Chem 191: Plotting Ozone Data in Microsoft Excel

Instructions: Complete this worksheet using the ozone data you collected last week.
Grading: This assignments counts for 15 points toward your lab grade.
Submitting: Before you leave today, turn in an electronic copy of your Excel file to Dropbox with the "Excel - Ozone Lab" Link. Make sure you include answers to the questions at the end of this worksheet.
Filename Example: `ozone`

Introduction

In the last lab you used ImageJ to process images of the stratospheric ozone hole. Specifically, you calculated the area of the ozone hole (<250 Dobson units), the minimum value, the maximum value, and the mean value.

Today, you will use Microsoft Excel to view trends in this data over time.

You will also explore ground-level (tropospheric) ozone trends from two monitoring sites in the Smokies.

Getting Excel (if you don't have it already)

To use it through VCAT:

1. Go to [vcat.wcu.edu] (https://vcat.wcu.edu) and login.
2. Click the **STEM Specialized** machine and choose to launch it in the desktop app.
3. Use the Windows machine as normal.

To install it on your computer:

1. Go to my.wcu.edu. Click on **Email (Office 365)**.
2. Click your **account icon** (probably your initials) in the top right corner of the screen. Click **My account** in the drop-down menu.
3. Click **Install Office** under *Office apps & devices* and follow further instructions on the screen.
4. If you need more help, see the WCU Device Setup Guide.

Using Excel

Input Data

1. Open Excel and create a new blank workbook.
2. Type your data into Excel as columns (as it appears on your datasheet).

Plot Data with One Series

1. Click **Insert > Scatter**. Choose a scatter plot with lines.
2. Right click on the plot and choose **Select Data**.
3. Click the selection box (with red arrow) next to X-data and select the x-data; click the box with the red arrow again.

4. Repeat the above step for the y-data.
5. Adjust the plot as necessary to make it presentable.

Import Instrument Data (from CSV)

1. Go to and download the data file.
2. In Excel, click **File > Open** and choose the file your downloaded (you may need to select to show **All Files** instead of only xslx files).
3. This should bring up the *Text Import Wizard* window.
    1. Choose the **Delimited** radio button/check box.
    2. Find **Start import at row:** and input **9** (Look at the preview frame to determine which number to choose).
    3. Click **Next >**
4. In *Step 2* unselect **Tab** and select **Comma**. Click **Finish**.

Plot Data with Two Series

1. Repeat the plotting steps above for the Cade's Cove data vs. Day.
2. Click the + button under the data series box to add a second data series.
3. Repeat the plotting steps above for the Clingman's Dome data vs. Day.
4. Adjust the plot as necessary to make it presentable.

Interpret

Answer the following questions in Excel. 1. Click the + button in the bottom left corner of the Excel window to add a new sheet. 1. On the new sheet, right click the name (e.g. `Sheet 2`) and click **Rename**. Give it the name `Answers`. 1. For each question below, click **Insert > Text Box**. Clearly indicate which question you are answering and provide a short answer the question.

Part I

1. Which year had the largest ozone hole?
2. Which year had the smallest ozone hole? Are there any other years that are very small?
3. What conclusions can you draw from you findings regarding the smallest extent of the ozone hole?

Part II

1. In the **Cade's Cove** data, do you notice any trends in the ozone data related to time of day?
2. What time of day is ozone concentration highest at **Cade's Cove**? Why do you think it's highest then? Remember the formula for ground level ozone is:

$$O_2 + \text{VOC} + NO_x + \text{sunlight} \rightarrow O_3$$

3. What diurnal (daily) trends do you notice in the **Clingman's Dome** data (if any)?
4. What is the difference between the Cade's Cove and Clingman's Dome sites that causes the observed differences in ozone concentration?