Intro To Excel for use in Introductory Geosciences: Data, Graphs, and Model fit

Activity (II)

Part 4. Data acquisition and graphing

This activity assumes some familiarity with Excel. Parts 1 through 3 of this activity can give you that background if you need it.

The site below is titled "Importing Data into Excel from Easy InnKeeping" and gives a brief outline of some importing methods and might be useful as a reference if you get in a bind. **http://www.easyinnkeeping.com/faq/excelreports.htm.** You may also want to check out the help menu for Excel as it is usually very helpful.

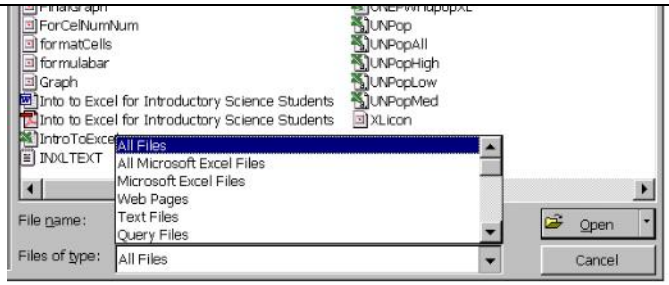
Below are some basic instructions for importing data from a text file (*.txt, or *.prn, *.csv) or using copy paste from a data table in a word document or web page.

Using the file-open command you can open any text file of data and import it into Excel for calculations of graphing. You can also Copy ***(edit-copy command)*** tables from other Excel spreadsheets, from a word processor document, from a text file, or from a tabular display on the web and then Paste ***(Edit-past command)*** this data into excel. Sometimes everything works out great and the columns from the original data source remain in tact when pasted into Excel. Often this is not the case and what you get is a single column with all data together. Fixing this is easy. Once the data are in columns you can then Graph this data and perform calculations with it. This section is intended to help you do this easily.

If the data is already in the Excel format *.xls, open it using the ***file-open command*** . Navigate to where the file is stored on you computer, click on it and then open.
*(the * here indicates any file name)*

If the data is in a tab delimited text format *.txt, or comma delimited text *.csv open it using the ***file-open command***

If the data is in a tab delimited text format *.txt, open it using the ***file-open command.*** To see text files you have to change file types to All files or Text files in the drop down menu for file type in the Open Dialog Box. Navigate to where the file is stored on your computer, click on it and then open. Excel generally knows what you're trying to import so using the default entries that follow typically does the trick.



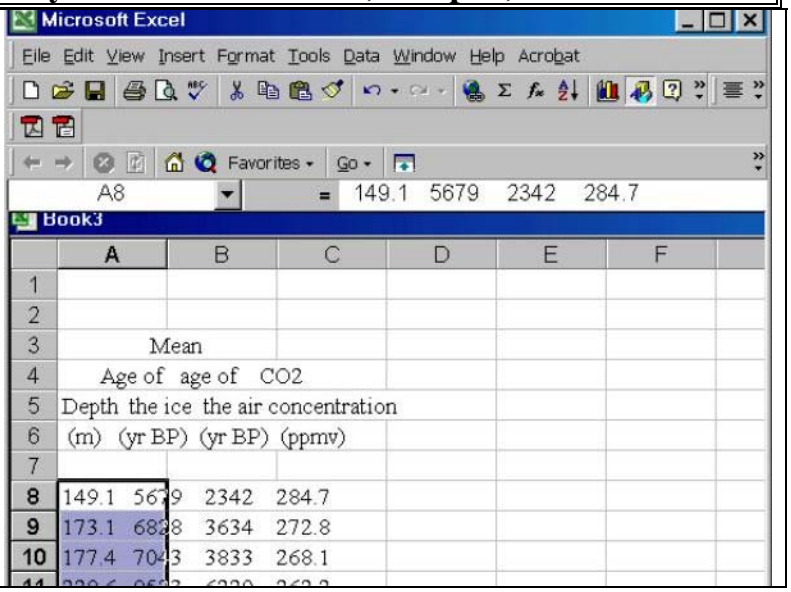
If the data is in a space delimited text format *.prn, open it using the ***file-open command*** . To see text file you have to change file types to All files in the drop down menu for file types id the Open Dialog Box.

Sometimes you get a single column with all data together when you open *prn files or when you copy and Paste in to Excel from a table on the web or some other document.

For example the digital data found at http://cdiac.esd.ornl.gov/trends/co2/vostok.htm is from the vostok ice core record.

This data was ***selected*** and then ***Edit-copied*** from the web page and pasted into a new spread sheet. The result is shown here. The column from A8 to A330 is selected here because that's where the data is, but it is all in column A. Using the ***Data-Text to Columns command*** fixes this problem and break the data into four neat columns fro Ice core depth, Age of Ice, Mean age of air, and CO2 concentration.

