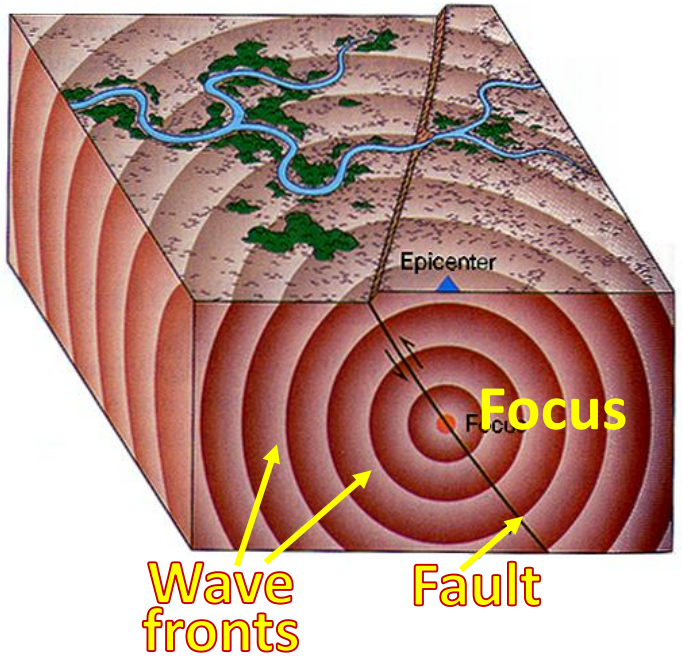
Seismic Waves

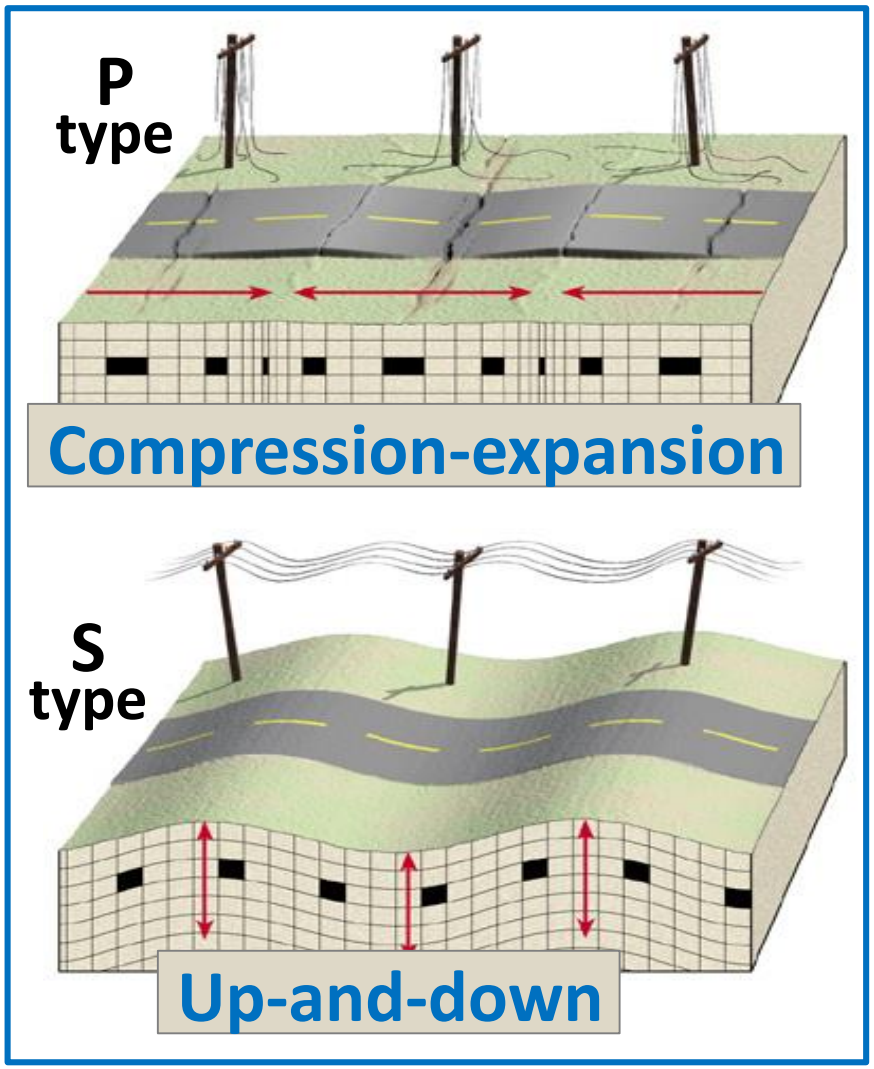


- **Energy released from the earthquake source (its focus) radiates in all directions.**
- **Energy is in the form of *waves* called seismic waves.**
- **Earthquakes create distinct types of seismic waves that travel through the Earth's layers with different velocities:**

