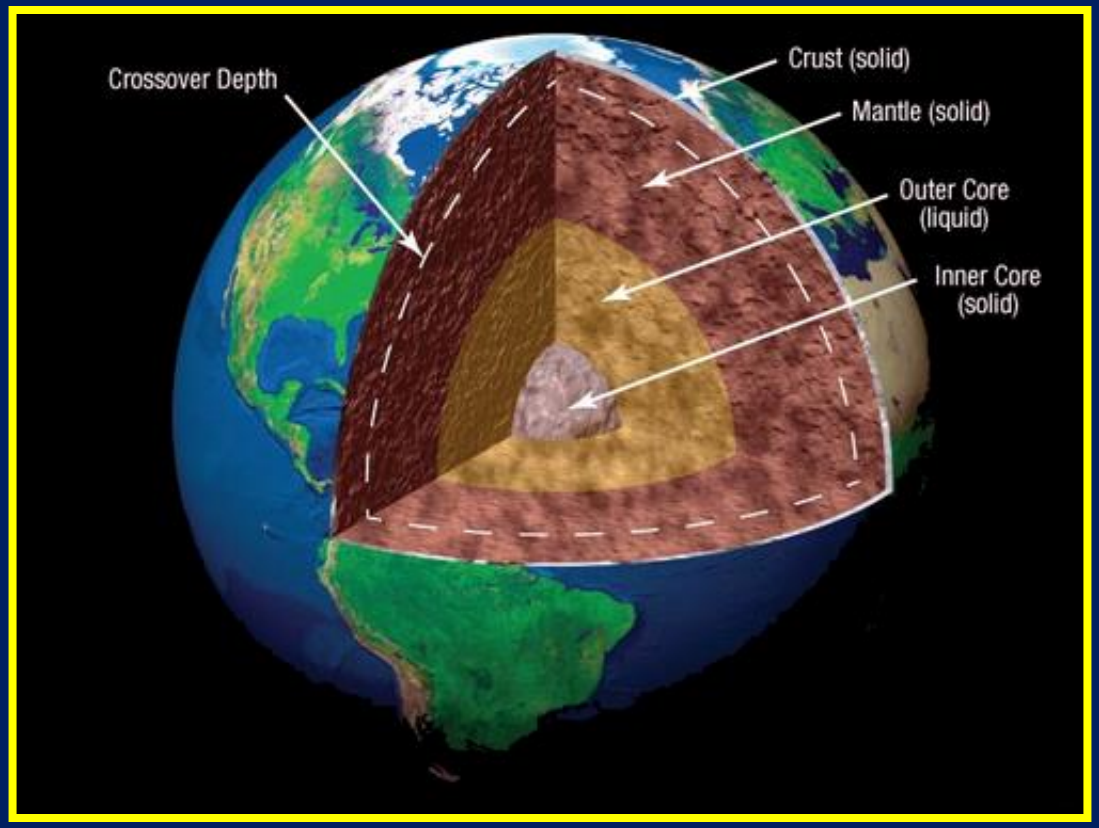
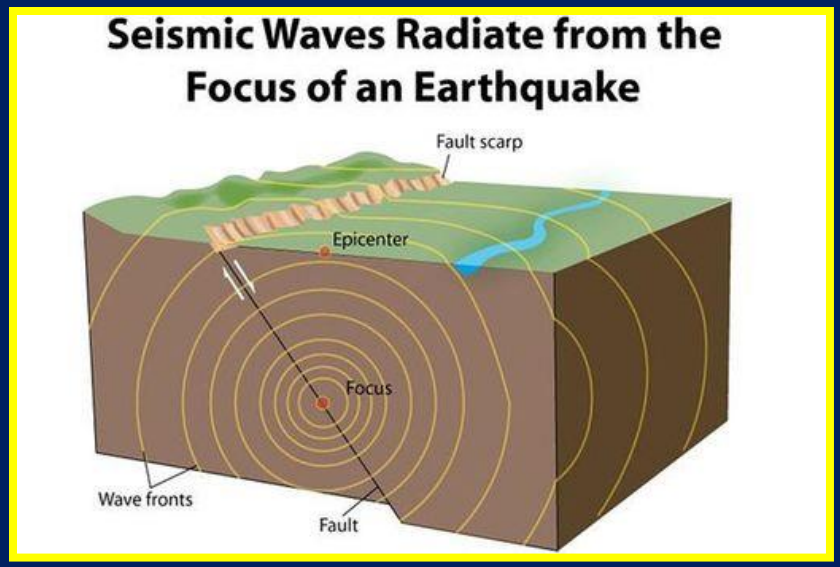
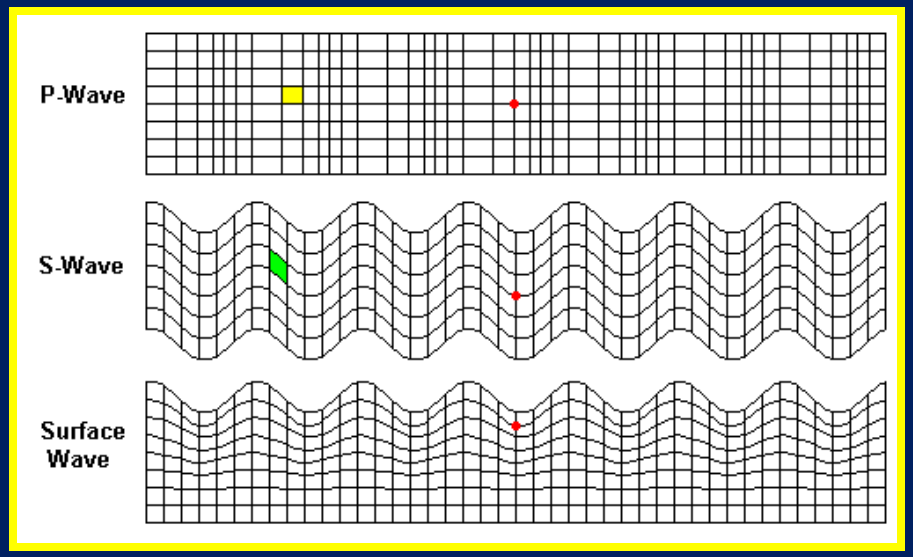
Seismic Waves and the Structure of Earth



