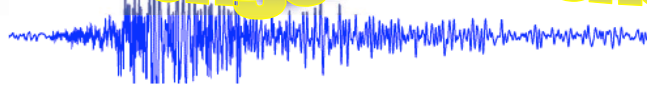


# Challenge Worksheet



Geophysics of Earthquakes

## Lab 7: California Faults & Seismicity

- Your Mission:**
- (1) Identify 20 active faults in California
  - (2) Identify the direction of fault motion and the slip rate for each fault
  - (3) Investigate recent earthquakes near your hometown
  - (4) Use Microsoft Excel to plot a small set of earthquake data

**Your Supplies:**

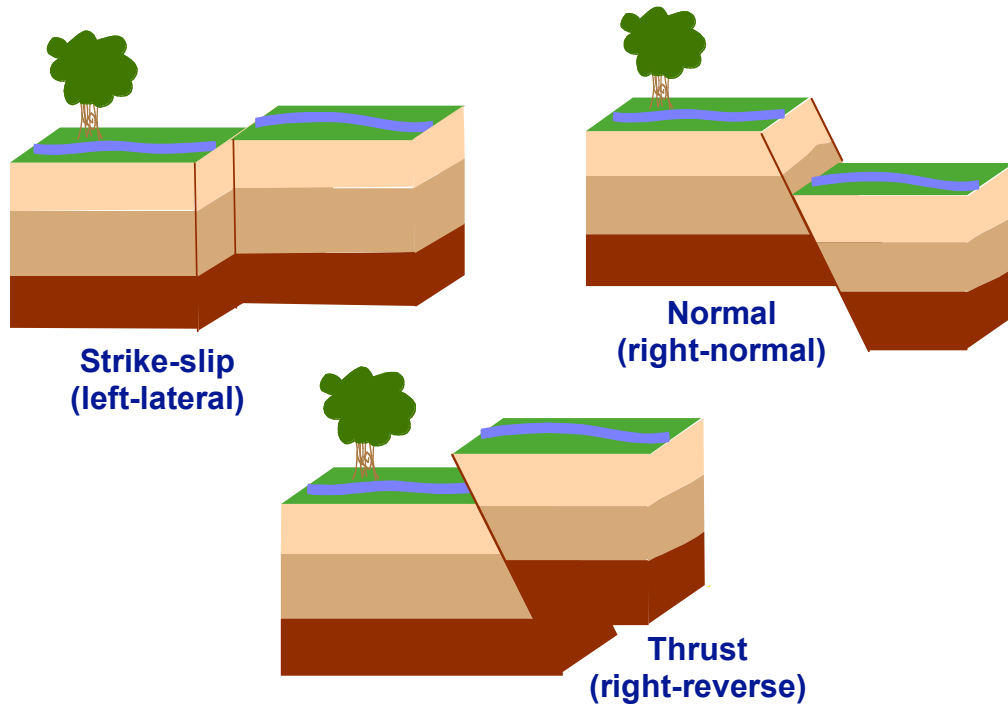
- **California Faults** map handout
- Assembled 4-page California fault map (taped together)
- **Sense of slip** fault map handout
- **Slip Rates** fault map handout
- **California Faults & Rates** table

**Your Task:**

### Part 1. California Faults

1. Using your assembled 4-page California fault map, identify each of the faults numbered on the map handout titled **California Faults**. Write each of these in the **2<sup>nd</sup> column** of the table handout titled **California Faults & Rates**.
2. Now use the fault map handout titled **Sense of slip** to identify the “sense” (or direction) of slip for each of the southern California faults that you identified in the table. Each fault is color-coded according to the type and direction of fault

movement. The colors designate whether a fault is primarily a normal fault, a lateral (strike-slip) fault, or a reverse (thrust) fault. The colors also designate the direction of fault motion (left or right). Use your best judgment and identify the sense of slip in the **3<sup>rd</sup> column** of the table.



