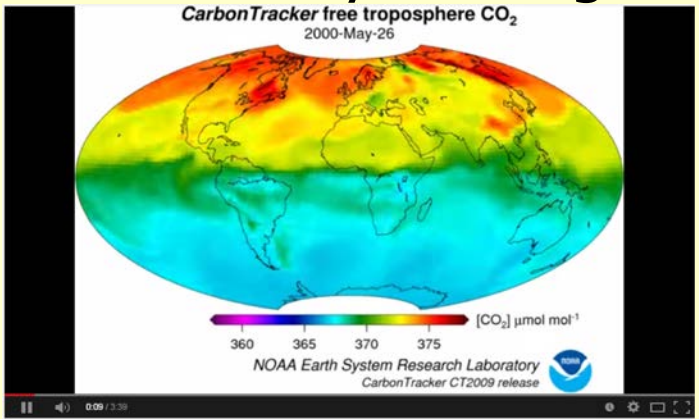
# The Big Picture: Global $CO_2$

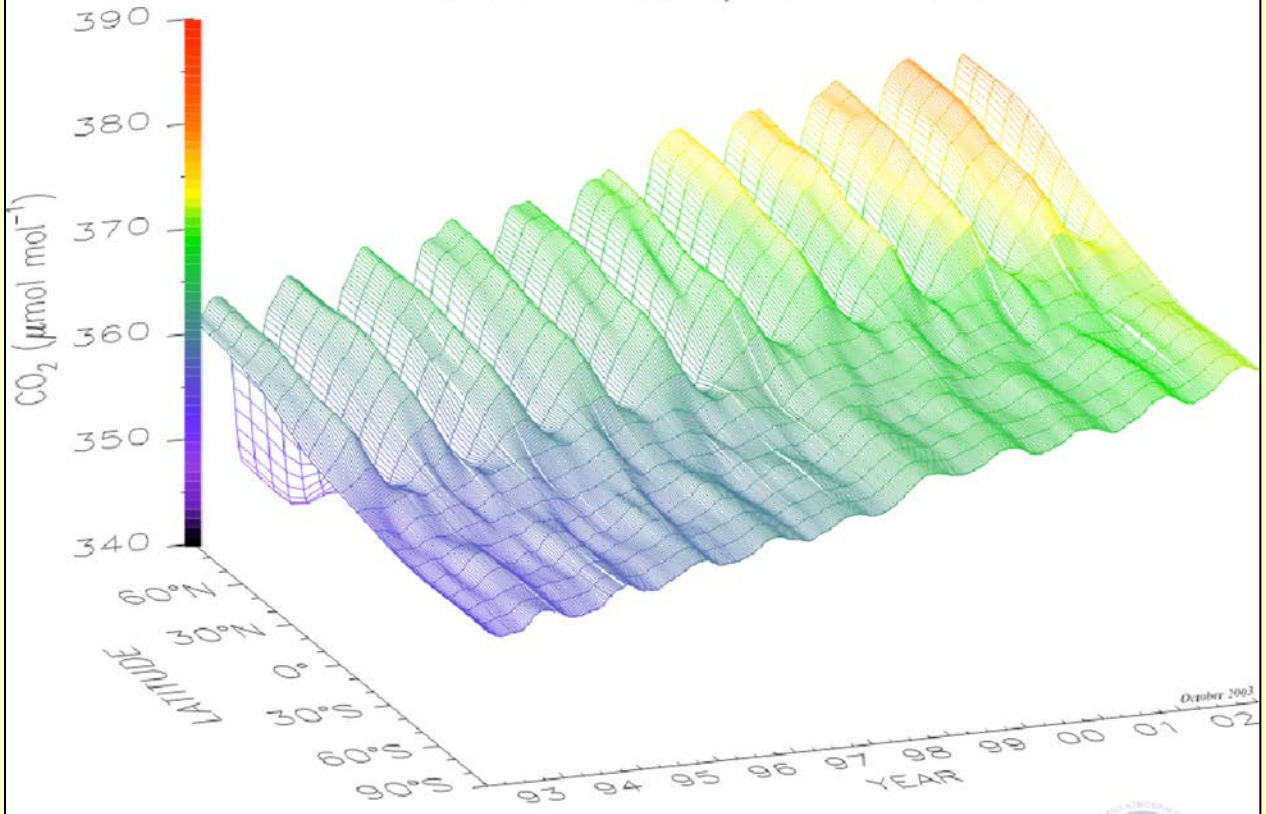
1. Watch the animation of geographic and seasonal patterns in tropospheric carbon dioxide
2. Make note of three things you notice or observe. Share with your neighbor.
3. Watch the animation again, looking for new patterns.
4. Discuss with your neighbor what is causing these patterns.



