

Ge161, Plate Tectonics. Fall 2008. Instructions for final paper.

Final paper for Ge161. Due Dec. 12 or earlier, 2008. (Note that Dec. 12 is the Friday before the fall AGU meeting, and is the official end of first term.) Worth 25% of the course grade.

For your final paper on your study area for Ge161, please include the following things from previous problem sets (revised if necessary based on the comments given back to you about them):

- Maps of seismicity and focal mechanisms (revised if necessary from PS 5)
- Maps of gravity field, crustal age and seafloor spreading provinces (revised if necessary from PS 6)
- Triple junction linear velocity diagram (revised if necessary from PS 1)
- Angular velocity triangle (revised if necessary from PS 3)
- Magnetic anomaly profile from your study area (revised if necessary from PS 2)
- One paragraph on paleomagnetic data from a drill hole in your study area (PS 7)

1. Make a tectonic map, like the one you made for PS 6 but with a bit more stuff on it:

First, take a sheet of tracing paper and draw another map, at the same scale, as an overlay to the gravity map. On this overlay, you should sketch in all of the major features that are visible in the gravity data. These may include the active plate boundaries but also might include, e.g., fracture zones, pseudofault traces, dead ridges, seamounts, hotspot traces, or the traces of triple junctions.

Draw in 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. (You can use your results from PS #3 for this.)

Use references or the magnetic anomaly map we gave you earlier in class, to sketch in the approximate locations of key magnetic isochrons on the seafloor in your area.

2. Write up some text describing the plate tectonic evolution of your study area.

Describe the tectonic history that produced the important features visible on your tectonic map. Use the other maps and figures that you prepared for reference. 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. The seafloor spreading province map you made for PS #6 will come in handy here.
- 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?

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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 seismicity pattern or the length down-dip of the Wadati-Benioff zone?

e) Are there any enigmatic features on your map, for which the origin and history is unknown? 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.

Please recall that this is a scientific paper, and organize it appropriately. For example:

- Figures should have captions.
- Figures should be numbered according to the order in which they are referred to in the text.
- There should be a reference list for any references you are quoting in the text.
- Pages should be numbered.

There is no specific length requirement. However I estimate that if you are including all of the previous figures and some discussion of each of these, your text is likely to be at least 6 pages (double spaced if you do it in a word processor) and most probably longer than this.

A reminder: you are NOT allowed to copy anything verbatim from another source, be it the Internet or a published paper, without placing the material in quotes and citing the reference for it. See the web site <http://www.its.caltech.edu/~grb/HonorSystem> or the undergraduate Honor System Handbook for a detailed definition and explanation of plagiarism.

Also note: grammatical mistakes don't count against your grade. So if English is not your native language, don't worry about the English having to be perfect – the science is what is most important. (I will mark the grammatical errors just for your own information, however.)

Please ask Joann if you have any further questions about this assignment.