

Exploring the Sea Floor

The purpose of this Lab Exercise is to reinforce information in Chapter 2 of your lecture textbook, let you become familiar with some of Earth's major geographic features, and introduce the longitude-latitude coordinate system. Be sure you have read Chapter 2, and reviewed Figures 2.7 and 2.8 (p. 41) before coming to this lab. A review of Figure 15.2 and pp. 405-406 will also help. **Bring your textbook to Lab!** Work with a partner, but turn in your own Lab Report.

Use the Web URL <http://www.geomapapp.org> to open the application GeoMapApp 2.8.2 you will be using to answer many of the following questions. Be sure to **read the directions carefully**. (There may be an icon on your computer desktop to start this program; if so, use it instead of the Web site.)

Part 1: Mid Ocean Ridges

- 1) What is the average depth of the oceans (in m or km)?
- 2) What percent of Earth is covered by water?
- 3) What is a mid-ocean ridge and what type of plate boundary does it constitute?

- 4) Once on the website, make sure to launch the application. A new window will open entitled GeoMapApp 2.8.2. On the toolbar, find and click on the tab Focus Sites, click on Focus Sites -> NSF Ridge 2000 Program -> Mid Atlantic Ridge -> Tables -> Hydrothermal Vent Locations. A table featuring the ID, coordinates and elevations of hydrothermal vents on the Mid Atlantic Ridge will appear. Use this table and your textbook to answer the following questions:
 - A: What is a hydrothermal vent and where on a mid-ocean ridge would one most likely be found?

 - B: Estimate the average depth of the hydrothermal vents listed. In what unit of measurement are these elevations given?

 - C: Why are the vent elevations listed on this table negative?

- 5) Note the elevation difference between Question 1 and Question 3B. What accounts for this difference?

- 6) Now use the same two questions mentioned in Question 5 to approximate the height of a mid-ocean ridge above the average sea floor, use **meters**.
- 7) Keeping the focus between the eastern edge of the United States and western edge of Africa, select the + magnifier tool and click on the Mid Atlantic Ridge **three or four times** to zoom in until the ridge structure fills about the center half of the image. Now, click on the Distance/Profile Tool icon on the toolbar. With your cursor, find the location along the center of the ridge closest to longitude $40^{\circ}27'W$, latitude $32^{\circ}41'N$. Once you find it, click and hold that location. Then, drag your cursor (without releasing the button) towards the right hand side, following the east-west gashes you see perpendicular to the ridge (faults of this type are small transform plate boundaries) until the color beneath your cursor has just barely reached a dark blue. A profile of the line that you have drawn should pop up in a new window. Use this to answer the following questions. Draw several profiles across the ridge extending 100-200 km to the sides of the ridge center (axis) approximately through the longitude and latitude give above until you get one you think is representative.

A: What accounts for the sharp decrease in elevation at the ridge axis compared to 10-20 km to either side?

B: Using the graph, determine the slope of the mid-ocean ridge from a high point near the axis to approximately 100 km east of the axis. Make sure to show your answer in percent slope (rise/run x 100). Please show your starting values and calculations.

Part 2: Trenches

Use the smaller box in the upper right hand corner insert of the map display to move to a different location on the globe, southeast of Japan (or zoom way out, then in again).

The deepest point in the ocean, Challenger Deep, is located in the Marianas Trench. Marianas Trench is located southeast of Japan. Get a wide view of Southeast Asia and look in the ocean floor to find a large, nearly semicircular gash—the trench. Challenger Deep is near the south end of the trench, at about 142°E , 11°N . Zoom in on the Challenger Deep.

- 1) What type of plate boundary is typically associated with trenches?
- 2) Would you say that this area is or is not seismically active? Why or why not?
- 3) Why does the color on the map darken as you approach the trench?
- 4) Using the Distance/Profile Tool as we did previously, draw a line that runs from about $11^{\circ}2' \text{N}$, $139^{\circ}41' \text{E}$ to about $11^{\circ}52' \text{N}$, $144^{\circ}25' \text{E}$. What is the elevation of the deepest point recorded on your profile?
- 5) What is the term used to describe a chain of volcanic islands located along a subduction zone?
- 6) Using the color patterns you saw on the Marianas Trench, find the trench between Antarctica and South America. (Most of this trench is oriented N-S.) Give its latitude and longitude. Zoom out or in as needed.
- 7) Is the chain of volcanic islands located to the east or west of this oceanic trench?

Part 3: Continental Margins

- 1) Now, center your view on the wide part of South America. Zoom in/out until you can see both the east and west coast of South America and a little ocean.

A: Why is the area along the edges of the continent a grey color rather than the blue of the ocean? What would this feature be called?

B: Use the Distance/Profile Tool to measure the width of the continental shelf on the WEST coast (at about 4°N, 78°15'W). What is the width of this grey area?

C: What type of continental margin is present here?

Active (earthquakes, mountains, volcanoes) OR Passive (none of those)

D: What type of plate boundary might be found here (subduction, transform or spreading)?

E: On the EAST coast of South America (at about 3°N, 49°W), what is the width of the grey area?

F: What type of continental margin is present here?

Active OR Passive

G: What type of plate boundary would be found here?

- 2) Hudson Bay (in northeast Canada) is a large body of water that is connected to the ocean, but geologically speaking it is made of continental crust.

A: Is this true of the Gulf of Mexico?

B: Is this true of the North Sea (between England and Germany)?

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C: How can you tell?

3) Check out the continental shelf in the Gulf of Mexico.

A: What type of continental margin is present here?

Active Passive

B: Give the width of the continental shelf along the western edge of Florida.

C: Is the Caribbean Sea (between Yucatan and Haiti) mainly and Active or Passive part of the continental margin? Why do you think so?

Part 4: Your Own Curiosity

1) Take a look around the globe with GeoMapApp and find **two** features that you find interesting. Tell why you find them interesting, what you know about them (or would like to know) and give their location using latitude and longitude.