa, Hawaii.

1974 - present = Global Monitoring Laboratory, NOAA

GML has taken over the work of monitoring carbon dioxide at Mauna Loa, and sites all over the world. Air samples collected globally are measured in Boulder, CO.

Historic Carbon Dioxide

- 1) Between 1000 and 1800s the amount of carbon dioxide in the atmosphere changed some. What do you think caused those changes?
- 2) What happened in the 1800s and 1900s to cause such a dramatic change in CO₂?
- 3) This graph includes data from both Antarctic ice cores and air measurements from Hawaii. How can scientists make sure the data matches up well?



Graph from the University of Wyoming

20th and 21st Century Carbon Dioxide (next page)

- 1) Create a visual representation of CO₂ data. You can make a graph, a picture, a poster, a video. You can be creative!
- 2) Make observations. What is the rate of increase? What else do you observe in the graph?
- 3) What do you think will happen in the rest of the 21st century? What can be done to change the amount of CO₂ in the atmosphere?

Annual Average Carbon Dioxide - Mauna Loa, Hawaii

year	mean CO ₂
1959	315.98
1960	316.91
1961	317.64
1962	318.45
1963	318.99
1964	319.62
1965	320.04
1966	321.37
1967	322.18
1968	323.05
1969	324.62
1970	325.68
1971	326.32
1972	327.46
1973	329.68
1974	330.19
1975	331.12
1976	332.03
1977	333.84
1978	335.41
1979	336.84
1980	338.76
1981	340.12
1982	341.48
1983	343.15
1984	344.85
1985	346.35
1986	347.61
1987	349.31
1988	351.69

year	mean CO ₂
1989	353.2
1990	354.45
1991	355.7
1992	356.54
1993	357.21
1994	358.96
1995	360.97
1996	362.74
1997	363.88
1998	366.84
1999	368.54
2000	369.71
2001	371.32
2002	373.45
2003	375.98
2004	377.7
2005	379.98
2006	382.09
2007	384.03
2008	385.83
2009	387.64
2010	390.1
2011	391.85
2012	394.06
2013	396.74
2014	398.87
2015	401.01
2016	404.41
2017	406.76
2018	408.72
2019	411.66
2020	414.24