To easily select A8 to A330 click on A8 and then hold down the Ctrl & Shift keys simultaneously and press arrow down.



When you get the data the way you want it it's a good idea to save it as tab delimited text for easy access later. Also, if you modify the worksheet further and do calculations or make graphs make sure to save it as an MS Excel Work book otherwise your graphs or formulas will not be saved. Another suggestion is to save different versions of your work by frequently saving but also use the ***Edit-Move or Copy Sheet-Create copy command***. This creates an identical sheet that can be modified and if you make some big mistakes you will always have your original. It conceivable that you would do this several times as you progress from simple data to a more complex graph and calculations sheet. To rename each sheet use Format-Sheet-Rename command. The ***Edit-Move or Copy Sheet-Create copy command*** is also useful when you want to make several graphs that are only slightly different. You can create a copy of the whole sheet, which includes graphs, and then simply modify the graph on the newly created sheet to meet your needs.

Graphing Sea Floor Topographydata.

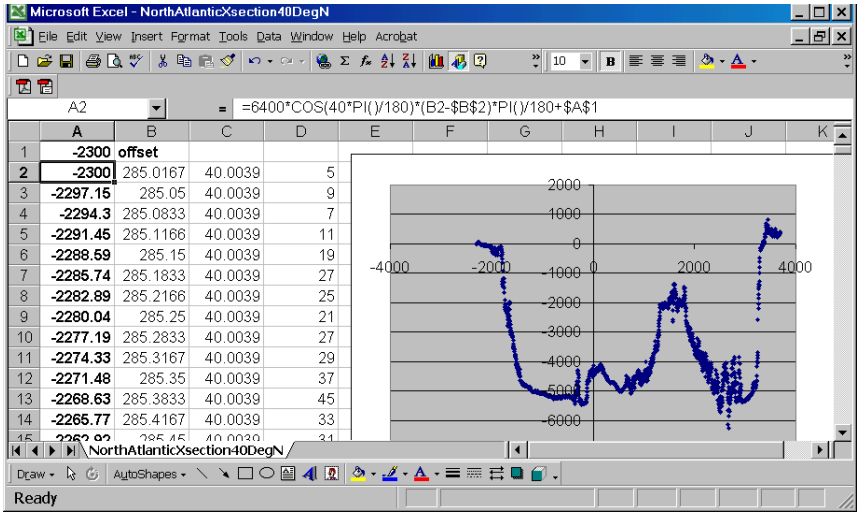
One of the nicest features of Excel is that you can easily make a ***graph*** **of** data that is available on the web as a text file or in tabular data that can be copied directly from a table and pasted. As discussed in Part 3 you can also make a graph of a table generated by a formula. Here we assume that your data file has three columns and is either obtained from the Topex site (long, lat, and elevation) or from the text files links below.

The site http://topex.ucsd.edu/cgi-bin/get_data.cgi is an interactive site that has topographic data for land and ocean as measured by the Topex satellite system. If you use this site I recommend taking very small latitude slices like 40.00 to 40.01 degrees or you can end up with extremely large files. Choosing these latitude limits and –75 to –5 long gave a file with 2100 data points (long, lat, and elevation) which spanned the Atlantic at 40 degrees North Lat. Tab delimited text files of North Atlantic Cross sections for 30 N , 40 N, and 50N are also located at

http://serc.carleton.edu/files/introgeo/models/examples/SFS30N
http://serc.carleton.edu/files/introgeo/models/examples/sfs40N
http://serc.carleton.edu/files/introgeo/models/examples/SFS50N

You can either retrieve data from the topex site yourself or use the above text files. In either case save

your files in a memorable location on the hard drive, with a memorable name, and open it with Excel.



	A	B	C	D
1	-2300	offset		
2	-2300	285.0167	40.0039	5
3	-2297.15	285.05	40.0039	9
4	-2294.3	285.0833	40.0039	7
5	-2291.45	285.1166	40.0039	11
6	-2288.59	285.15	40.0039	19
7	-2285.74	285.1833	40.0039	27
8	-2282.89	285.2166	40.0039	25
9	-2280.04	285.25	40.0039	21
10	-2277.19	285.2833	40.0039	27
11	-2274.33	285.3167	40.0039	29
12	-2271.48	285.35	40.0039	37
13	-2268.63	285.3833	40.0039	45
14	-2265.77	285.4167	40.0039	33

The spread sheet above is the original 40 degree North data file: http://serc.carleton.edu/files/introgeo/models/examples/sfs40N with a few modifications. We selected all of row 1 by clicking on the 1 box on the far left and used the ***insert-row-command.*** We selected all of column A by clicking on the A at the top of the column and then did the ***insert-column command***. With a new blank column A and everything shifted to the right we typed into Cell A2:
=6400*COS(40*PI()/180)*(B2-B2)*PI()/180+A1

This converts longitude into distances (in km) (using radians) and cell A1 is an offset so we can adjust distance to get the Mid-Atlantic-Ridge (MAR) right at zero. This offset is useful for comparing observations with our mathematical model for ocean depth discussed in Part 3. The MAR is not there yet so you should adjust the value in cell A1 to shift the MAR left to zero. We then copied this formula all the way down by selecting A2 and then using the scroll bar on the right to scroll to the bottom of the page (around line 2100), then while holding the shift key down clicking on cell A2102, and finally doing the ***Edit-Fill-Down command*** (or Ctrl-D).