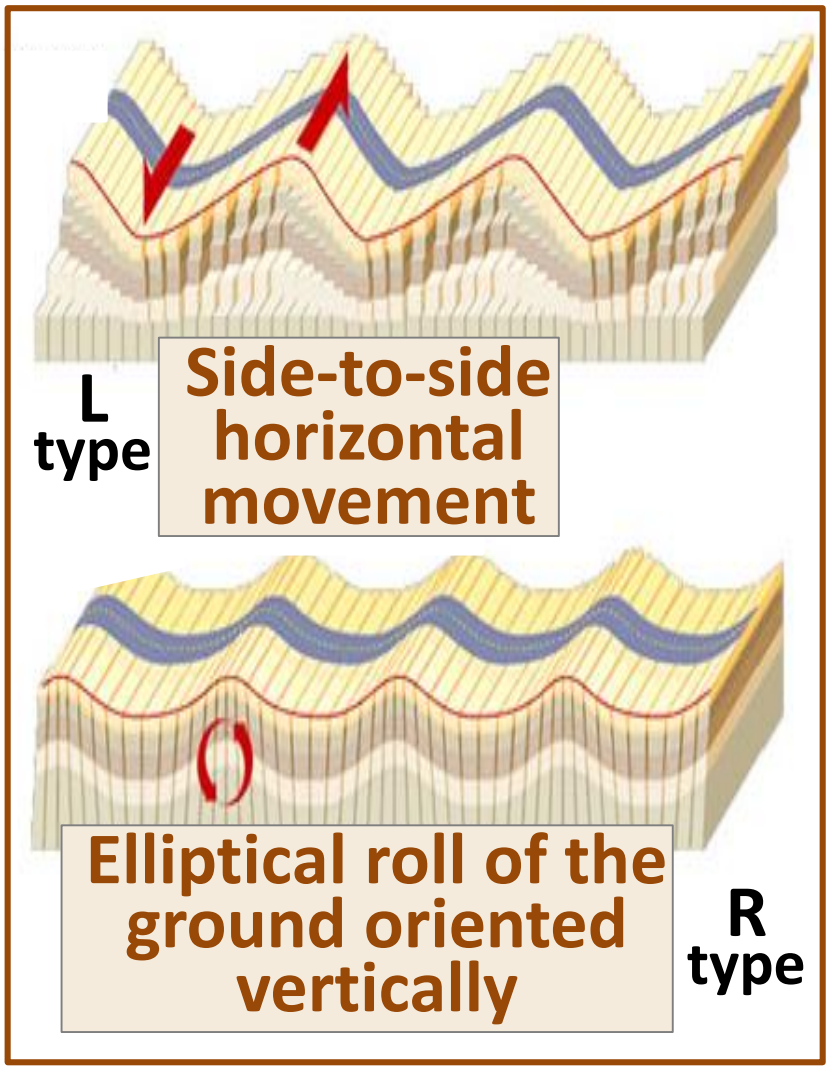
1. **Body waves - travel through the Earth interior (*Primary* waves and *Secondary* waves).**
2. **Surface waves - travel on the Earth surface (*Love* waves and *Rayleigh* waves).**