Seismic Waves

The vibrations of the ground that radiate out from the focus of an earthquake are called seismic waves.

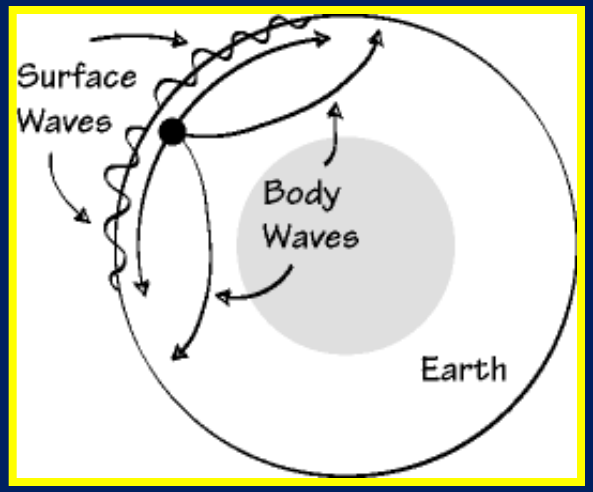


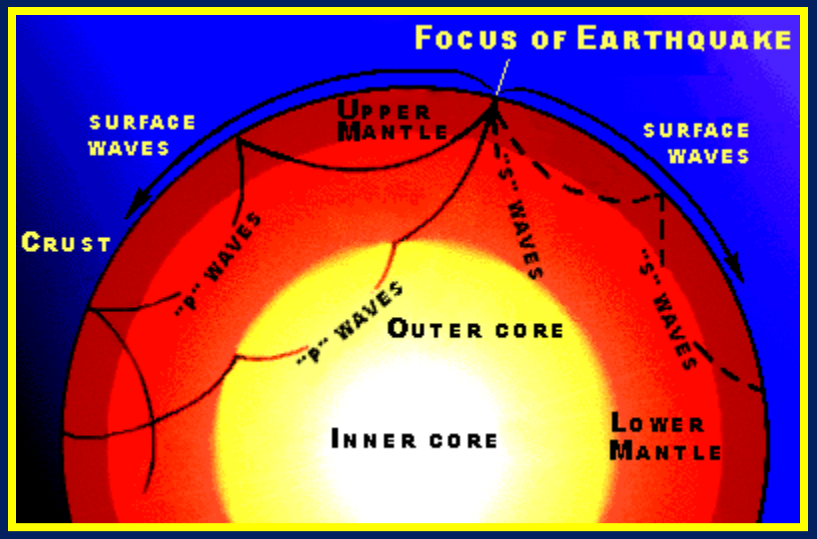


Three types of seismic waves: primary waves; secondary waves; and surface waves.