The last thing was to make the graph by selecting cells A2-A2102 and D2 to D2102. To select columns that are not adjacent you must use the Crtl key when moving from the bottom of the first column to the top of the second. An easy way to do this is to use the following keys. Click on A2 , hold Crtl **and** Shift and then arrow down, keep only Ctrl pressed and move to cell D2102, then hold Ctrl-Shift and arrow up.

To make a *graph* of the elevation above (or below) sea level*:

— Select cells A2 –A2102 and D2-D2102 (2 columns) — Click on the chart wizard icon ** The x-axis values are always in the first column on the left*	

- Select XY scatter and select the type of x-y scatter plot you want (click Next)

- Excel usually knows that you are using columns for x and y data (click next)
- You can enter the title and axes labels here. Click on the Legends tab and uncheck the check box. Click on the other tabs to see what they can do. You can come back here later if you want to change your graph a bit. ** [click Next]
- You can save the chart as a separate page or as an object on your working spreadsheet. The save as object choice keeps numerical values and the graph together which is often nice. Choose this option. [click finish]

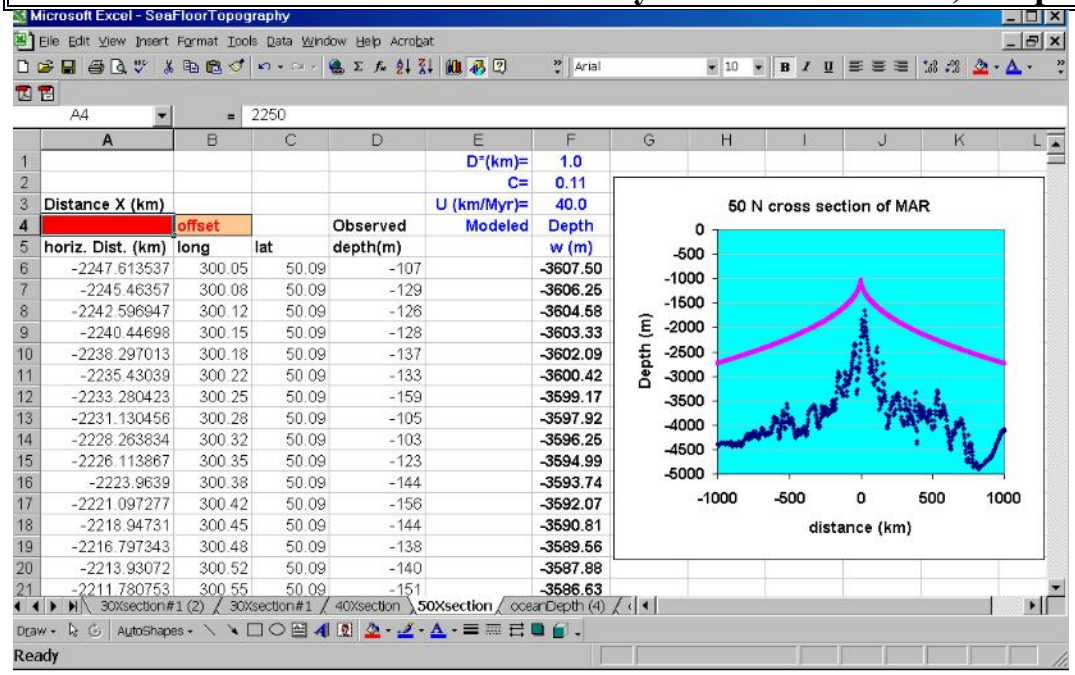
If you want to modify your graph after finishing it use **Chart Options of the **Char**t menu. To get the Chart menu you have to first finish the graph and then click somewhere on it to select the whole graph.

Resave your worksheet by using the **File *Save*** command (save as Microsoft Excel Workbook) and then make your graph look good by formatting and labeling axes, include units,…… ***Save*** again.

Questions:
What off-set did you use to set the MAR over zero?
If your off-set was smaller than this number was the MAR to the left or right of zero.
Graphs
The above discussion shows the 40 N cross section of the Atlantic. For your graph use the 50 N data. Spiff up your graph to make it look very presentable and print it out to turn in.