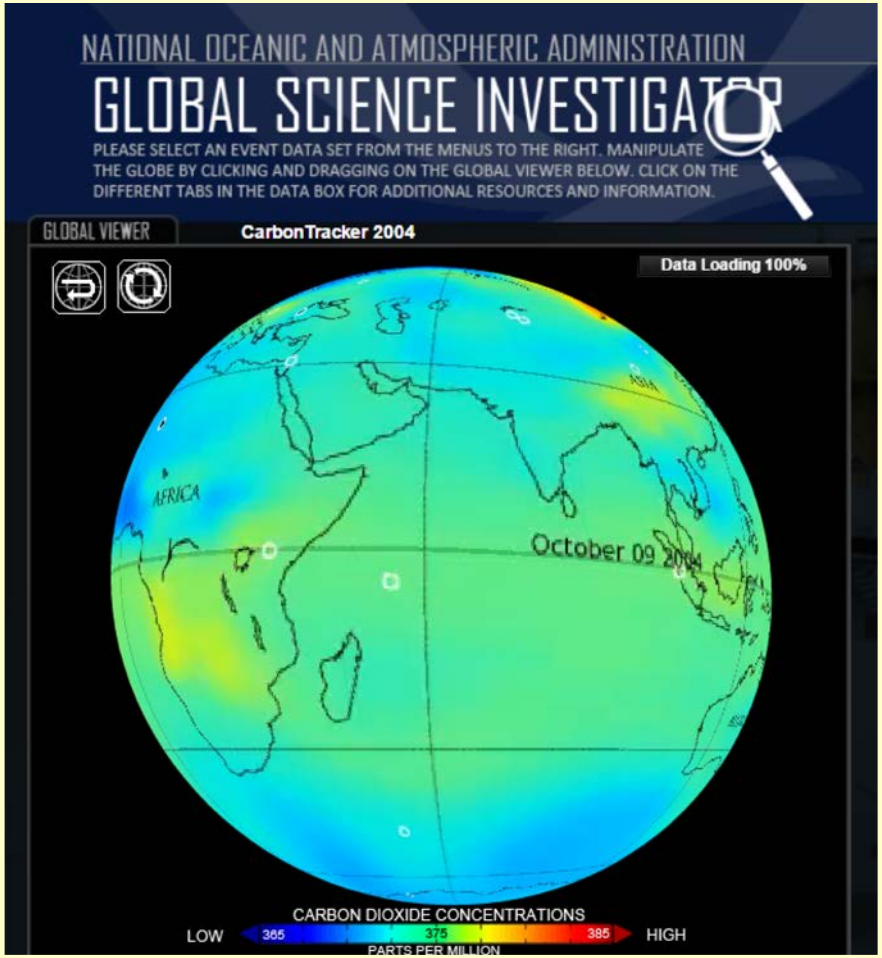

http://www.youtube.com/watch?v=j1ehcjjDPy8

# Global Distribution of Atmospheric Carbon Dioxide

## NOAA CMDL Carbon Cycle Greenhouse Gases




Three dimensional representation of the latitudinal distribution of atmospheric carbon dioxide in the marine boundary layer. Data from the NOAA CMDL cooperative air sampling network were used. The surface represents data smoothed in time and latitude. Principal investigators: Pieter Tans and Thomas Conway, NOAA CMDL Carbon Cycle Greenhouse Gases, Boulder, Colorado, (303) 497-6678 (pieter.tans@noaa.gov, http://www.cmdl.noaa.gov/ccgg).




