

'Data Analysis in Geophysics
ESCI 7205

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Room 103 in 3892 (long building), x-4929

Tu/Th - 13:00-14:30
CERI MAC (or STUDENT) LAB
Lab - 16, 22/10/13

Last time we made a map of earthquakes from data we downloaded from IRIS. Thanks to the Wilber interface we could see what the data set looked like and select the earthquakes interactively. This is great for doing it once. Not so good if you want to have this the map ready for you when you arrive to work in the morning! So one of the things we want to do is to automate it.

Wilber 3: Select Event

✉ Wilber Feedback/Questions

Looking for previously requested data? [View recent requests.](#)

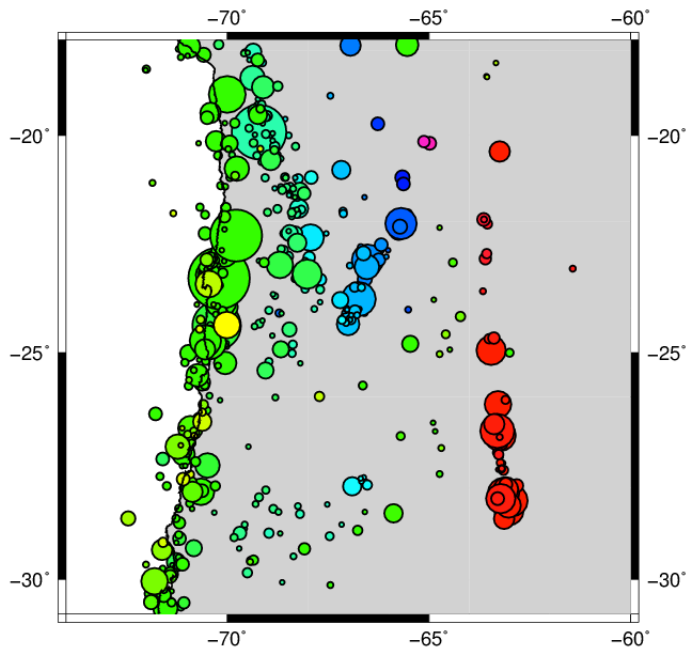
Load Event Data:

Using the map and controls below, select a geographic area and date/magnitude range, then click the **Get Events** button to load events matching those criteria. The full database contains several million events, so some queries (particularly across large spans of time) may be very slow.

485 events listed. Download events

Date (UTC)	Region	Magnitude	Latitude	Longitude	Depth	Contributor
2013-08-23 08:34:06	Northern Chile	MW 5.8	-22.27°	-68.59°	111 km	NEIC PDE-Q
2013-08-05 05:40:56	Near Coast Of Northern Chile	MB 5.5	-20.18°	-70.71°	19.1 km	NEIC PDE-W
2013-07-10 14:32:12	Northern Chile	MW 5.7	-19.30°	-69.25°	110 km	NEIC PDE-M

We selected events in western South American and colored them by depth and plotted the size as a function of magnitude. Our map should have looked something like the map below. We could play with the color map (the cpt file) to make it look more like one from IRIS above, or give more variation as a function of depth, etc. We used a size scaling method that made the dot sizes vary more than those on the IRIS map above.



Today we are going to make a cross section (and could also show where it will go on map). For this we will need to project the data – find its distance along a line on the map (modify the map above to plot this line, and possibly a box, showing where the

cross section is – easy in our case for the center line since we need the endpoints is easy to get the far endpoint, in general this is challenging).

First, for this we are going to use the “new and improved” USGS earthquake catalog at

<http://earthquake.usgs.gov/earthquakes/search/>

this is a more complete list of earthquakes (and is a lot larger). The IRIS list only shows the events for which there are prepared, triggered, files with seismic data organized by event. Many more earthquakes than this occur and are located by the world’s seismic networks. The USGS ANSS Comprehensive Catalog (ComCat) catalog has a much larger, as real time as can be, catalog of earthquakes. Unfortunately it does not have a nice pretty Wilbur like GUI, you have to type in the information.

So – go to the web site and type in the limits from the data selection you did last week. If you don’t have the info, use the limits of the map you made.

(I will also do this with a Firefox plugin called iMacros, so I can save my actions on the web page into a file. I can then run this file when I want to get the data automatically. Since the file is a text file, I can also edit it if I want to change the information I entered on the web page.

I start iMacros, set it to record, do what I need on the web page, get the data and save it. I then stop recording with iMacros and save the iMacros file with my commands in it (put in a file name you want – blue).

```
/Users/robertsmalley/iMacros/Macros/getCOMCAT
```

You have to be careful not to make mistakes on the web page.

Later, to execute the macro (and make the data file again) use the command –

```
/usr/bin/open /Applications/Firefox.app "http://run.imacros.net/?m=getCOMCAT.iim"
```

You can run this from a shell script.

If iMacro is not installed on your machine, just do the selection and download. You will get the same file.)