Types of Seismic Waves

BODY WAVES

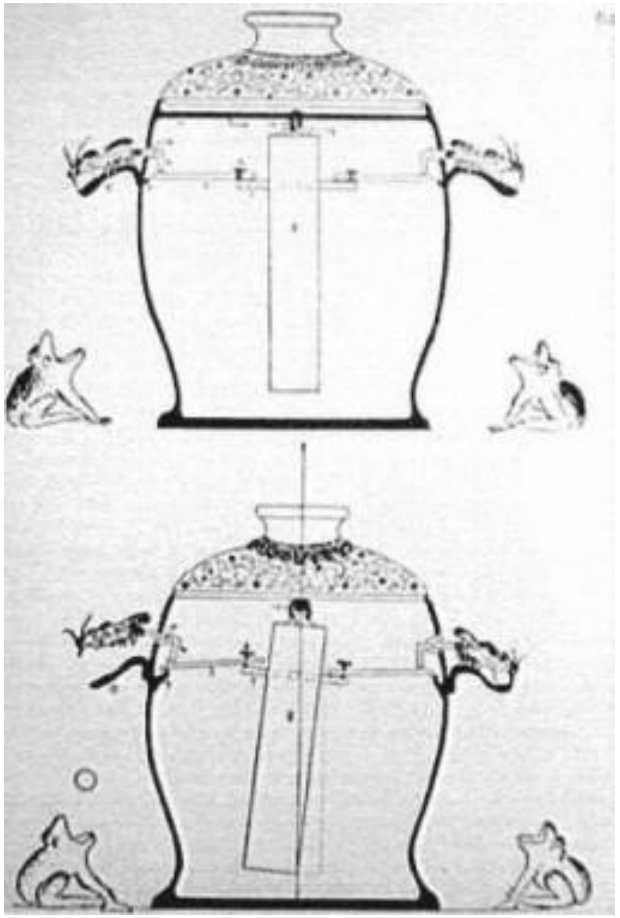


SURFACE WAVES



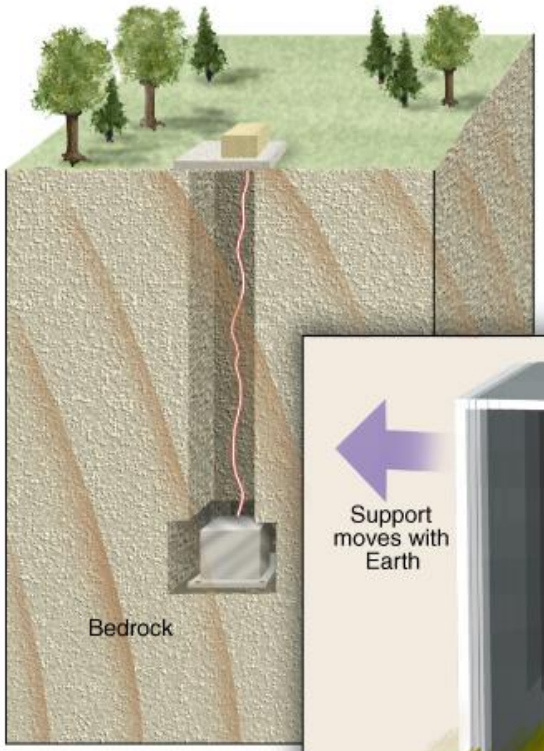
Detecting an Earthquake

Chinese created the first earthquake detector over 2000 years ago!



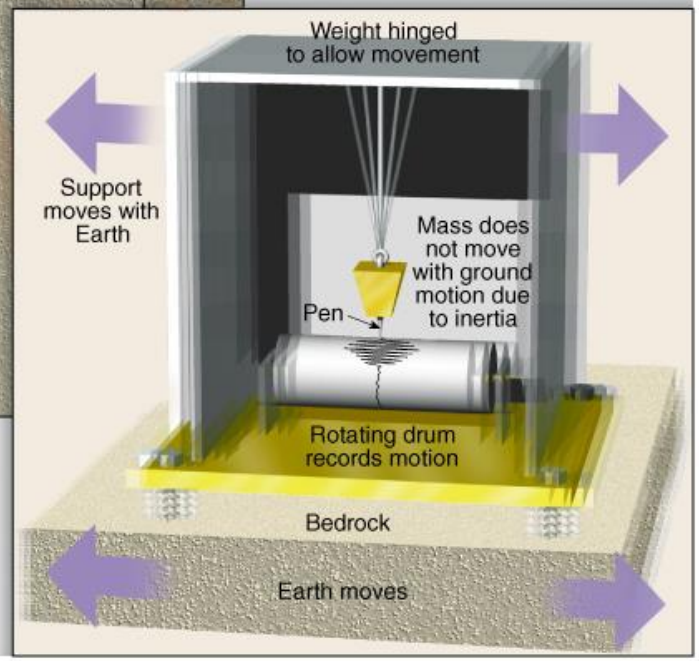
Measuring an Earthquake

Earthquakes are measured using observations from seismographs, instruments that record seismic waves.