Seismic Waves

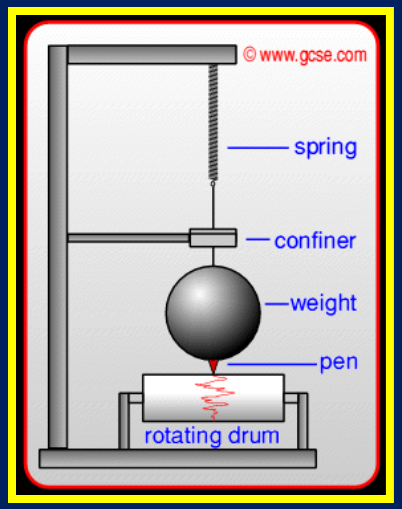
Surface waves travel horizontally across the surface of Earth.



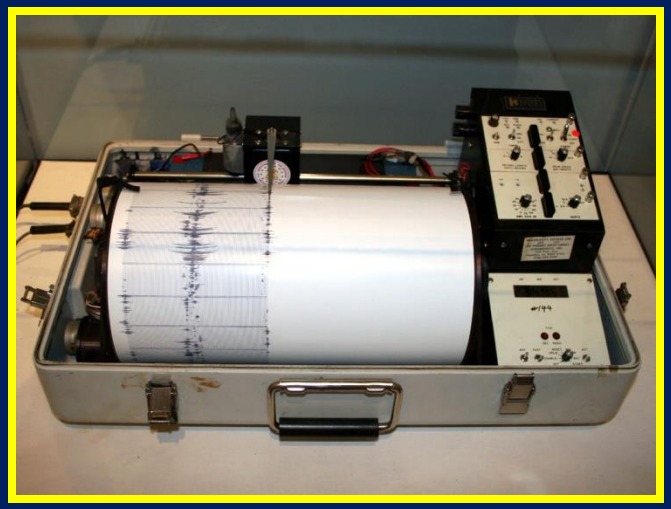


Both primary and secondary waves are called body waves because they travel downwards through the body of Earth.

Seismic Waves

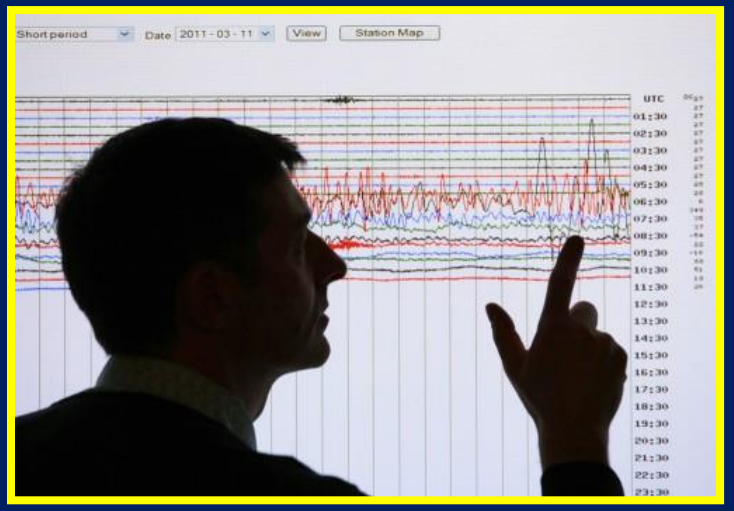


Seismic waves can be measured and recorded using seismometers



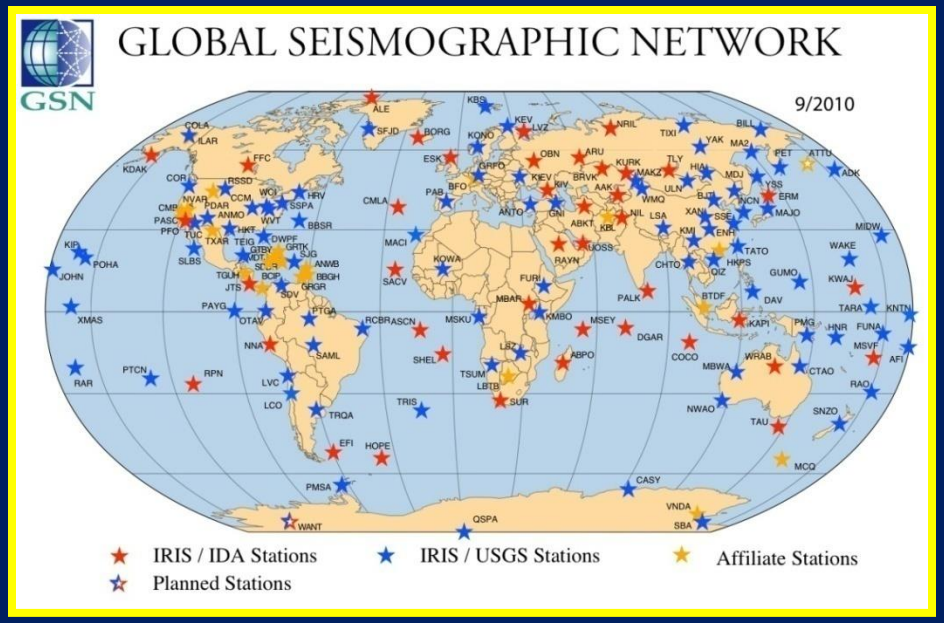
The study of earthquake waves is called seismology

