

The Geology of Pacific Northwest Volcanoes, Mountains and Earthquakes

Lab 2: Plate Rates

Name _____ Date: _____

Part 1: Tectonic Plate Spreading Rates

We can calculate an average rate of seafloor spreading by measuring the distance between MOR's, then divide the distance by the age of seafloor rocks collected there (e.g. such as from ODP cores).

$$\text{Recall: Rate (r) = Distance (d) } \div \text{ Time (t) or } r = d / t$$

(1) 5 pts: What is the average half spreading rate of the Atlantic Ocean basin measured along the Equator? Use the outer edge of the continent of Africa to determine the edge of the oceanic plate. The oldest ocean floor, basalt rocks collected at the base of the continental shelf are mid-Cretaceous in age. **(Show your calculations below)**

(2) 5 pts: What is the average half spreading rate measured from the MOR to the continental margin of the Pacific Ocean basin along the Equator? Measure from the East Pacific Rise to the continental margin in the western Pacific Basin. The oldest seafloor, basalt rocks collected here are mid-Jurassic in age. **(Show your calculations below)**

The Geology of Pacific Northwest Volcanoes, Mountains and Earthquakes

Lab 2: Plate Rates

Part 1: Tectonic Plate Spreading Rates

You now can synthesize your knowledge of charts, map scales, and plate tectonics to determine rate of plate movements. You will need a ruler and a calculator to make the 7 separate calculations (one for each of the Hawai'ian or Emperor Seamounts listed below). The radiometric age for each island or seamount is given in MYBP of Millions of Years Before Present. Show your work on a separate piece of paper and put your final answers in the Table below.

(3) 5 pts: Calculate the average rate of seafloor movement of the Pacific plate over the Hawai'ian Hot Spot using the radiometric age of the volcanic islands with respect to the distance from the active Hawai'ian Island shown in Figure 1.

One strategy to complete this is as follows:

- 1) Use latitude to determine the scale of the chart. To determine the scale, use a ruler to measure the distance on the chart (in mm) of 10° latitude. Since 1° latitude = 60 Nautical Miles, then 10° (of latitude) = 600 NM. Convert 600 NM to mm (using conversion factors). Calculate the fractional scale by dividing the 600 NM by the distance measured on the chart. Conversion Factors: 1 NM = 1.852 km; 1 km = 1,000,000 mm
- 2) Measure the distance between the Big Island of Hawaii and each of the successive older islands in the chain using the ends of the label lines.
- 3) Use the fractional scale to convert these to "real world" distances.
- 4) Divide the "real world" distance to the each island by the age shown and determine the rate of plate movement for each time period (e.g. 2 to 10 MYBP, 10 to 20 MYBP, etc.).
- 5) Show your calculations on a separate piece of paper and place your final answers in the table below.

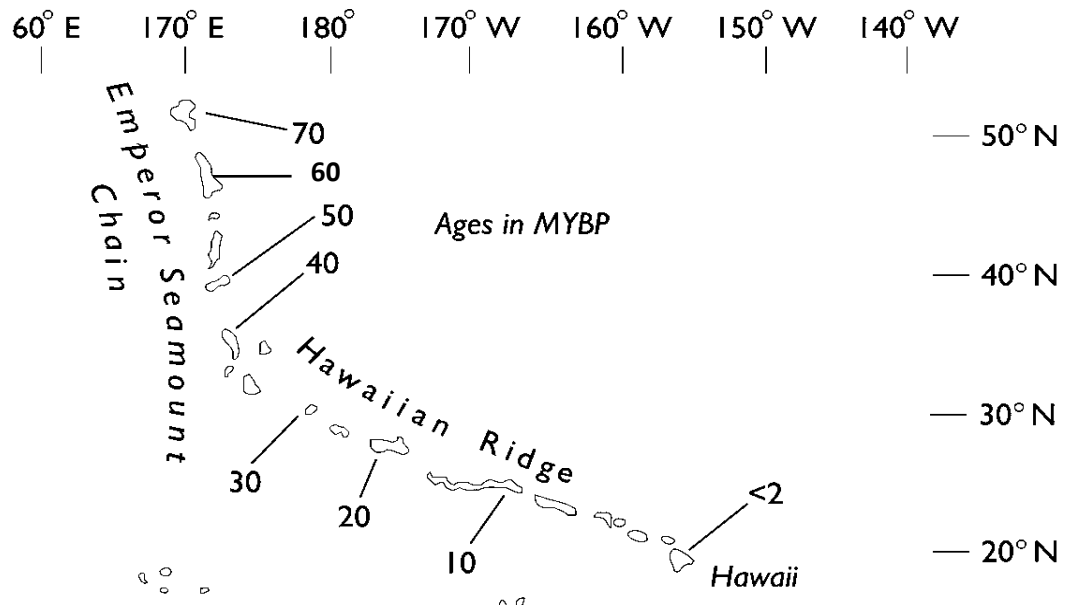


Figure 1: A chart showing maximum radiometric age dates and the distance from the active modern hot spot island of Hawai'i.

The Geology of Pacific Northwest Volcanoes, Mountains and Earthquakes
Lab 2: Plate Rates

(4) 5 pts: Assume sediments accumulate at the rate of 2 mm per 1000yrs (2mm/1000yr), what is the expected thickness of the sediment cover for each of the 7 seamount ages listed (e.g. 10 my, 20 m.y., etc.) up to the oldest seamount. Put your answers in the table above and show your work below or on a separate sheet.

Scale: _____

Age (MYBP)	1) Rate of Seafloor Movement (mm / yr)	2) Sediment Thickness (meters)
10		
20		
30		
40		
50		
60		
70		