**Challenge Question #1: Looking at your table, what is the general slip direction of most faults in southern California?**

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**Challenge Question #2: Which faults move in a different slip direction? What is their direction?**

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- Next use the fault map handout titled **Slip Rates** to identify the slip rate for each of the southern California faults. Each fault is color-coded according to the amount of slip (in mm) that takes place each year. Use your best judgment and identify the slip rate for each fault in the **4<sup>th</sup> column** of the table.

**Challenge Question #3: Looking at your table, which fault(s) have the highest slip rate? What is it?**

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**Challenge Question #4: Which fault(s) have the lowest slip rate? What is it?**

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4. Finally, use the assembled 4-page California fault map to identify if any major earthquakes have occurred on your listed faults. Major earthquakes are identified by solid black dots. Information about each earthquake is given in the top right-hand corner of the assembled map. If an earthquake has occurred on a fault, list the year of the earthquake(s) and the magnitude.

**Challenge Question #5: From your table, name the faults that hosted the three largest earthquakes in California. When did these occur?**

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5. Next locate the region of your hometown on the assembled 4-page California map and identify the largest fault in your area. If the fault near your hometown is **not** labeled on your map, visit the large classroom map of all California faults. Fill in the blanks below about the largest fault in your area:

**Name of fault** \_\_\_\_\_

**Sense of slip** \_\_\_\_\_

**Rate of slip** \_\_\_\_\_

**Last major earthquake?** \_\_\_\_\_

## Part 2. California Seismicity

Next you are going to inspect the earthquakes that have occurred in or nearby your hometown over the past week. Login to a computer in the computer lab and open up Internet Explorer. Type in the following web address:

<http://quake.wr.usgs.gov/recenteqs/latest.htm>

1. Find the region of your hometown on the map and click on it.
2. Next click on the heading at the top of the map that says

**“Other Maps: Recent earthquakes with fault and topographic information”**

3. Now you should be looking at a map that shows major streets (gray lines), faults (thick brown lines), and topography (pastel shades in the background). By simply running your mouse over each of the fault lines (don't click!), you can discover which faults reside near your hometown. In the space below, list at least 5 faults that you see in your area:

**Fault #1** \_\_\_\_\_

**Fault #2** \_\_\_\_\_

**Fault #3** \_\_\_\_\_

**Fault #4** \_\_\_\_\_

**Fault #5** \_\_\_\_\_

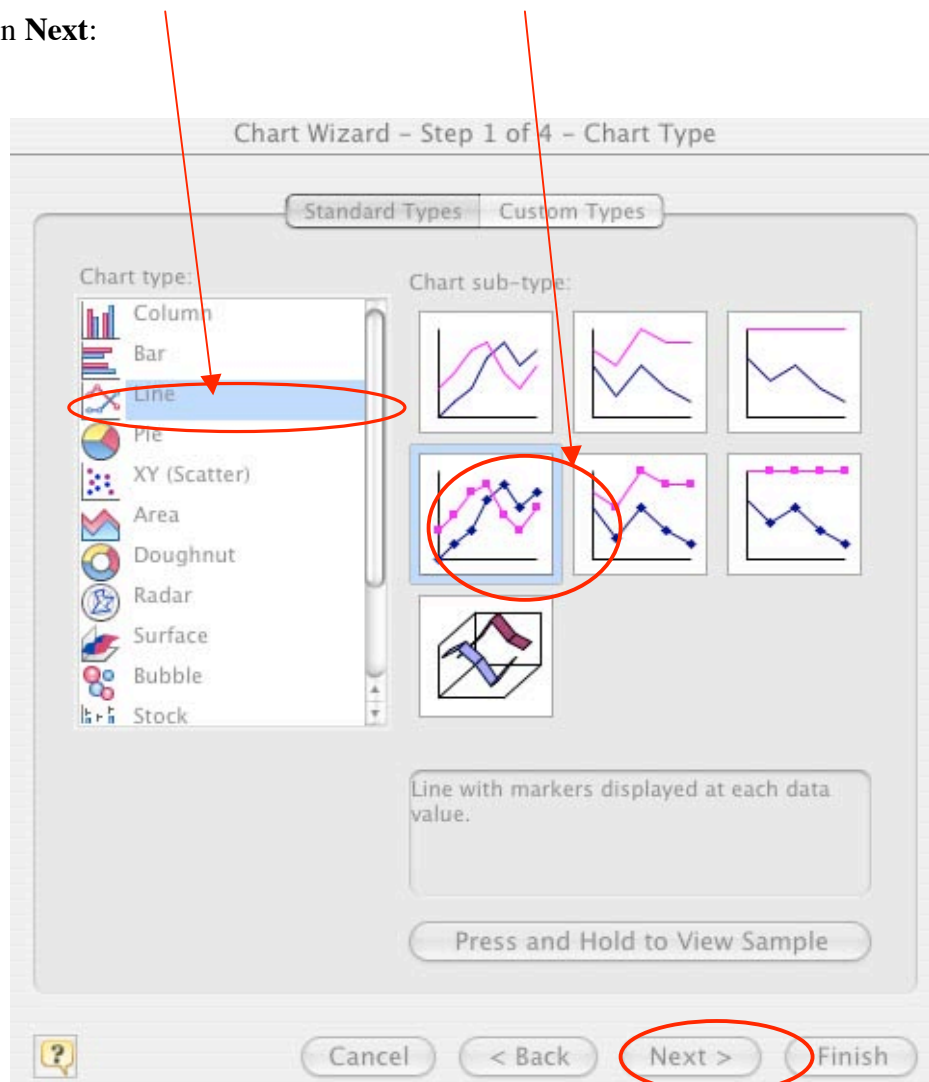
4. Now hit the “Back” button and return to the previous page. Then click on the **“List of Earthquakes on this Map”** link below the map. This should bring you to a list of earthquakes in your area.

5. In the table provided below, enter the information from at least 10 of the earthquakes in your area (you can do more if you want!) from the past week.

<b>Date of earthquake (Example: 2005/07/21)</b>	<b>Depth of earthquake (km) (Example: 10)</b>	<b>Magnitude of earthquake (Example: 2.5)</b>

6. Using the earthquake data that you collected in the table above, you will now plot this data using Microsoft Excel. To begin, open up the Microsoft Excel program on your computer. Open up a new workbook by clicking on the **OKAY** button.

7. Now you will enter the data from your table into the columns labeled 'A', 'B', 'C' in Excel. Enter the date of each earthquake in column 'A'. Enter the depth of each earthquake in column 'B'. Enter the magnitude of each earthquake in column 'C'. Note that you can enter your earthquake dates in the same format as listed in your table (example: 2005/07/21) and Excel will automatically adjust these numbers into a format that it prefers. This is fine!
8. After you have entered all of your data, use your mouse to highlight your first two columns (Dates and Depths). Next, select **Insert** from the menu bar, then select **Chart** from the pull down menu. Now you will use the Chart Wizard Popup window to create a plot.
9. Step 1: Click on **Line**, then click on the graph type as shown below, and finally click on **Next**:



10. Step 2. Preview your plot. Then click on **Next**.
11. Step 3. Give your plot a **title** and also fill in names for the **(x) axis** and the **(y) axis**. Then click on **Next**.
12. Step 4. Click on the **As object in** button to save your plot into the same document as the data you have entered. Then click on **Next**. Finally, click on **Finish**. Your plot should now appear in the same window as your typed data.
13. Now repeat the steps above, but now plot your 1<sup>st</sup> and 3<sup>rd</sup> columns (Dates and Magnitudes).
14. Now save your document. Select **File** from the menu bar, then select **Save**. You can name the file anything you want.

**Challenge Question #6: From your plot, what day from the past week had the deepest earthquake?** \_\_\_\_\_

**Challenge Question #7: Do you see any unusual (or unexpected) patterns in your plot? If so, explain.** \_\_\_\_\_

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