The record produced by a seismometer is called a seismograph



Seismic Waves

Seismic stations are located around the globe, sharing information about detected vibrations.

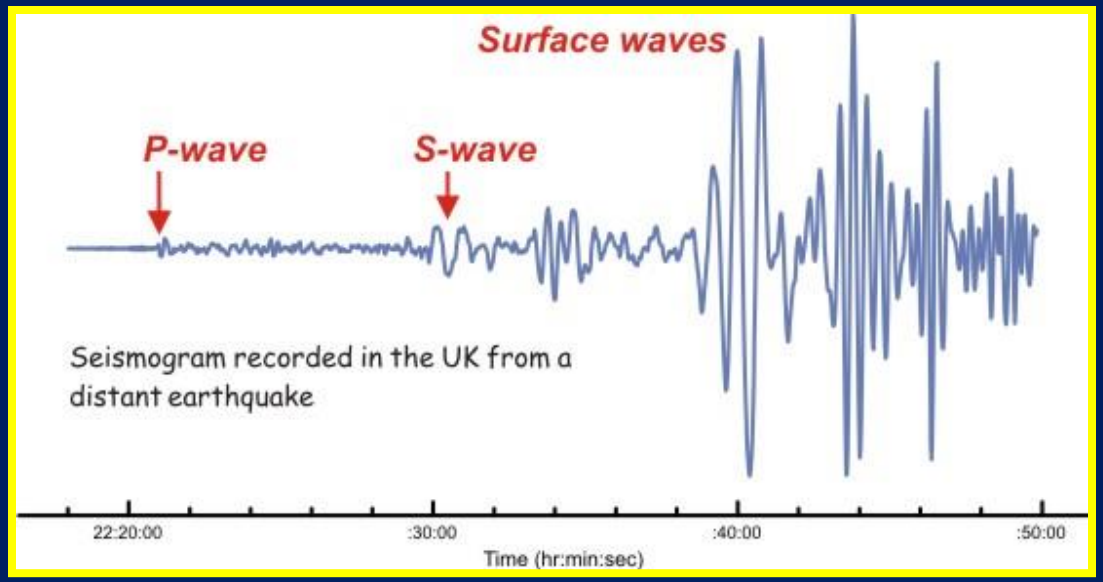


The study of seismic waves not only tell us about where earthquakes originate, but also tell us about when volcanoes are likely to erupt; when tsunamis may occur; and even about the interior structure of Earth.

Seismic Waves

At any seismometer, primary waves, P-waves, arrive first.

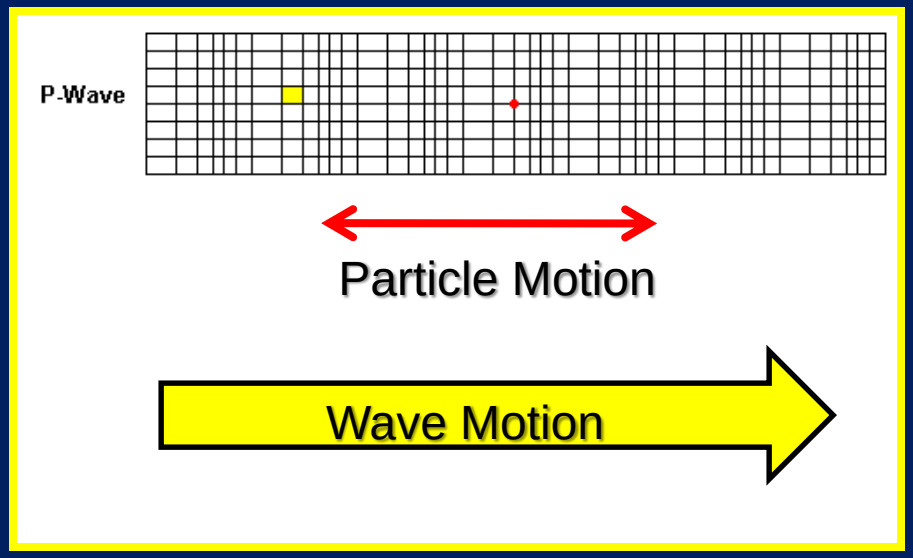
Secondary waves, S-waves, arrive second.

