Lab 1: Reading different kinds of maps used in geology

Note: On all labs, you may work in small groups. You may turn in one lab for all of the group members; make sure that everyone who should get credit is listed! For exams, you may use the labs as a reference, but you may not share labs during the exam — please keep a copy of the answers for your own use.

Mt. St. Helens and vicinity topographic map

Topographic maps (or “topo sheets”) show a representation of an area, and use contour lines to depict elevations.

1. a. What is the year of publication of the map? Which organization(s) produced it (they are typical of the maps we will look at this quarter)?

b. What is the highest elevation on the map? What is the lowest elevation on the map? Include units.

2. What is the straight-line distance between the two points in part b? Include units.

3. What is the latitude and longitude of the Mt. St. Helens crater? Include units and compass directions.

4. What does the green shading indicate? (Traditionally, green meant forested land) So how can you tell where the deforested “blast” zone (from the eruption on May 18, 1980) is?

5. What does the gray non-speckled area represent? What does the gray speckled area represent? Which is the more far-reaching hazard?
6. What is the slope of the inner wall of the caldera? What is the slope of the southern flank of the mountain? Which is steeper? Report slopes as a percent slope (calculate this by picking two contour lines on the slope, then find the difference in elevation between the two lines, divide by the lateral distance between the two lines and multiply the result by 100).

7. a. Plan a hike from Woodland (near the lower left corner of the map) to Randle (near the upper right corner of the map). Remember you want to minimize elevation gains and losses. List three geographic features, towns or roads you will pass by or on:

Raised relief map of Mt. Rainier

These maps make the idea of contours more tangible — follow any of the brown-line contours; they should form a level path.

b. On your hike, were you to continue upstream along the banks of the Cowlitz River, all the way to its headwaters, where would you end up?

8. What is the vertical exaggeration on this map? Does this mean that the mountains are taller than they ought to be for the scale of the map, or shorter?

9. Why didn’t the Mt. St. Helens blast of 1980 affect the upper Cowlitz River valley (where State Route 12 runs)?
Geologic Map of Washington

Geological maps have a different emphasis than topographical maps. Though the topography might lurk in the background of a geological map, it may be hard to figure out exactly where you are on a geological map!

10. Note the column headed “Geologic Units” to the right of the map. By what two characteristics are the geologic units divided into different colors (page 224 of the text may be helpful in determining one of these characteristics)?

11. Locate north Seattle. Write the two-letter designation of the local geologic unit. What is the apparent dominant geologic force that has shaped this area (hint: read the unit description and guess what the second letter of the designation stands for)?

12. Note the large portion of the colored areas on the map that have a “Q” as the first letter of that geologic unit. Give a reason that there is so much “Q” area (page 224 may be helpful again).

13. Note the “Explanation” of symbols at the bottom of the map. A contact is a line along which two geologic units meet. A fault is a breakage in the rocks along which movement has occurred. Choose the correct entry from within the terms in the parentheses:

a. (All Some No) faults are contacts.
b. (All Some No) contacts are faults.

14. Are all the faults shown on the map active? Explain your answer; sketch a portion of the map that illustrates your answer. Hint: Do some of the faults seem to terminate abruptly when the color of the geologic unit changes? What does this indicate about the “brokenness” of the color without the fault and what does this imply about the fault?
The Plate Tectonic Map of the Circum-Pacific Basin Region

Some geologic maps dispense with showing rocks altogether; clearly, they are used for a different purpose.

15. Find the Pacific Plate. Later in this exercise, you will want to find out the rate at which the Pacific Plate is moving. Do you use the red arrows or clear arrows? What's the difference between them?

16. What is the current rate of Pacific Plate motion near Hawaii? Don’t forget to include the units of motion!

17. a. Measure the distance from the big island of Hawaii to Kammu Seamount, off to the west (remember to measure this distance as kilometers).

b. Using the conversion factor 1 km = 100,000 cm, calculate the length of time in years represented by the seafloor between Kammu Seamount and Hawaii, assuming the Pacific Plate has moved at a constant rate.


18. As you may have heard on the news the other day, this area (known also as “Washaway Beach”) has been eroding rapidly over the past couple weeks. Since 1956, the coastline has steadily eroded back to the town of North Cove (on the northern part of the map) and Highway 13A (now called Highway 105). Using the blue line which defines the shoreline, calculate the rate of coastal erosion here.
19. What changes have been forced on human usage of this area?

20. a. Judging by the shape of Leadbetter Point spit, what is the direction of the longshore drift (the larger map may also help answer this question)? Therefore, where is the most likely source of sediment for the creation of Willapa Bay?

b. So, ultimately, what is causing the coastal erosion of North Cove?