Name\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ ESCI7205 hw4

**Due Th., Oct 17, 2013.**

1) Say you are interested in keeping up to date with earthquakes that occur around the world. Someone has told you that the “National Earthquake Information Center“ (NEIC) has a web page that reports earthquakes that have occurred during the last day, week or month.

We are going to try and make this be “realistic” in the sense that it is something you might actually have to do.

a) Use your favorite browser and search engine to connect to

[http://**earthquake**.usgs.gov/**earthquakes**/index.php](http://earthquake.usgs.gov/earthquakes/index.php) .

You will see a link for “Latest Earthquakes” (or try this one directly <http://earthquake.usgs.gov/earthquakes/map/>)

At the top right you will see icons for: *a list, the earth and a gear*. Use these to get a list of the earthquakes for the last month, magnitude 4.5+, worldwide. There should be 300-500 of them. Once you select what you want you should get a list on the left hand side with some descriptive information. Select the download button and then the csv format (comma separated values). This will give you a text file that you can open in any editor or word processor.

b) Using your favorite editor/word processor (or go directly to nawk), change all the commas to spaces. Save it as a text file.

c) Now you have your data set.

2) Now we are going to make a map of this data.

We are going to make a “world” map in a Mercator projection between ±60° latitude (you can’t go to ±90 as those latitudes are at ± ∞ in a Mercator projection.) and -180 to 180 longitude. A template for this file is below. You will have to put this into an editor and fill in the blanks.

The key to getting this homework done is to “vote early and often”. If you don’t understand some detail of what you are trying to do, or it is not coming out correctly, ask for help (from me, or if I’m not available try finding a more computer savvy senior grad student) as soon as possible.

We are going to give our output file the same name as the shell script file with “.ps” appended (to identify it as a postscript file produced by the shell script making up the first part of the name).

Notice that I have made a bunch of useful shell variables for colors, the control of the postscript file header, continuation, and footer, and the output file name. You will have to replace the ***bold italic parts of the shell script with the appropriate shell variables, commands, etc***.

Don’t worry that we have not done much GMT yet. You don’t need to know anything about GMT to do this exercise. You may have to look at one or two GMT program man pages to answer some of the questions. You can find information on GMT programs several ways. Man pages (man NameOfGMTProgram, eg man psxy), typing the gmt program name without any arguments will produce a the part of the man page that shows how to call it, or you can look for man pages and other info for the GMT program on the web (try google on “psxy gmt” for example, (you can find online GMT documentation at <http://gmt.soest.hawaii.edu/gmt/html/> ).). The GMT calls are blue below (you will not have the colors in your UNIX shell script)

a) The first thing you have to do is replace the **W, X, Y** and **Z** with the appropriate latitude and longitude values.

b) Note the name of the file you prepared that has the earthquake data.

c) Plot the basemap. You will need to set up the output file name where it says ***output***. What is the output file name that will be used (how is it constructed)?

d) We will then plot the earthquakes in magenta with size proportional to magnitude (you have to put the proper thing in where it says ***color***). (if you did not prepare the file with an editor by hand, this could also be done doing some processing of the input data file using [n]awk.)

The earthquake file should have a header line with a description of the columns.

e) Plot the plate boundaries in red for ridges, green for transform, and blue for trenches, using files from the directory pb2002.

You can find the Plate Boundary files in /gaia/home/rsmalley/ESCI7205/pb2002 on the Mac. Please let me know ***ASAP*** if there are any problems with the files.

f) Why did we plot the plate boundaries last?

g) Explain what the sections of code marked by the #f-i and #f-ii do. What files do they process? How are the files selected?

h) What does the -M$ mean in the psxy calls to plot the plate boundaries? You (might) need to read the man page for psxy and look in the data files to answer this.

i) What do the > and >> do?

j) What does the last line “echo showpage >> ***output***“ do?

The file produced by GMT is in the postscript language and is a text file so you can look in it if you want or need to (hint for j).

This script worked in 2011 before I butchered it to make the template, so if you replace the stuff in ***bold italic*** correctly it should work.

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Shell script template – put this in your favorite editor and have at it:

#!/bin/bash

#Set stuff up

PB=**??????**

LONMIN=***W***

LONMAX=***X***

LATMIN=***Y***

LATMAX=***Z***

REGION=$LONMIN/$LONMAX/$LATMIN/$LATMAX

PROJ=-J**?**0.06

RED=255/0/0

BLUE=0/0/255

GREEN=0/255/0

MAGENTA=255/0/255

CYAN=0/255/255

MOREPS=-K

CONTINUEPS="-K -O"

ENDPS=-O

OUTFILE=**???.**ps

#Done with setup, now process and plot

#Start the map. Draw the basemap

pscoast -R$REGION $PROJ -G200 -B30g15 -W1 $MOREPS -X4.8 -Y3.6 -Dh -U > ***output***

#Now add the earthquakes

***use awk to process the file you obtained above and pipe it into gmt*** | psxy -R$REGION $PROJ -Sc -G***color*** -L -W.1/0 -: $CONTINUEPS >> ***output***

psxy -R$REGION $PROJ -M$ -W3/***color*** $CONTINUEPS -V $PB/OceanicSpreadingRift.gmt >> ***output***

#f-i

transforms=`ls $PB/\*Transform\*gmt`

for transform in $transforms

do

psxy -R$REGION $PROJ -M$ -W3/***color*** $CONTINUEPS -V $transform >> ***output***

done

#f-ii

convergents=`ls $PB/\*Convergent\*gmt $PB/\*Subd\*.gmt`

for converge in $convergents

do

psxy -R$REGION $PROJ -M$ -W3/***color*** $CONTINUEPS -V $converge >> ***output***

done

echo showpage >> ***output***