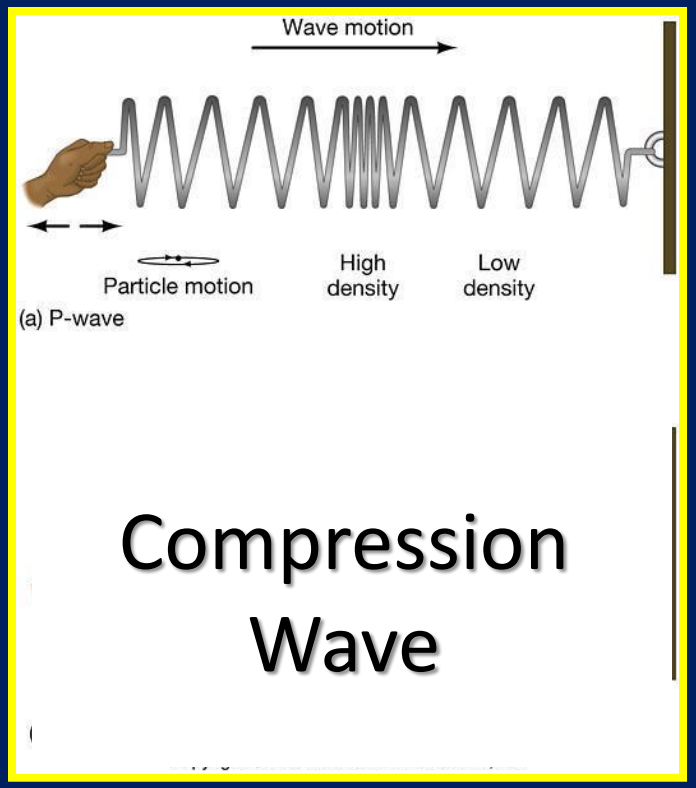


Surface waves arrive last.

Seismic Waves

Primary waves are a type of wave called a compression wave.



