Part 1: Visualize your own climate data

- Go to Interactive Atmospheric Data Visualization. The main page has an interactive map of the world with a bunch of colored dots on to designate places where atmospheric data is habitually collected by NOAA. You'll see that the default current selection is set to the Mauna Loa Observatory. Click “Carbon Cycle Gases” to expand that menu and then choose Time Series. You will be taken to a new page. Don’t change anything on the page, just scroll down and click the Submit button. You have just generated a time series plot of carbon dioxide concentrations recorded at 3397 meters above sea level at the Mauna Loa observatory. In fact, it is exactly the same plot we discussed on the previous page of this lesson, except more updated because I created that course page a while ago. Go ahead and try it! Then after you check out the plot, you can click the “Site Selection" link to get back to the original page we started on.
- Now back at the original page, you see a world map and by hovering your mouse over the different circles you can find out the name of any station and what kind of samples it takes (carbon dioxide, methane, whatever) and how long the station has been active. If you click on one of the network station symbols, the menu side of the page changes so that you can make a plot of that station's atmospheric data. Go ahead and play around with this Web site. There's a lot of neat stuff here. You can always click “Site Selection" to get back to the original page we started on.
- Pick two stations other than Mauna Loa and preferably ones that have at least a couple of years of data. It’s also interesting to pick one in the northern hemisphere and one in the southern hemisphere.
- Make time series plots for both carbon dioxide (CO_2) and methane (CH_4) at your stations—that's 4 plots. You can save the plots to your computer by clicking where it says "PDF version" on the page where it makes your plot.
- Paste your PDF file plots into your document.
- Answer the Part 1 questions on your document.

Part 1 Questions

1. Where are your stations and what type of data collection do they employ? (i.e., how far above sea level? surface? airplane? tower?)
2. Compare your time series plots of CO_2 to that of Mauna Loa in a few sentences. Are the ambient levels of CO2 today the same or different at each of the three stations? Is the change per year about the same or different? Is CO_2 level rising faster / slower / at the same rate at your stations compared to Mauna Loa?
3. What is the seasonal variability of CO_2 at your stations compared to that at Mauna Loa? (You can see the average seasonal pattern better by choosing the "seasonal patterns" option when you make your plot.)
4. Compare your time series plots of CH_4 to that of Mauna Loa in a few sentences. Are the ambient levels of CH_4 today the same or different? Is the change per year about the same or different? Is CH_4 level rising faster / slower / at the same rate at your stations compared to Mauna Loa?
5. What is the seasonal variability of CH_4 at your stations compared to that at Mauna Loa? (You can see the average seasonal pattern better by choosing the "seasonal patterns" option when you make your plot.)
6. A well-mixed atmosphere is one that is basically homogenous with respect to gas concentrations on short timescales (less than a year). If our atmosphere is well-mixed, it means that regardless of the locations of the sources of the greenhouse gas emissions, all parts of the world have about the same level of greenhouse gas concentrations. Based on this exercise, is our atmosphere well-mixed with regard to carbon dioxide and methane? (Feel free to check out a few more stations to verify your answer.)
7. Before the Industrial Revolution, the concentration of carbon dioxide in the atmosphere was about 270 parts per million. Many climate scientists have hypothesized that the present climate conditions for which our species is adapted will deteriorate significantly and irrevocably if the atmospheric concentration of carbon dioxide doubles from its pre-industrial level. If the current average rate of

increase of carbon dioxide concentration you have observed at your three stations remains the same, when will atmospheric carbon dioxide double its concentration from pre-industrial times?

Part 2: Bad cherrypicking of good data

People often wonder how there can be different interpretations of the same datasets. In Part 2 of this activity, we will deliberately set up a “straw man" of a dataset that has been selected to maximize the potential for incorrect interpretation in order to see how different interpretations can arise. To do this we will take advantage of the fact that there is natural variability in the concentration of CO_2 in the atmosphere due to the seasonality of plant growth. We will make two plots, each containing several months of data at Mauna Loa.

- Go to NOAA’s Trends in Atmospheric Carbon Dioxide page.
- Scroll down to the bottom of the page so that you are looking at the plot called “Mauna Loa Daily, Monthly and Weekly Averages for two years”
- Use the slider bars below the plot to make the x axis go from Oct 2014 to May 2015. Take a screenshot of this plot and include it in your document.
- Use the slider bars below the plot to make the x axis span June 2015 - October 2015. Take a screenshot of this plot and include it in your document.
- Answer the Part 2 questions on your document.

Part 2 Questions

1. Look at the October to May plot. If you had never seen the full range of data spanning multiple decades, what might you conclude from this plot?
2. Look at the June to October plot. If you had never seen the full range of data spanning multiple decades, what might you conclude from this plot?
3. Why is it so important to sample the atmosphere continuously and for a long period of time?
4. What are some of the points raised in this problem set that *do not* lend themselves to simple table-top experiments in a lab or a classroom?