GE01 Introduction to Geophysics

Plate Tectonics Summary Paper

(*adapted from the Plate Tectonics Course offered at Caltech*)

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Summary:

The assignment as a final project is to summarize papers that students have been individually reading about their study areas which were assigned in the beginning of the course semester. In class, students will learn fundamental concepts and observations of Plate Tectonics and Earthquakes. In each week, students will read papers regarding the tectonic/geologic history and past/current seismic observations done in the region, and also will complete several assignments before this final project, which involve interpretation of geophysical and geological data in their region of interest. From this assignment students can be familiarize with the linux system and know how to execute scripts to make plots.

Context:

Audience

Undergraduate upper division class (anticipating students less than 20 people) or first-year graduate course

Skills and concepts that students must have mastered:

Students should be able understand and evaluate plots and dataset presented in their reading materials after learning about geophysical methods in the class.
Students should be able to retrieve dataset available and make plots using the datasets and prepared scripts in the linux environment.

How the activity is situated in the course:

This is a final project submitted as a series of iterations over the course of a semester.

Goals:

Content/concepts goals for this activity

Plate tectonics of the region; Seismicity in response to plate motions; Review of geophysical methods

Higher order thinking skills/goals for this activity

Synthesis of different ideas; Critical evaluation of other models; Interpretation of geological/ geophysical dataset

Other skills/goals for this activity

Scientific writing skill; Critical reading skill; Effective communication skill

Format of Paper:

(1) COVER PAGE

Include a cover page with the appropriate title (which includes your study region) and your name.

(2) FIGURES

For your paper on your study area, please be sure to include maps (using any linux machine in the computer lab). The scripts you need to plot maps can be found under */home/datalib/Ge01/scripts*. Please copy them onto your directory. Please read *README* file first so that you can make appropriate changes for your map.

1. Make a tectonic map. Draw the active plate boundaries in color and label the plates. Label the direction and rate of relative plate motion at representative locations along the active plate boundaries.
2. Make maps of seismicity. The local seismicity can be color-coded according to their depths. The data can be found from http://earthquake.usgs.gov/earthquakes/eqarchives/epic/. Select "Compressed File Format" in output file type when you request the data. Copy the output results onto text file (called "seis.txt") and place it under the same directory as the plotting script.
3. May include other maps and figures that you found from the references (and/or the website). In this case, be sure to include the references (and/or the website link) in the figure caption.

(3) TEXTS

Describe the tectonic history that produced the important features visible on your tectonic map. Your discussion should include the following:

a. What is the age range of the ocean floor within your map area?
b. Explain how this ocean floor formed, that is, when it formed, what the spreading rates were (approximately), and between which pair or pairs of plates, along which spreading center (or spreading centers). There may be zones formed at different plate boundaries so please distinguish among them.
c. What are the principal events that caused the other features that you have annotated on your map (for example, microplates, seamounts, dead ridges, triple junction traces, continental mountain ranges or volcanic chains)? How are these related to the plate tectonic history?
d. If you have a subduction boundary, how old is the ocean floor being subducted from place to place? Can you relate this to the amount of seismicity or the length down-dip of the Wadati-Benioff zone?
e. Are there any enigmatic features on your map, for which nobody knows how they formed or what their history is? If so please mention these and any hypotheses about their origin. Of course you may also comment on anything else that you think is important about your area.

(4) REFERENCES

Please read the AGU style guide (see link below) and follow its format for your references.
http://www.agu.org/pubs/authors/manuscript_tools/journals/references.shtml