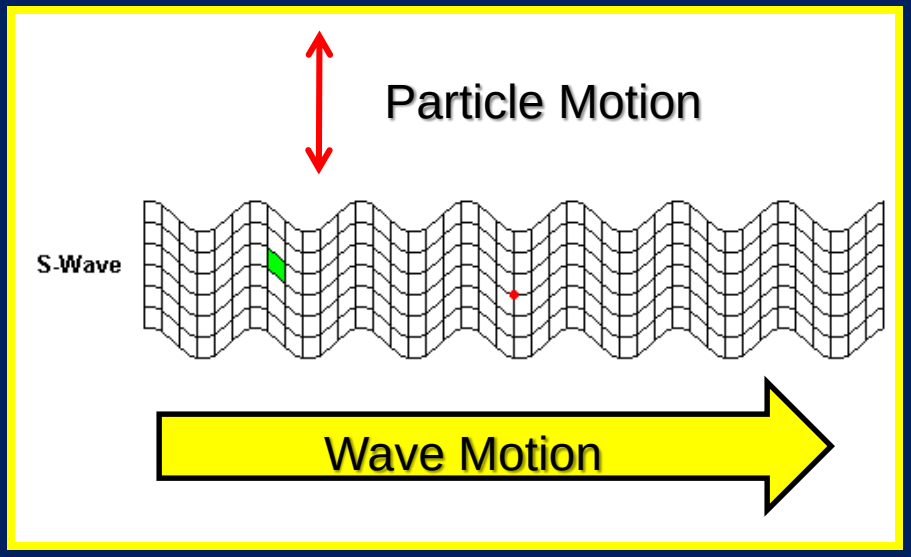


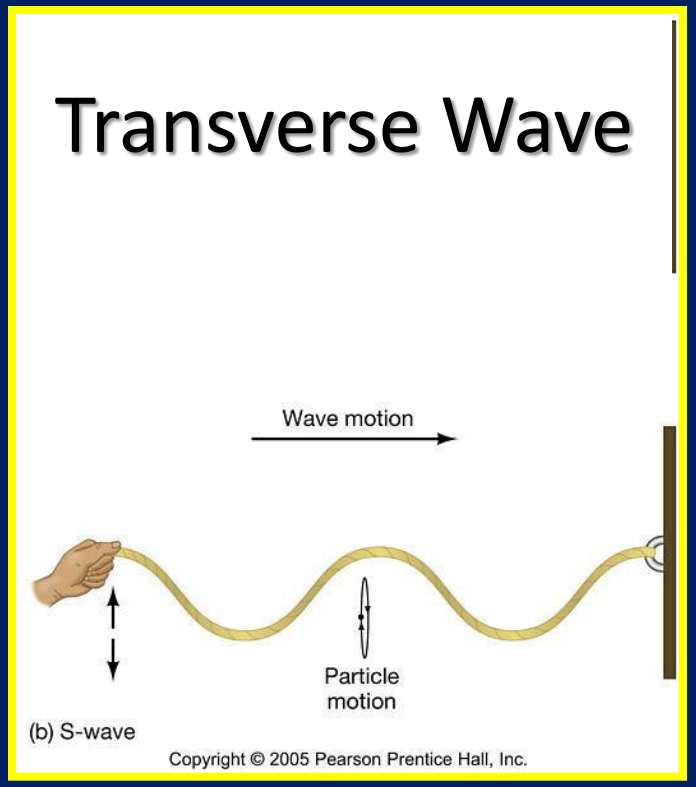
Compression Wave

In a compression wave, the movement of the particles is parallel to the movement of the energy, or wave motion.

Seismic Waves

Secondary waves are a type of wave called a transverse wave.

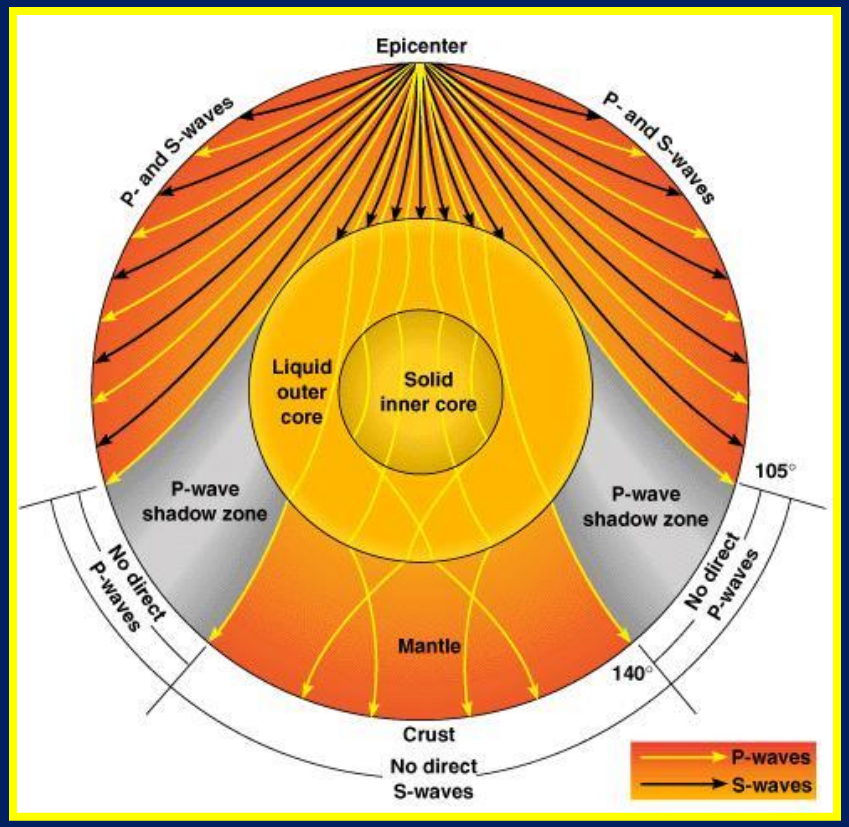




In a transverse wave, the movement of the particles is perpendicular to the movement of the energy, or wave motion.

Seismic Waves

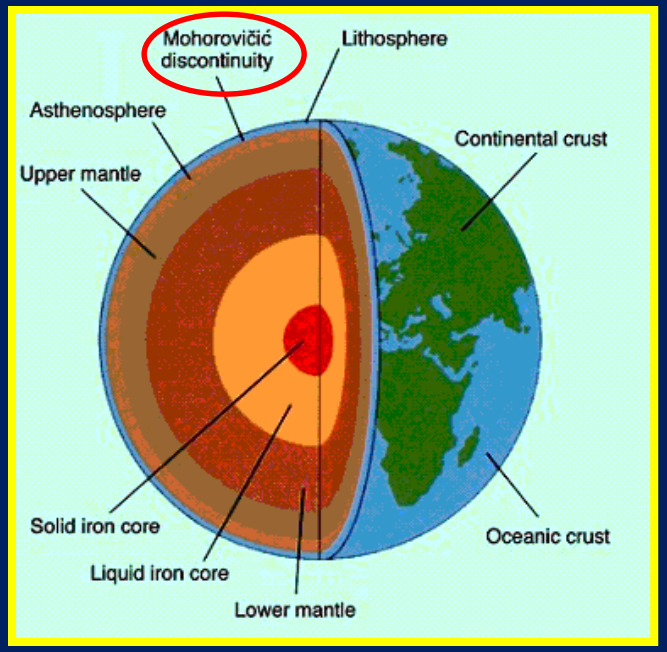
Due to the different natures of primary and secondary waves, the waves travel through the body of Earth in different ways.

