

How far was the explosion from each station?

We do not know exactly when the explosion happened. This means that we cannot simply use the speed and time of arrival of one type of wave. Instead, we must use the difference in arrival time of the P and S waves.

1. Reading from the seismograms

Your teacher will tell you which station to start with. Complete all the steps for one station before moving on to the next one.

Station A – Beijing

- The first P arrival is at _____ seconds.
- The first S arrival is at _____ seconds.
- The difference in arrival time is _____ seconds.

Station B – Taipei

- The first P arrival is at _____ seconds.
- The first S arrival is at _____ seconds.
- The difference in arrival time is _____ seconds.

Station C – Sapporo, Japan

- The first P arrival is at _____ seconds.
- The first S arrival is at _____ seconds.
- The difference in arrival time is _____ seconds.

Station D – Seoul

- The first P arrival is at _____ seconds.
- The first S arrival is at _____ seconds.
- The difference in arrival time is _____ seconds.

Station E – Siberian outpost

- The first P arrival is at _____ seconds.
- The first S arrival is at _____ seconds.
- The difference in arrival time is _____ seconds.

2. Working out the distance

- V_P is the average P wave speed along this path.
 $V_P = 8\text{km/s}$
- V_S is the average S wave speed along this path.
 $V_S = 4.5\text{km/s}$

These are shown on the time-distance graph.

Use the graph and the difference in arrival time to find the distance of the source from the station.

Station	Location	Distance from epicentre to station/ km
A	Beijing	
B	Taipei	
C	Sapporo, Japan	
D	Seoul	
E	Siberian outpost	

3. Drawing on the map

- Add this information to your map. Draw on where the explosion could have occurred according to the data from this station. Take care with the scale!
- Your teacher will tell you when you should stop looking at new stations. You can share values with the class and add all the information to your map. This should tell you the location of the explosion!
- Where was the explosion? What could have caused it?
- Extension 1: What are some assumptions we made to work out the distances from the stations?
- Extension 2: Pick a station and draw the P and S wave journeys as a distance-time graph