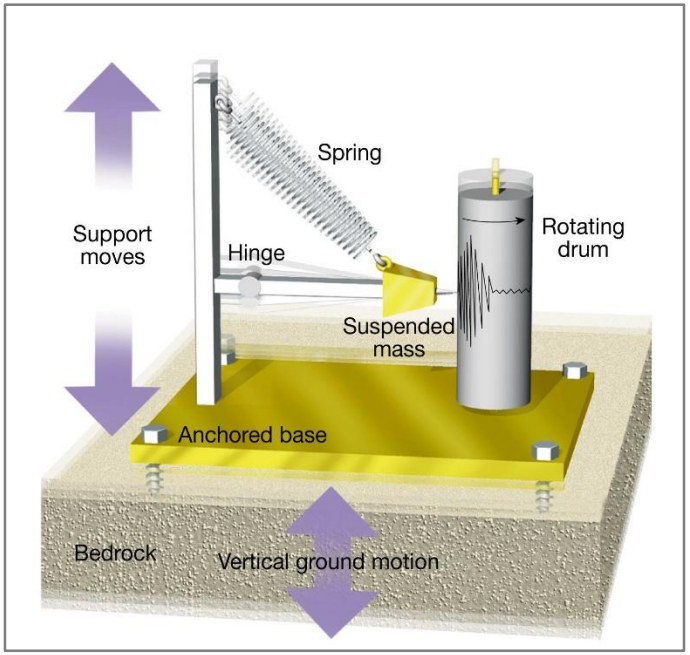


Different *seismograph types* are needed to record both vertical and horizontal ground motion:

Horizontal

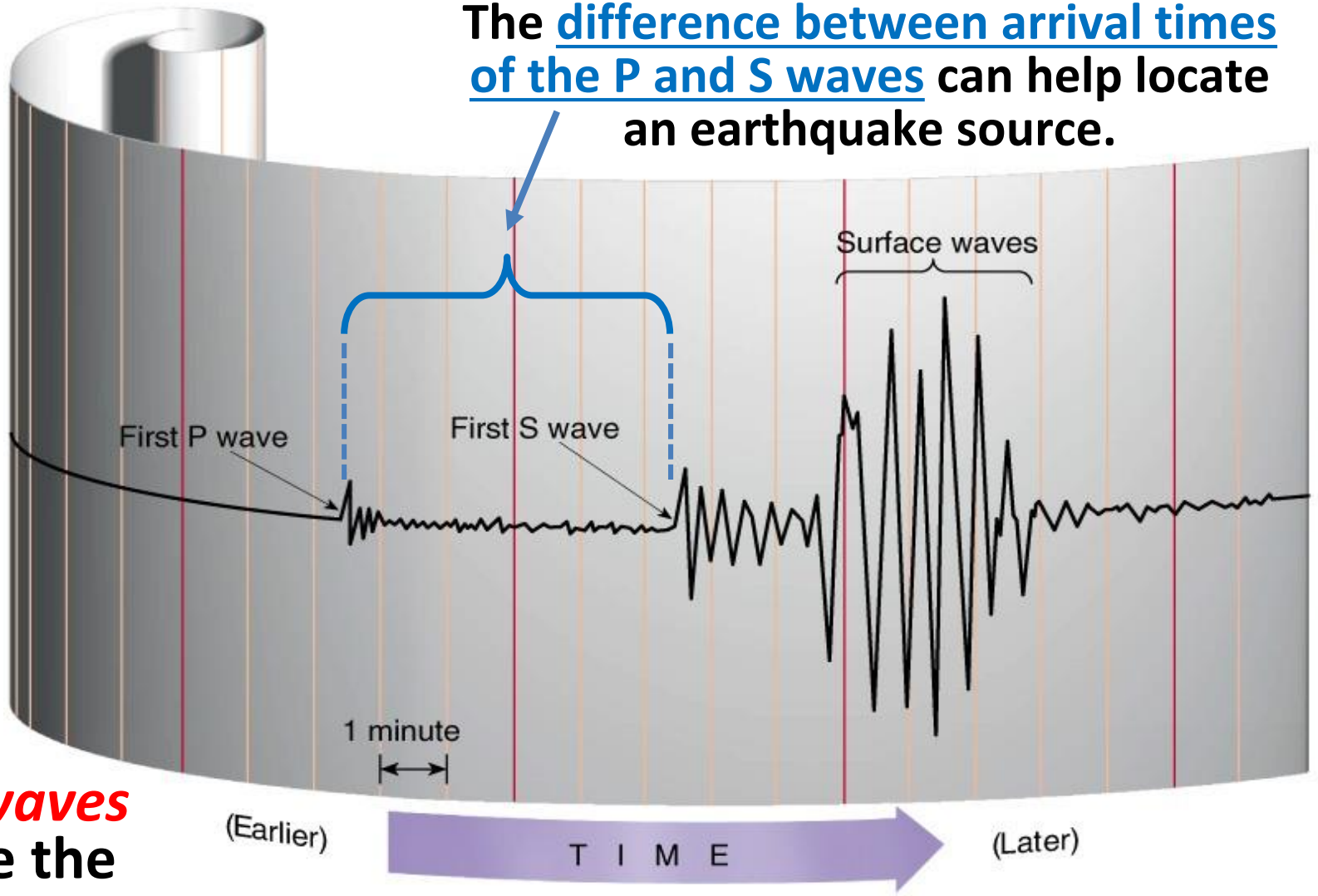


Vertical



Simplified Seismogram

The difference between arrival times of the P and S waves can help locate an earthquake source.