https://coast.noaa.gov/psc/dataviewer/#view=tracker

# What did you observe about global patterns in $CO_2$?

- What causes the seasonal variation?
  - Predominantly the cycling between growing and senescence of plants (respiration and photosynthesis).
  - Industry and fossil fuel combustion is a secondary factor

# Spring and Summer

- ✔ a lot of sunlight
- ✔ plants have a lot of leaves
- ✔ a lot of photosynthesis is happening
- ✔ huge amounts of $CO_2$ from the atmosphere get absorbed
- ✔ $CO_2$ levels in the atmosphere go down

# Fall and Winter

- ✔ less sunlight
- ✔ many plants are without leaves
- ✔ not as much photosynthesis is happening
- ✔ much less $CO_2$ from the atmosphere gets absorbed
- ✔ $CO_2$ levels in the atmosphere go up

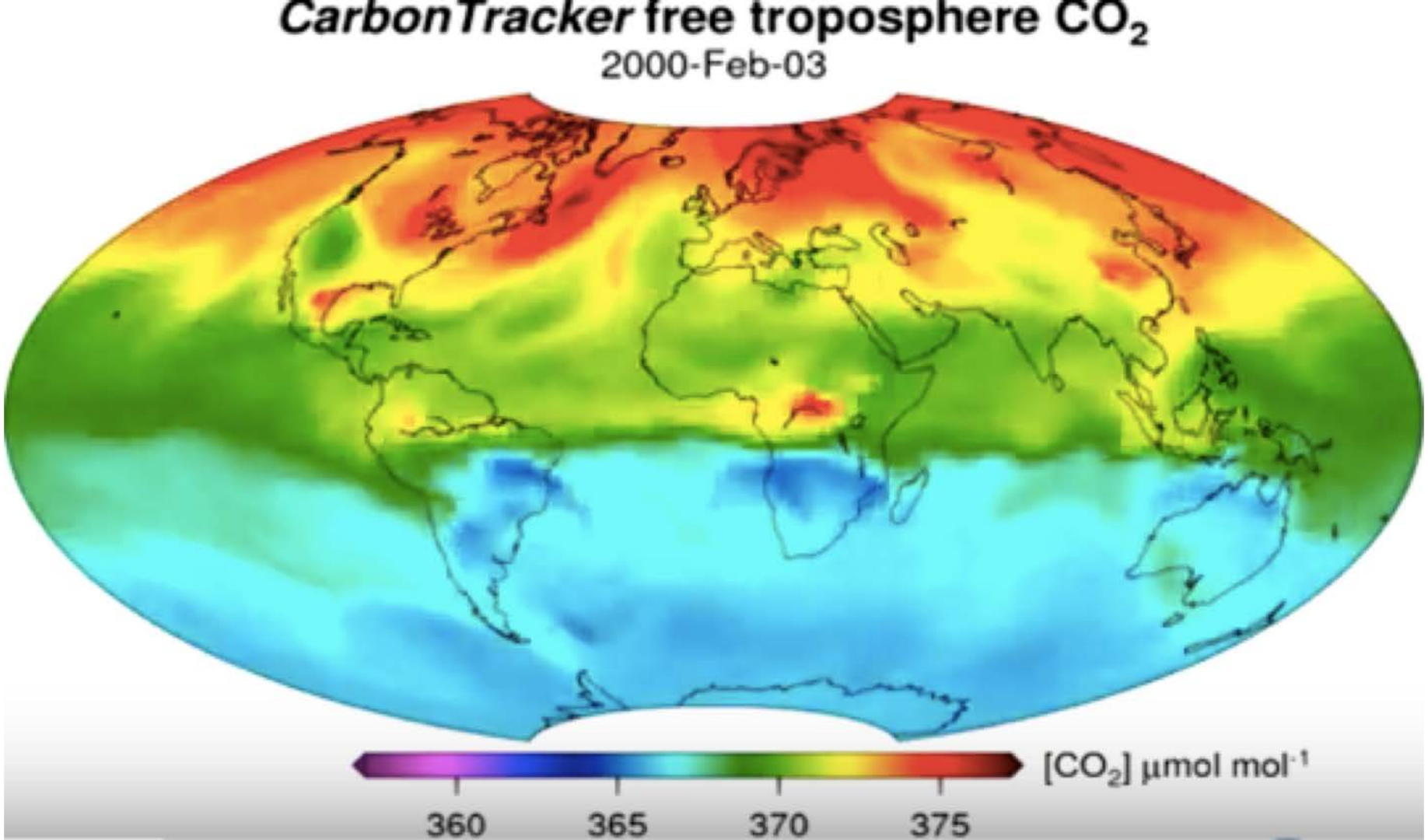
 

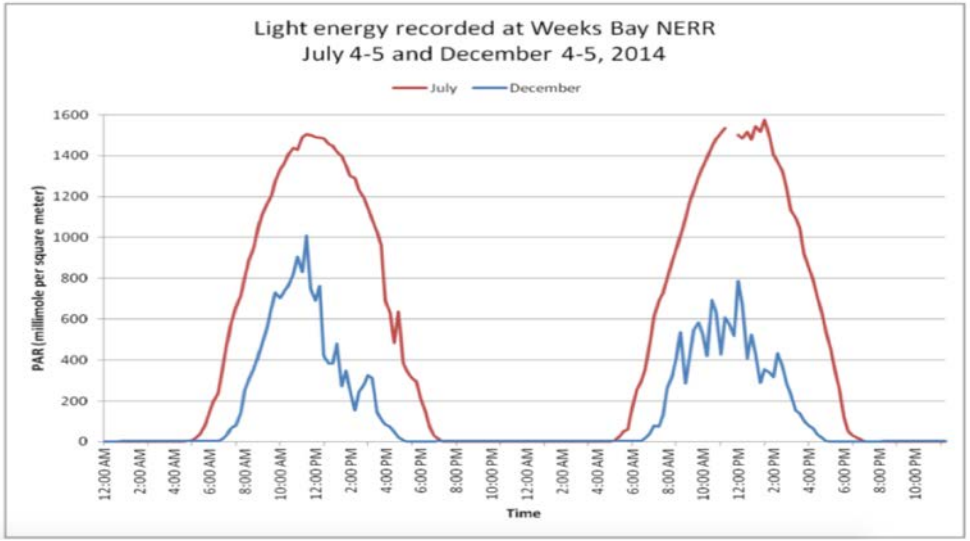
Key Concept

**During the growing season each year, plants take in huge amounts of $CO_2$ from Earth's atmosphere.**

# What did you observe about global patterns in $CO_2$?

- What causes the seasonal variation?
  - Predominantly the cycling between growing and senescence of plants (respiration and photosynthesis).
  - Industry and fossil fuel combustion is a secondary factor
- Why is there so much greater variability in the northern vs. southern hemisphere?
  - More land masses in northern hemisphere
  - More rivers and terrestrial input


CarbonTracker free troposphere CO2
2000-Feb-03
[CO2] µmol mol-1
360
365
370
375




1.What do you notice about the difference in PAR?

