Virtual Earthquake Exercise for GSCI 100

You are about to trigger a virtual earthquake and measure its properties. This will allow you to practice using information recorded on a seismograph to recognize the different velocities of compression (P) and shear (S) waves and locate the epicenter of an earthquake. By the end of the exercise, you will be a certified seismologist, at least in the virtual world.

Note: Mozilla Firefox is the preferred web browser for this exercise. Other web browsers may not load images effectively (especially during the "quiz" – see below). You will need to allow pop-ups on the website in order to complete each exercise.

Part 1. Recognizing the relationship P and S-wave travel times and distance to the epicenter

1. Point your web browser to: http://www.sciencecourseware.org/eec/Earthquake/

2. Click on the icon that reads "Travel Time", then click "Start".

3. Familiarize yourself with the icons on the panel, then begin the exercise.

4. Start by typing your name in the blank space in the lower window. You will save your work later.

5. Drag the five seismograph stations to random positions on the map. Ideally, each station will be at a different distance from the earthquake epicenter.

6. Turn on the volume of your computer, then click "Trigger Explosion"

7. Measure the S-P lag times. Start by clicking on the icon with a horizontal arrow in the upper right corner of the window. For each station, drag the line from the start of the P waves on the seismograph to the start of the S waves. The distance between them on the seismograph is proportional to the lag time. Record the S-P lag time for each station in the data table.

8. Once you have recorded the lag times, click on the icon in the upper right with half circle and three boxes. On the map display, click and drag the circle to measure the distance from the epicenter of the explosion to each seismograph. Record each distance in the data table.

9. Click "Verify Data Table" to check your answers. If necessary, go back to the seismograms or the map to fix your mistakes.

10. When you are ready, click on the icon with an arrow pointing to a dot to plot the S-P lag times verses distance to the epicenter. Plot the points in the correct position on the graph. Click on "Verify Points" to make sure you have plotted the graph correctly. Fix any mistakes if necessary.

11. Click on the icon with an arrow pointing to a line to add a best-fit line to your data. Click on "Verify Slope" to make sure you have the best possible fit (with the minimum errors).

12. Answer the questions at the end of the journal (you have to click on the graph icon to do this).

Part 2. Locating the epicenter and finding the magnitude of an earthquake.

13. Go back to the Virtual Earthquake homepage. Click on the icon that reads "Epicenter and Magnitude". Start the activity.

14. Familiarize yourself with the icons on the panel, then begin the exercise by typing your name in the blank space on the data table.

15. Click on the icon of an "E", turn up the volume on your computer and click "Trigger Earthquake". Note that in this case you do not have the option of moving the seismograph stations (indicated by numbers in red boxes).

16. Measure the S-P lag times and amplitudes. This procedure is very similar to what you did in part 1. Note that you only need to do this for three stations on the map. Start measuring lag times by clicking on the icon of a horizontal arrow, then measure and record amplitudes by clicking on the icon of a vertical arrow. Record your measurements and station numbers in the data table.

17. Click on the icon of a graph and line to determine the distance from each station to the epicenter, as you did in part 1. Record the data in the table.

18. Click on the icon of three intersecting rings to go to the map display and locate the epicenter. For each station, draw a circle with a radius equal to the distance from the epicenter. The intersection of all three circles marks the location of the epicenter. Do not worry if the circles do not intersect perfectly.

19. Click on the icon of a circled "E" to plot the epicenter on the map.

20. Click on the icon of a globe to find the latitude and longitude coordinates of the epicenter. Note that 1° of latitude or longitude is equal to 60 minutes. Record the geographic location information in the data table (use units of degrees and minutes, no decimals!).

21. Click on the icon of three vertical lines with a slash to determine the magnitude of the earthquake at each station. Note that this is dependent on amplitude on the seismogram and distance from the epicenter. Record the magnitude for each station in the data table.

21. Click "Verify Answers" in the data table to determine if you have successfully completed the exercise. If necessary, go back and fix any mistakes.

22. Once you have completed the exercise, TAKE THE QUIZ.

23. Fill out the information in the blank spaces. ENTER THE CLASSCODE, 1045875

24. Complete the quiz, and print your certificate of completion if you want to (your score is automatically entered into a database). Repeat the quiz if you wish to improve your score. If the quiz does not load images effectively, go back to the homepage, click "Take Quiz Now", enter the class information again and repeat the quiz. Try running the exercise with Mozilla Firefox if problems with the quiz persist.