Data Analysis in Geophysics (CERI 7104/8104)
Homework 4 – Due 11/29/18

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 map in question along with the commented shell script that you used to create the map (one script for each problem).

1. Use `psvelo` to plot GPS velocities for the Parkfield section of the San Andreas Fault (provided in the file "parkfield_velocity.txt") on a Mercator projection. Your plot should also show shaded topography (illuminated from roughly 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, a scale for the GPS vectors, and 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 AWK script). This problem is described in more detail in the course notes for the second class on AWK.

2. Create a map to plot the result of seismic backprojection on a map. Use an Albers conic projection. The backprojection results will consist of summed amplitudes on a regular grid of possible source points. You should plot these using a colorscale to denote amplitude. Since the backprojected amplitudes are arbitrary, you do not need to provide a color scale. You should also plot the moment tensor solution for the event on top of the color values. I provide sample data for plotting in the files "backprojection_amplitudes.txt" and "backprojection_focalmech.txt" (holding the backprojection results and the focal mechanism, respectively). The backprojection results are formatted such that there is one source point per line, with the three columns indicating source latitude, source longitude, and amplitude. They form a regular grid with 1 degree spacing.

   To make your code re-usable on your final project, you should use input arguments to your script to handle variables that might change. This includes the latitude/longitude values for the map limits, the two input files, and the grid spacing on the backprojection grid value file (it is 1 degree for the example that I provide, but you should not assume this value holds for all cases). You may handle these inputs as you wish, as I will not be testing your codes.