

Chapter 1

Exercise solutions

1. The radii of the Earth, Moon, and Sun are 6,371 km, 1,738 km, and 6.951×10^5 km, respectively. From Figures 1.1, 1.5, and 1.6, make a rough estimate of how long it takes a P -wave to traverse the diameter of each body.

Crude estimates based on mean velocity follow:

Earth: $2 \times 6371 \text{ km} / 11 \text{ km/s} = 1160 \text{ s} = 19.3 \text{ min}$

Moon: $2 \times 1738 \text{ km} / 7.6 \text{ km/s} = 460 \text{ s} = 7.7 \text{ min}$

Sun: $2 \times 7 \times 10^5 \text{ km} / 250 \text{ km/s} = 5600 \text{ s} = 93 \text{ min}$

2. The P to S velocity ratio for most common rocks is about 1.7 ($\sim \sqrt{3}$). What solid part of the Earth has a very different P/S velocity ratio? Hint: Look at Figure 1.1.

The inner core, where the P/S velocity ratio is about 3.

3. Assume that the S velocity perturbations plotted at 150 km depth in Figure 1.7 extend throughout the uppermost 300 km of the mantle. Estimate how many seconds earlier a vertically upgoing S -wave will arrive at a seismic station