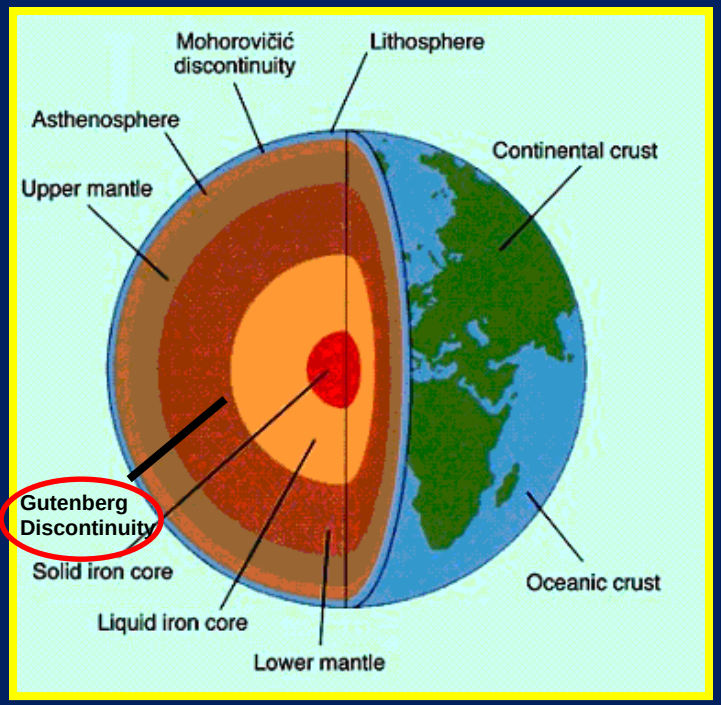


As the body waves encounter material with different densities, they change speed, direction, and are sometimes even blocked.

Seismic Waves

Due to a change in density, body waves change speed at the boundary between the crust and the mantle.

