

Data Analysis in Geophysics (CERI 7104/8104)
Homework 5 – Due 12/8/17

This homework focuses on using shell scripts and AWK to create maps in GMT. For each question, you will need to hand in a PDF, PNG, or (E)PS file of the plot/map in question along with the commented shell script that you used to create the plot or map. You can put all three shell scripts in the same file or separate them, it is up to you, but you must include documentation either way. You are welcome to work on these during class time on GMT, though you will probably want to work your way through the four sets of notes before attempting the homework problems.

1. Download the earthquake focal mechanism catalog worldwide for $M \geq 5$ for one month of your choice from the Global CMT project. A searchable catalog is available at:

<http://www.globalcmt.org/CMTsearch.html>

The catalog begins in 1976 and continues through the present.

Plot the focal mechanisms in the catalog using **psmeca** on a Hammer projection. You should scale the size of each beach ball by the event magnitude. You can download the events in **psmeca** format, or you can use AWK to reformat the data files to be used in **psmeca** (please include the code within the shell script if you reformat). Include a title on your plot.

2. Use **psvelo** to plot GPS velocities for the Parkfield section of the San Andreas Fault (provided in the file “parkfield.velocities.txt”) on a Mercator projection. Your plot should also show shaded topography (illuminated from the north) as well as the fault trace of the San Andreas fault (data can be found in the file “Historic.kml”). Also show the station name (included in the data file) on the plot, as well as a title.

You will need to use AWK to reformat the fault trace data files for use in your GMT script (please include the code either within the shell script or in a separate script). You can do this with approach that uses basic AWK string matching to find lines that contain coordinates, though this will miss one point on every fault segment. A better, but trickier, method is to use a regular expression to match coordinates. Note that the KML file contains all faults, not just the San Andreas section, so your script should select only the fault segments that lie within the mapped region to be output to GMT.

3. Make a plot the 2014 National Seismic Hazard Map for 2% exceedance in 50 years on an Albers Conic projection for the continental US using a color scale to indicate hazard. The data is in the file “2014_pga2pct50yrs.dat”. Include country and state boundaries on your plot, as well as a title and a labelled color scale. The water regions of the plot should not show the seismic hazard data.