EES 151: Quantitative Foundations
Homework 3
Due: Tuesday March 27, 2018

Name: _____

Models of the interior of the Earth

The first thing we will do is look at the model of the interior of the Earth that is homogeneous with a P wave seismic velocity of 11 km/s.
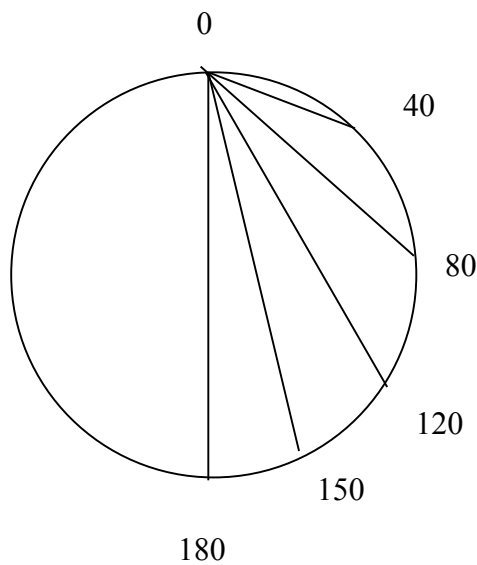

TABLE 1. Model of the interior of the Earth with constant seismic velocity 11 km/sec

Geocentric Angle Δ (degrees)	raypath length (km)	Travel Time (s)	Travel Time (min)
0			
40			
80			
120			
150			
180			

1. Plot the calculated travel times at the five distances (place a dot at the distance and location given by the data in columns 1 and 3 of Table 1 on the graph shown in Figure 1(last page). Draw a smooth curved line through the calculated travel times beginning at zero distance (Delta) and zero time. <u>Observed</u> travel times for the compressional wave are plotted as solid lines. . Do the observed and calculated times differ significantly? What does this imply about our assumption that the Earth's interior can be modeled using a P wave with a constant velocity of 11 km/s?

2. If the Earth is homogeneous and we selected a different velocity than 11 km/s, could we obtain an adequate fit between the observed and calculated travel times? Why or why not?

3. Which of the raypaths you looked at tell us about the shallow Earth? Which tells you about the deep Earth? Which tell you about both? (This is a slightly tricky question)

4. Now that we know that the Earth's interior cannot consist of a constant velocity, we use the travel time information to make additional inferences about the velocity structure of the interior.   Compare your answers to the measured P-wave velocities. In shallow areas do you need the velocity to be greater or smaller? How about deeper? How do you know this?
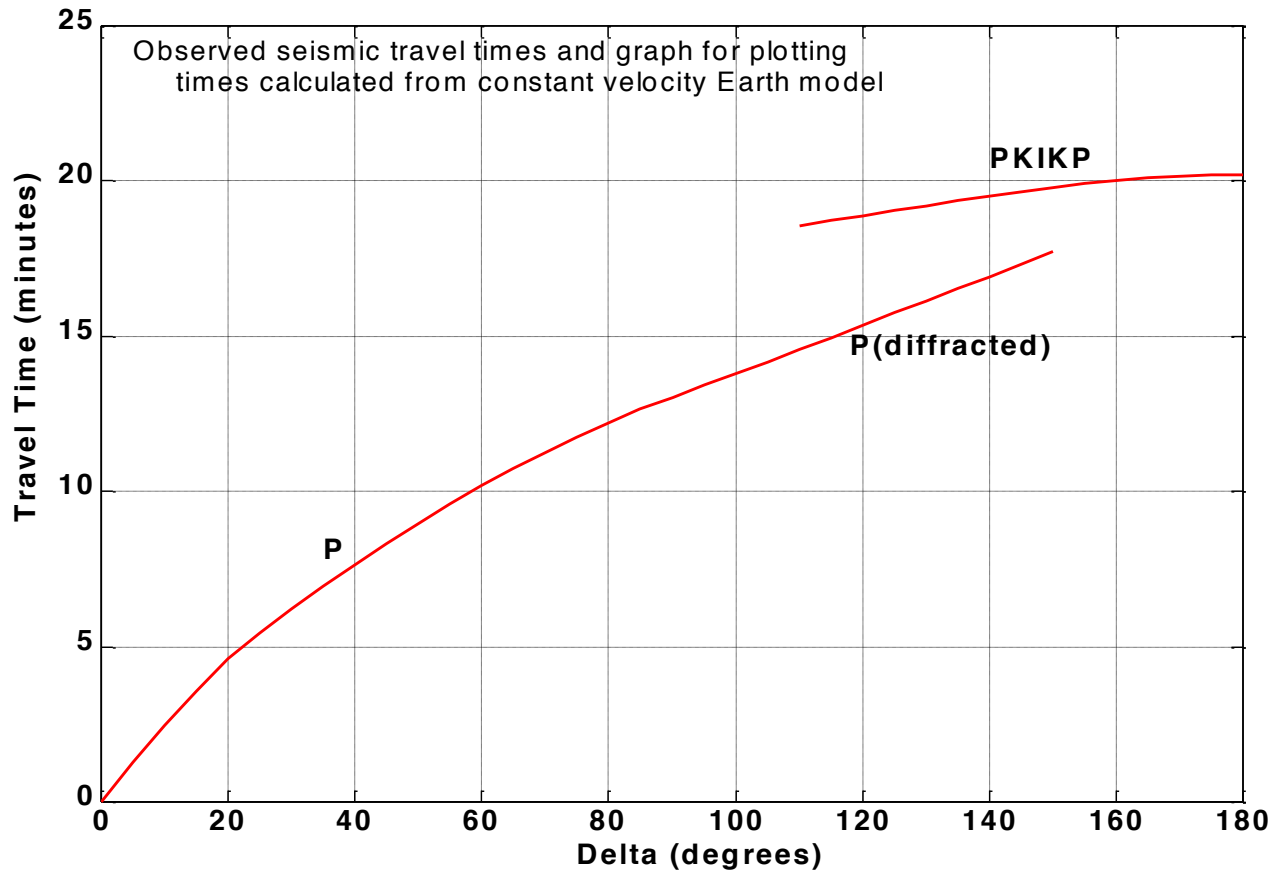
Figure 1 . Observed time travel curve for a compressional wave through the Earth. From Braile (2000)