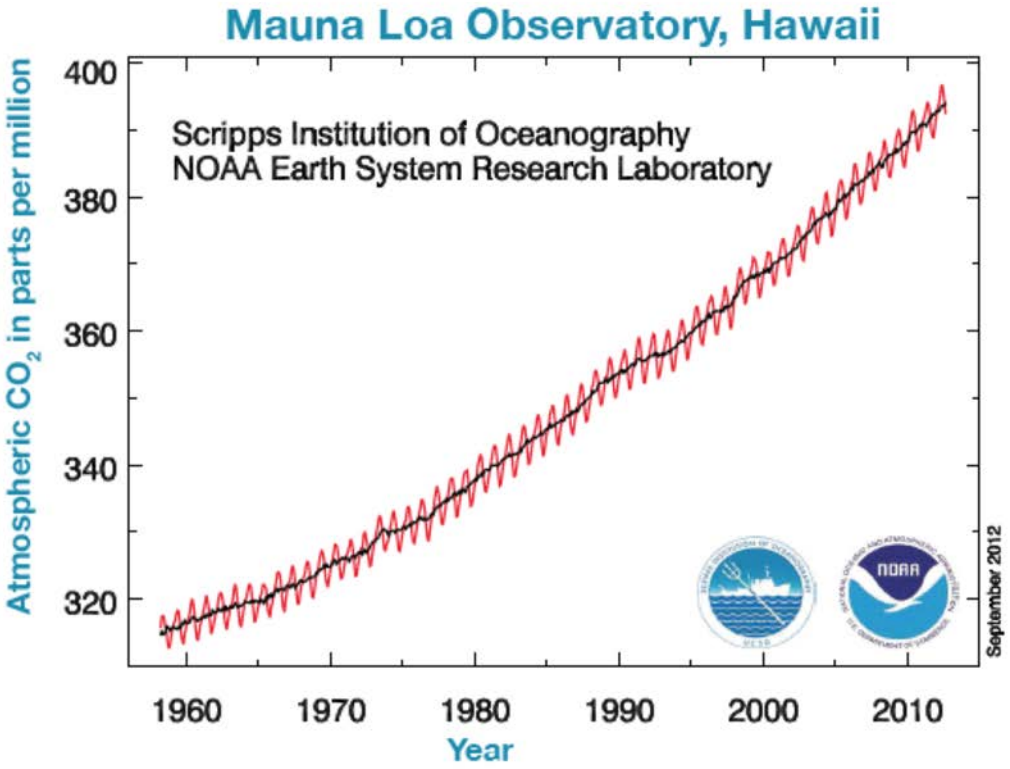
2.How do you think the decrease in light availability will affect the rate of photosynthesis?

3.If rates of respiration remain relatively constant while the rate of photosynthesis decreases, what do you predict will happen to $CO_2$ concentrations?

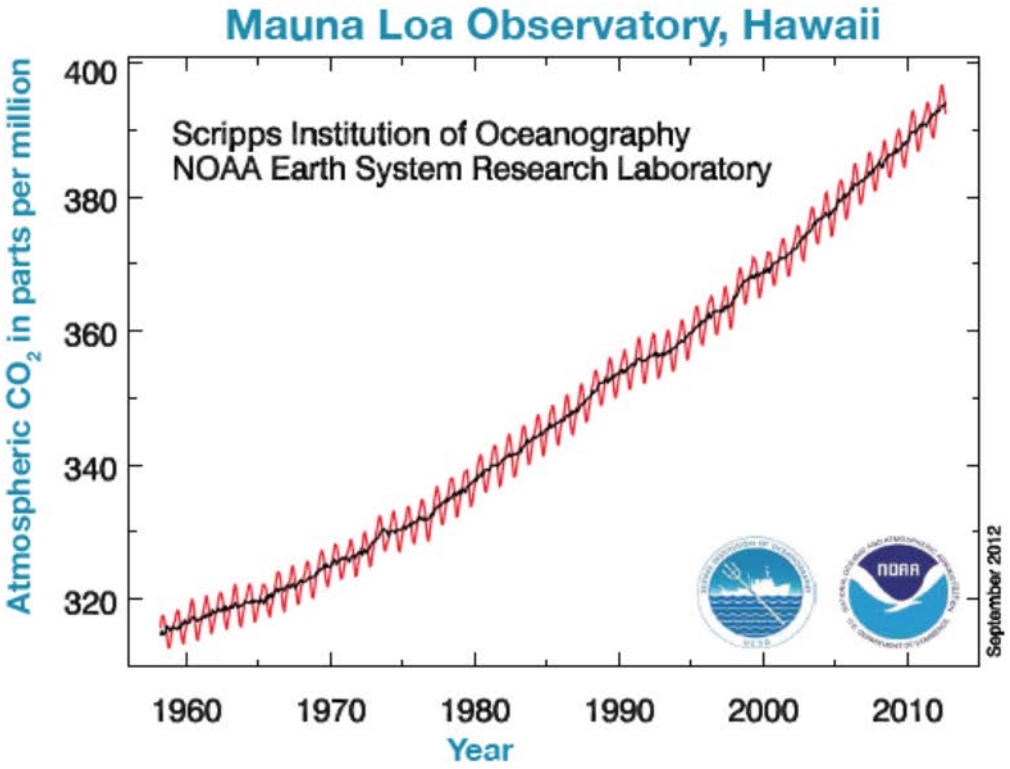
4.During what season would you expect to see the highest concentrations of $CO_2$ in the water or atmosphere?

