

Geophysics 210 Fall 2008 Assignment 3 – Earthquake seismology

Question 1 (Fowler Chapter 4, problem5)

During a micro-earthquake survey in Turkey, an earthquake was recorded by three seismometers. The travel times are listed below. A map showing the seismometer locations is attached below.

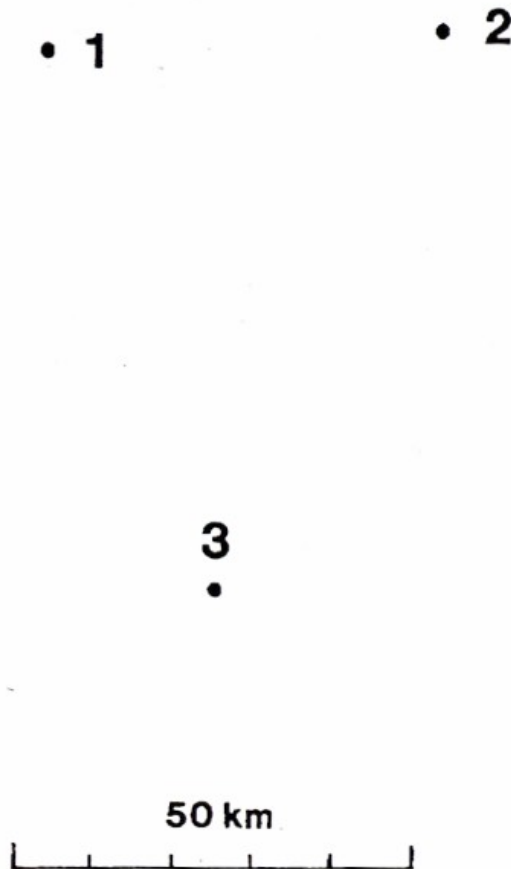
Seismometer 1	<i>Hours</i>	<i>Min</i>	<i>Seconds</i>
P-wave	13	19	58.9
S-wave	13	20	4.7

Seismometer 2	<i>Hours</i>	<i>Min</i>	<i>Seconds</i>
P-wave	13	20	2.6
S-wave	13	20	10.8

Seismometer 3	<i>Hours</i>	<i>Min</i>	<i>Seconds</i>
P-wave	13	19	54.5
S-wave	13	19	57.4

Assume that the earthquake occurred at the surface.

The P-wave and S-wave velocities in this area are 5.6 and 3.4 km/s respectively.



Answer the following:

- (a) Distance of earthquake from station 1 = _____ km
- (b) Distance of earthquake from station 2 = _____ km
- (c) Distance of earthquake from station 3 = _____ km
- (d) Time at which earthquake occurred = _____
- (e) Mark the epicentre on the map above

Question 2

Prior to the construction of a nuclear power plant in Alberta, a seismologist is estimating the probability of large earthquakes.

The area has been monitored for 50 years and ten $M > 3$ events have been recorded.

- (a) Sketch the appropriate Gutenberg-Richter relation. Assume $b = 1$
- (b) Estimate the a value
- (c) Estimate the repeat time of a $M > 6$ earthquake in this area.

Question 3

A newly discovered planet is being investigated by a seismologist.

It has a radius of 5000 km and is believed to have a core.

The outer layer has a **uniform** P-wave velocity of 8 km/s.

(a) P-waves are recorded from $\Delta = 0^\circ$ to $\Delta = 110^\circ$. Beyond $\Delta = 110^\circ$ is a shadow zone where no P-waves are observed. Estimate the radius of the core.