Look at the new file you have in your downloads folder – it should be called “query (the name is given automatically, look at the dialog box you get to save it, or look at the files in the directory where Firefox saves files for the newest one). You will notice that this file is similar to, but not the same format, as the one we downloaded from IRIS last week. Look at the header to figure out what is where. We can use the same tools to process it. Again, we want the location (lon, lat), depth and size, in that order, in the output.

Look up the gmt command “project” on the web. We need to state a starting point, azimuth and direction for the cross section. We also need to find the new limits to plot (can look at the file produced by project or base it on what you already know about the data and your projection parameters).

So we will have to assign a bunch of new variables/values and build the commands to project and plot the data.

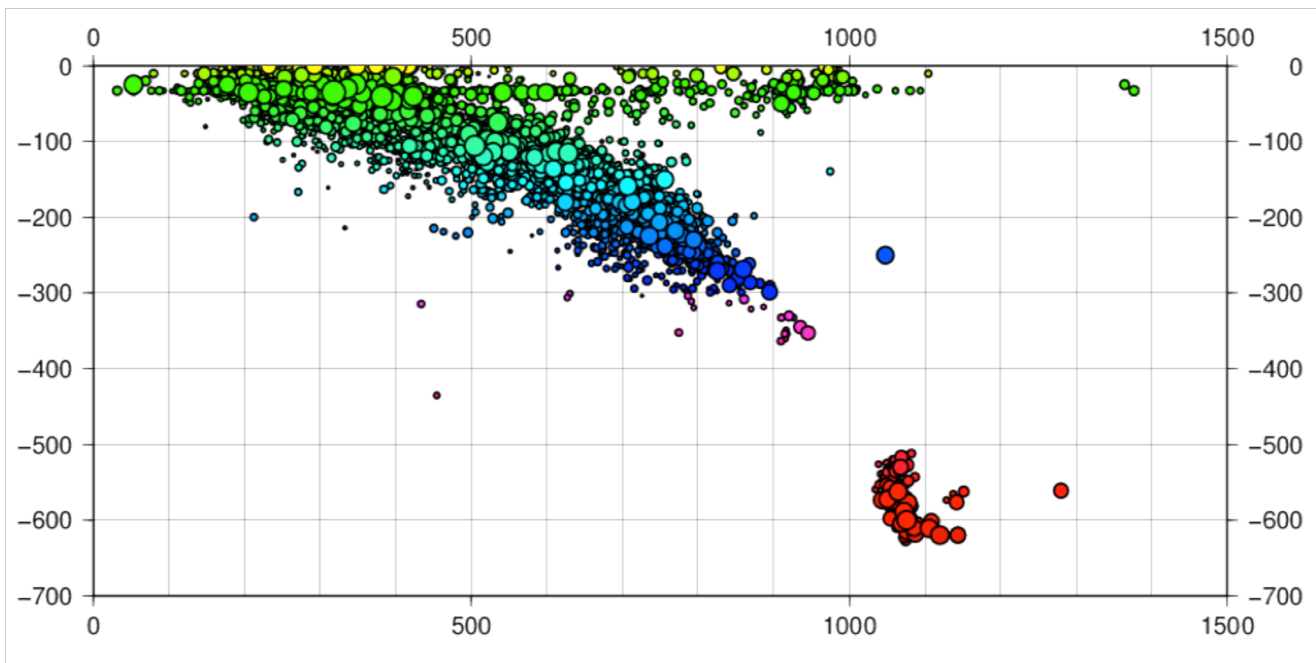
We will also have to find a new scaling and ordering to make the most informative presentation of the data.

Use the file template:

```
lab3gmt.xc.sh
```

to make the figure.

You will get a figure that looks like the following.



Making KML files for display of data in Google Earth, and extracting data from KML files for everybody else.

It is “easy” to make a placemark in Google Earth. The problem is when you need to make 10,000 of them.

So lets put our earthquakes into Google Earth. We would like to use the same coding – color for depth and symbol size for magnitude, but the **gmt2kml** routine will not scale symbol sizes individually or use a continuous color palette (but it is unix, so you can do it under the machine shop philosophy).

Look up the **gmt2kml** routine on google (or better type it in with no arguments) to get the man page (the one installed on our systems shows a different man page than the one on google).

This routine needs a bit of “help”. I have written my own, in fortran, to put up my GPS points, focal mechanisms, etc.

There is also a routine **kml2gmt** to go the other way. It is very basic. According to the man page

“**kml2gmt** reads a Google Earth KML file and outputs a GMT table file. Only KML files that contain points, lines, or polygons can be processed. This is a bare-bones operation that aims to extract coordinates and possibly the name and description tags of each feature. The main use intended is to capture coordinates modified in Google Earth and then reinsert the modified data into the original GMT data file.”

How about GPS track data to kml? There are lots of programs around to do this. I use “LoadMyTracks” on the Mac. You download the GPS data to your computer and feed the output file into the conversion program. The program has to support the file format your GPS receiver produces.