This would be a good time to use the ***Edit-Move or Copy Sheet-Create copy command*** and then resave the whole worksheet again. This will give you two sheets of what you just created so you can modify on of them following the instructions in Part 5 and not worry about losing what you've already done.

Part 5. Model vs Observations: *how will does our model work, and over what range is it valid?*



Insert a few more rows at the top, label your columns, and then put our model equation for sea-floor spreading in column F with labels in the first few rows of E. That is make your spread sheet look like the one above using the equation from part 3 to calculated model depth values in column F.

$$w = -1000[\ D^* + C\ \mathrm{sqrt}\ (10\ \ |X|\ /\ u)\ ]$$

The way the spread sheet is set-up above this formula in "*Excelian"* would be

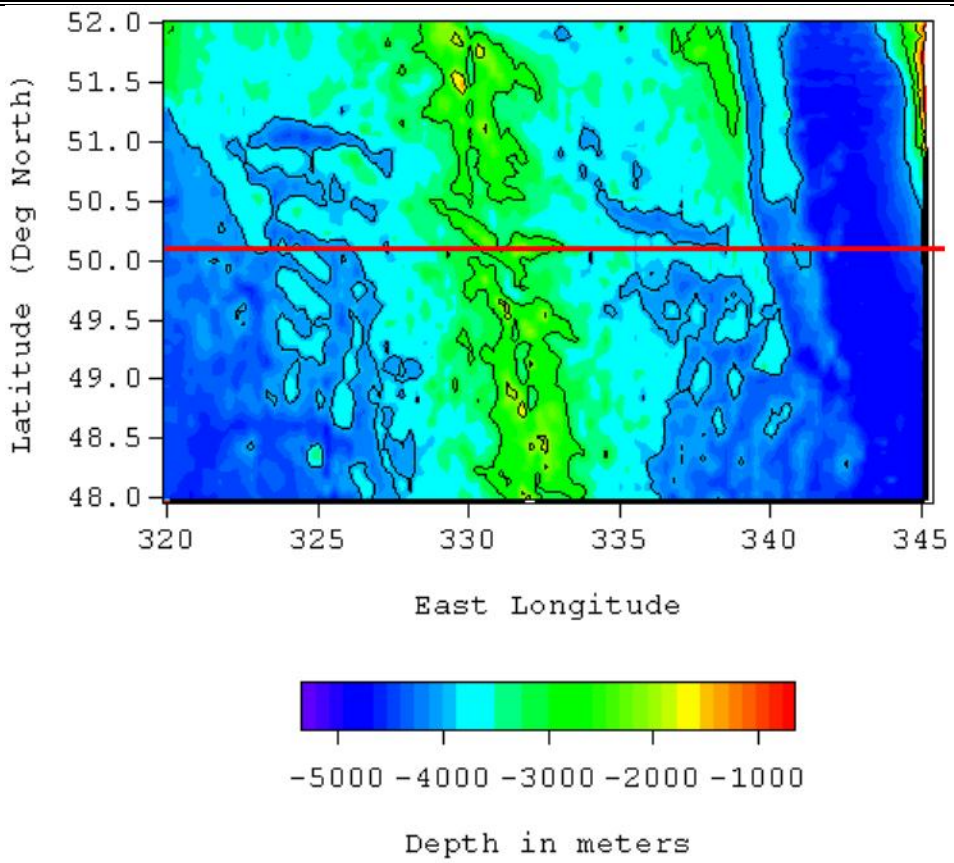
F6**: =-1000* (F$1+ F$2*sqrt (10.0* abs($A6)/F$3))**

Why has the 1000 been added to the equation in part 3?

Make sure that the offset is set correctly to put the MAR above the zero position. The red box (cell A4) is hiding the actual value from you so as not to spoil your fun, but there is a number there. Adjust the model parameters D* and U to give the best fit between model and observations.

What offset was needed to set the MAR over the zero position?

The Topographic map below better shows the true complexity of the ocean's topography in the region of 50 N.



red line indicates 50 N cross section slice

Data from: http://topex.ucsd.edu/cgi-bin/get_data.cgi

Questions:
Why has the 1000 been added to the equation in part 3?

What offset was needed to set the MAR over the zero position?

After you get what you consider the "best" fit, over what horizontal distances do you think your model provides good agreement with observations? Explain why the applicability of the model has limited horizontal range. For our graph above we have a horizontal range of –1000 to +1000. You may want to extend this range to say –2000 to +2000 to help you answer this question.

Graph: Print out your final graph to turn in

Repeat all questions and graphs from Part 5 for the 40 N and 30 N data.

For the 40 N data assume that the ridge top has been removed somehow so when you fit model to data imagine that there once was a ridge there. This may or may not be the case in reality but is an hypothesis worth testing further.

For the 30 N data there are two possible rigdes in the Atlantic. Use different offsets and different fit for both of these.