5.When would carbon dioxide be the lowest?

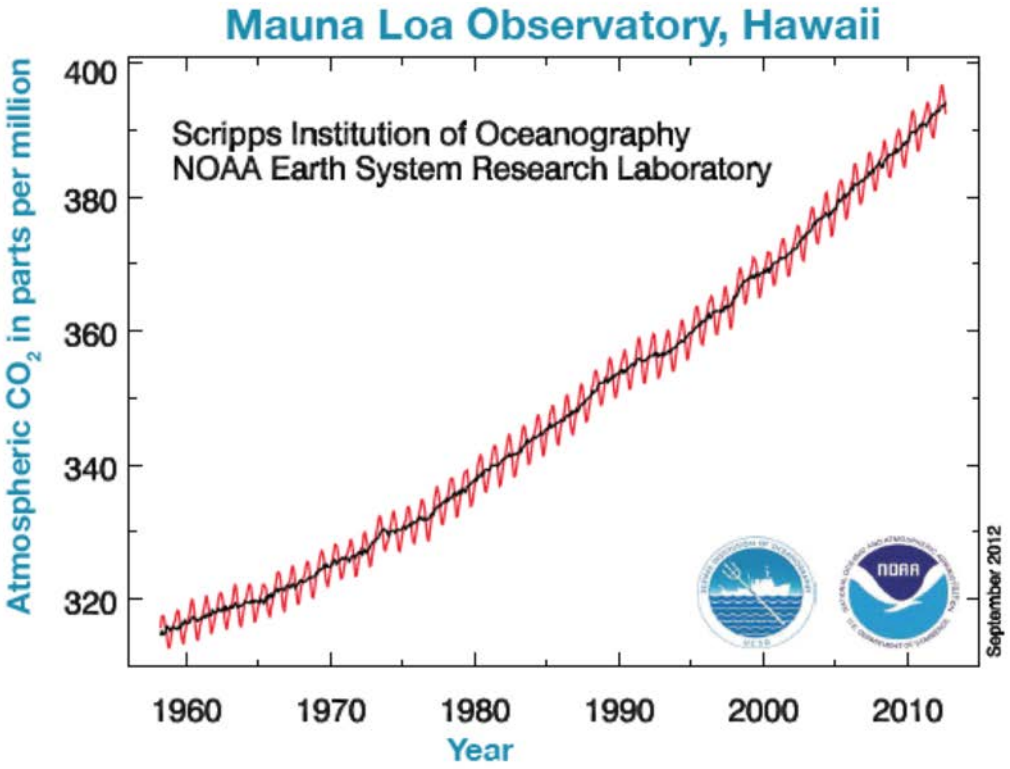
# Keeling Curve: $CO_2$ Levels in the Atmosphere



# Keeling Curve: $CO_2$ Levels in the Atmosphere



# Keeling Curve: $CO_2$ Levels in the Atmosphere



# The Keeling Curve – long term CO2 measurements