Problem Set #3- Strain Rates.

Use the MATLAB script called strain_sphere.m that is available on the class website to estimate the strain rate from a GPS velocity field that is available through EarthScope.

Assignment

Step 1. Get strain_sphere.m. Set up a working directory.

Step 2. Download the GPS velocity file that is available from the EarthScope Plate Boundary Observatory.

Go to http://unavco.org
Hit "Plate Boundary Observatory: Data and Data products"
Hit "GPS"
Location "Network Velocities" and download the one in "SNARF" (Stable North America Reference Frame), called something like pbo_final_snf01.vel.
Also get the .pdf file which documents the meaning of the columns.

Step 3. Write a MATLAB script to read this file to provide you with fields you need. Make sure you've got it right by making a plot of the velocities using MATLAB's "quiver" command. Look ok?

Step 4. Decide on a region of tectonic interest that you would like to investigate. It should be large enough to include several GPS sites (in a good configuration), and small enough so that the strain rates to not change too much inside the area. Truncate the fields that you have to include only the sites that you are interested in. Make another quiver plot that includes just your selected area.

For example:

```
iwant = find(longitude>-120 & longitude<-118 & latitude>38 &
latitude<40);
ve = ve(iwant);
vn = vn(iwant);
```

etc....

Step 5. Get the MATLAB script strain_sphere.m from the class page. Read the help page for it (help strain_sphere.m).

Step 6. Format what you have into what you need for the strain_sphere.m script. Make sure your velocities and uncertainties are in m/yr, that you set the flags "weight" and "paramsel" appropriately, and that you pass CO-latitude to strain_sphere.m

Step 7. Execute strain_sphere. Do the outputs make sense? Use DispStrainRate.m (also available on the class page) to format the outputs of strain_sphere.m for human consumption. Use plot_tensor.m (there as well) to plot the strain rate tensor principal strain rate axes on the figure with the quiver vectors.

Step 8. Make a table that clearly lists the strain rates and their uncertainties (you can use matlab fprintf, do it by hand or whatever). Include the value and orientation of the principal strain rates.

Step 9. Plot the predicted velocities in a different color on your quiver plot. Note that MATLAB will scale vectors automatically unless you tell it not too. You will have to scale your vectors 'manually' to make them look nice, i.e. fit on your plot. e.g.:

```
sv = 50;
quiver(lon,lat,u_phi_p*sv,-u_theta_p*sv,0,'r');
```

The "0" in the 5th input field, tells MATLAB to not scale vectors automatically.

Is the model a good model? What is the χ^2 per degree of freedom? Is that good? bad?

Step 10.

Email your quiver plot, table, and responses to questions to *whammond@unr.edu* in some format I can read (.pdf, .ps, Word, Open Office, etc.)