Lab # 20: Finding Epicenters

Procedure A:

The diagram below, Finding Epicenters, illustrates the method of using the difference in arrival times of P and S waves to determine the distance to the epicenter. Using the three seismograms provided on page 2 and the “Earthquake P-wave and S-wave Time Travel” graph in the Earth Science Reference Tables, calculate the following for each city. Enter the data into the data table on page 3.

1. Determine the arrival times for the P-wave and S-wave from the seismograms for Chicago, Tampa and Wink.
2. Subtract the P-wave arrival time from the S-wave arrival time to determine the difference in arrival times.
3. Use the ESRT page 11 to determine the distance (in km) of the epicenter from each city.
4. Using the distance you determined, find the P-wave travel time from the ESRT on page 11.
5. Subtract the P-wave travel time for the P-wave arrival time to determine the origin time.

Procedure B:

1. a) To locate the epicenter on the map, for each city, construct a circle whose radius is equal to the distance form the city to the epicenter.
   
   b) Use the scale of distance of your map to set the drawing compass at the correct radius.

2. Mark and label the epicenter on the map where all three circles intersect.

Diagram: Illustrating Finding Epicenters
Data Table

<table>
<thead>
<tr>
<th>Seismograph Station</th>
<th>Arrival Time (clock time)</th>
<th>Difference in Arrival Time (min. and sec.)</th>
<th>Distance to Epicenter (km)</th>
<th>P-Wave Travel Time (min. and sec.)</th>
<th>Time of Origin (hr, min, sec)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chicago</td>
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<tr>
<td>Tampa</td>
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<td>Wink</td>
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</tbody>
</table>
Discussion Questions: (Answer in Complete Sentences)

1. How do P-waves and S-waves differ?

2. What was the approximate location of the epicenter of this earthquake?

3. Why is three the minimum number of stations necessary to locate an epicenter?

4. Why does the time between the arrival of the P-wave and S-wave become greater and greater as you get farther away from the epicenter?