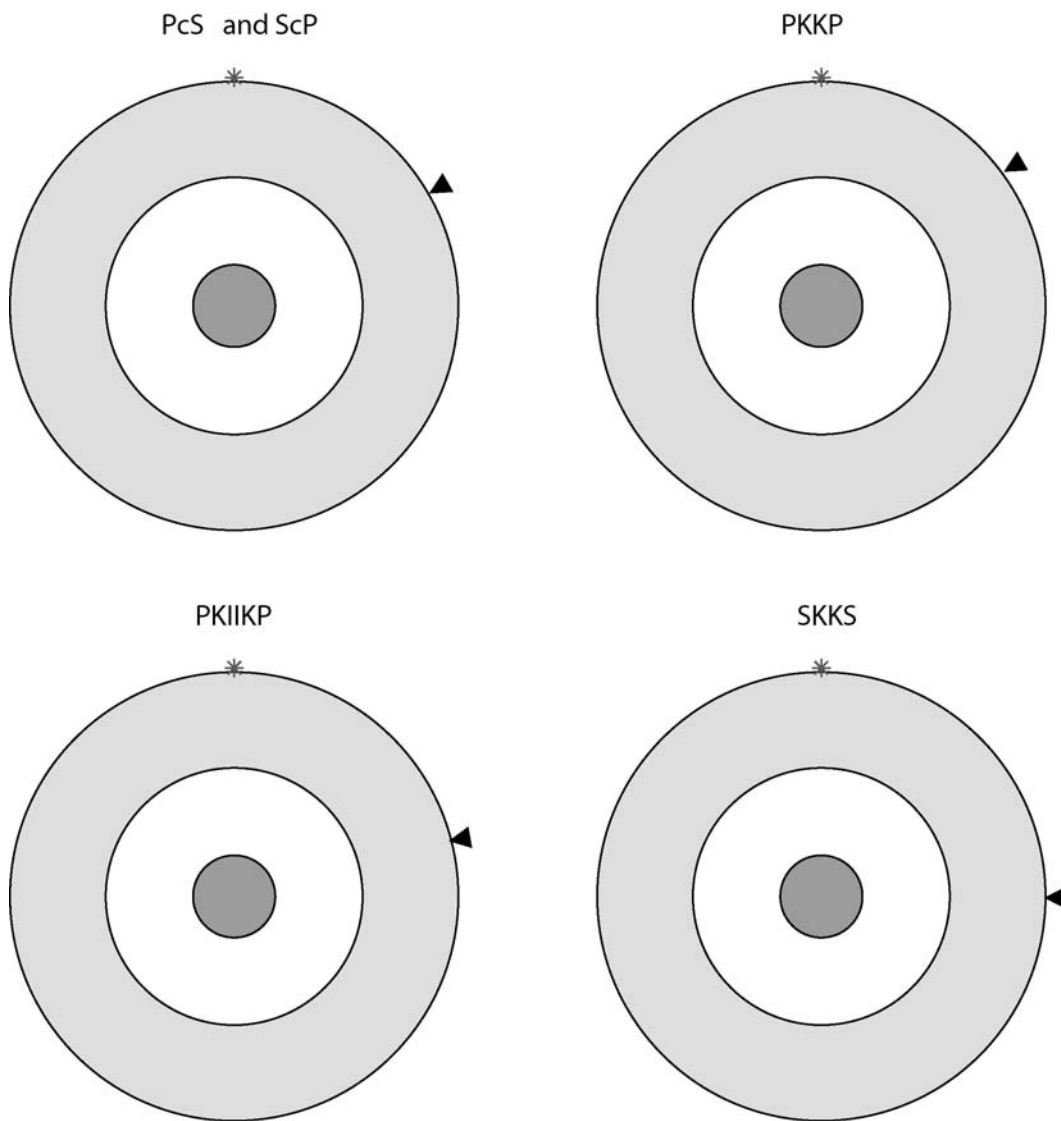
(b) The travel time for the P-waves arriving at $\Delta = 180^\circ$ and travelling through the centre of the planet is 23 minutes.

What is the P-wave velocity of the core?

Question 4

On the figure below, sketch the ray paths for the following teleseismic phases

- (a) ScP and PcS for $\Delta = 60^\circ$
- (b) PKKP at $\Delta = 60^\circ$
- (c) PKIKP at $\Delta = 80^\circ$
- (d) SKKS at $\Delta = 90^\circ$ (2 possible ray paths)



Question 5 Read sections 4.2, 8.1 and 9.6 from the text book.

This assignment will be due in class on **Tuesday November 25 2008**

Office hours will be announced shortly.