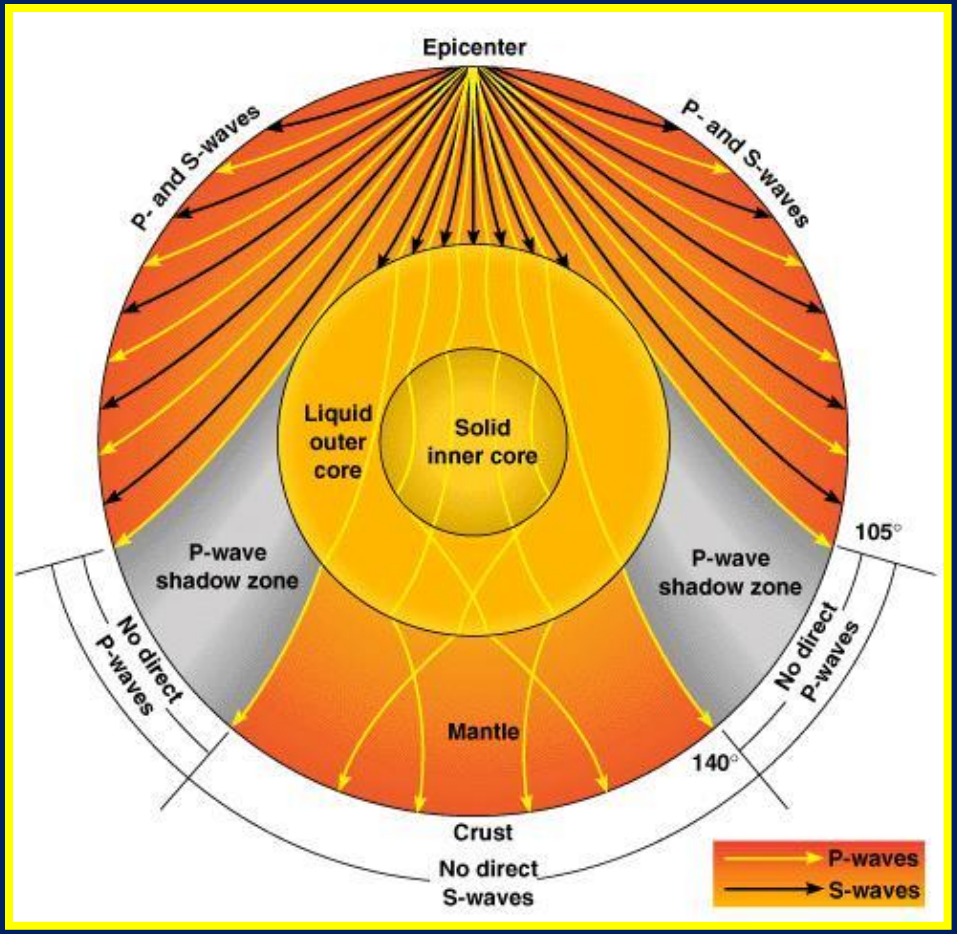




Body waves change speed, again, at the boundary between the mantle and the core.

Seismic Waves

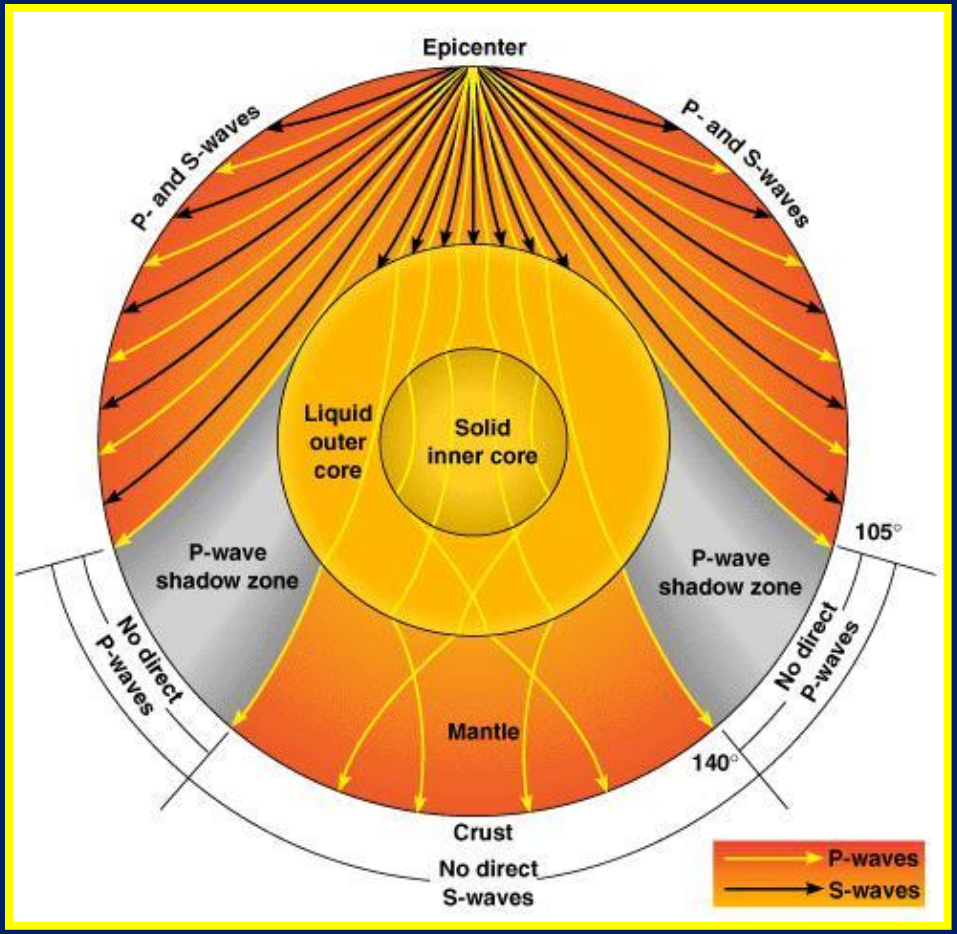
Primary waves are able to travel through both solids and liquids.



However, as primary waves move from the solid mantle into the liquid outer core, they change directions in such a way to create a shadow zone.

Seismic Waves

Secondary waves are only able to travel through both solids.



When secondary waves encounter the liquid outer core, their direction is changed and they are blocked from traveling through the core of Earth.

Inner Structure of Earth

It is through the study of seismic waves that we have come to understand the inner structure of Earth.

Crust - Solid

Mantle - Solid

Outer Core - Liquid

Inner Core - Solid