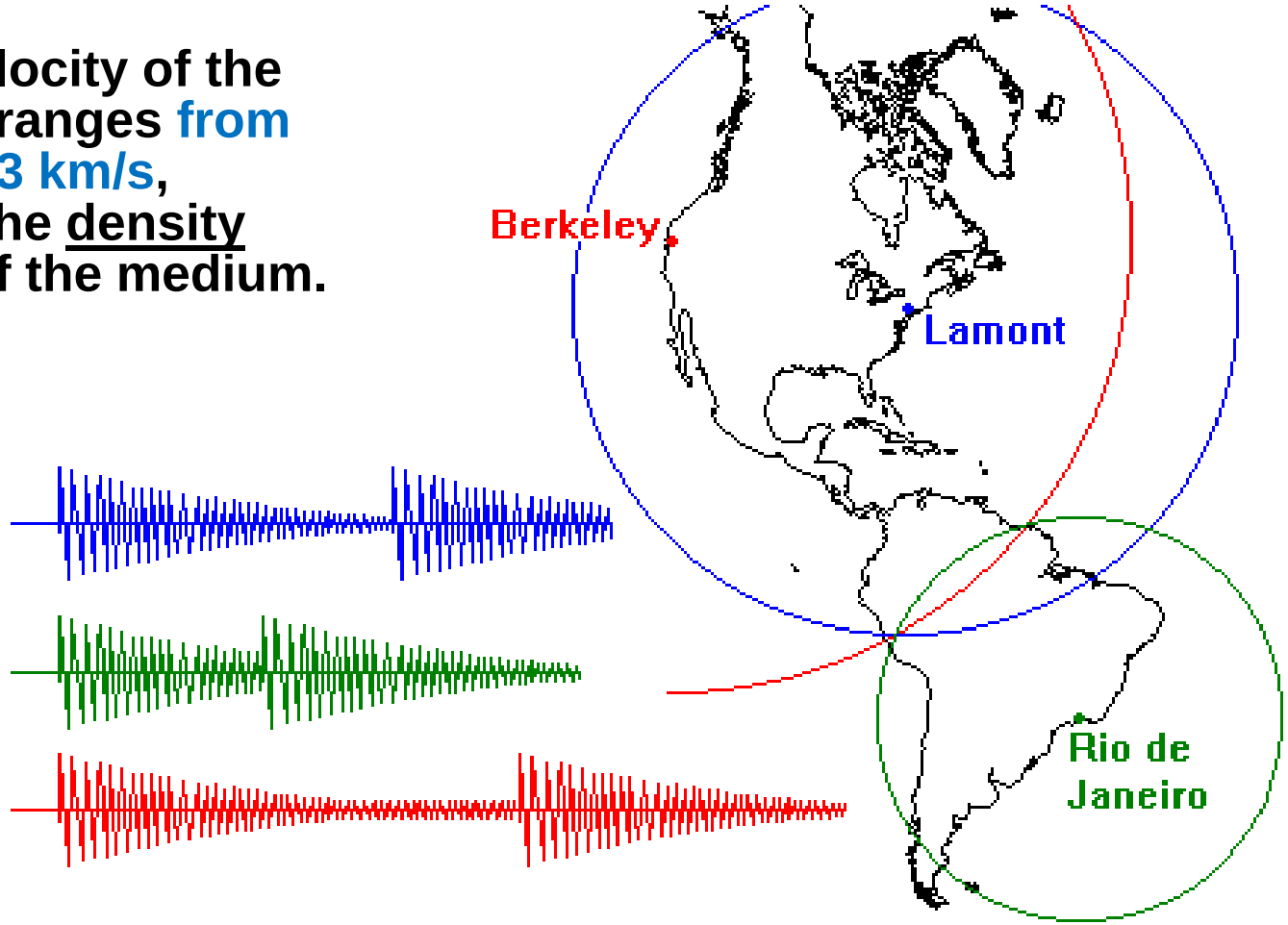


P waves **are the** **fastest**

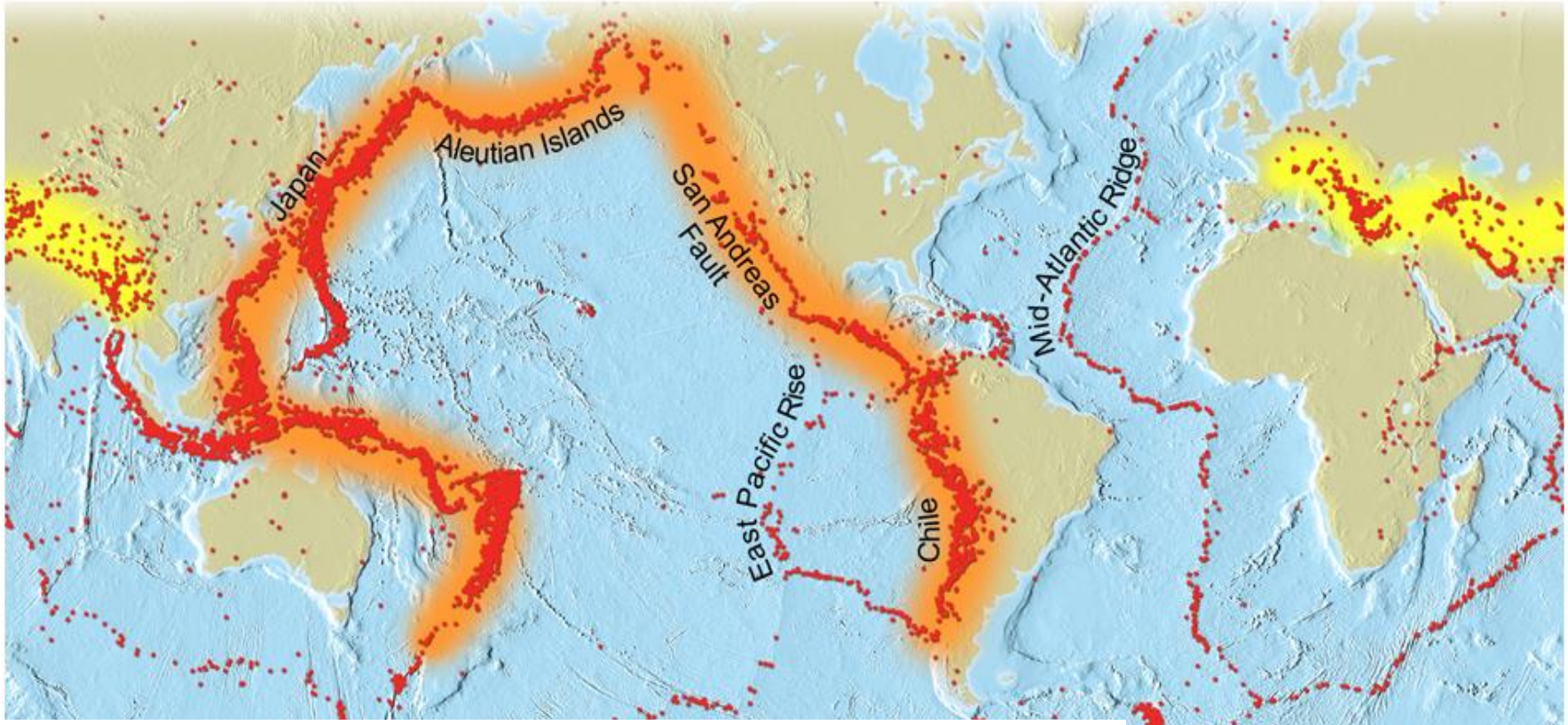
Locating Earthquakes

The further away an earthquake is from the point of detection, the greater the time between the arrival of the P waves and the S waves.

- **Propagation velocity of the seismic waves ranges from ~3 km/s up to 13 km/s, depending on the density and elasticity of the medium.**
- **Data from several different (*at least three*) seismic stations is combined to determine the earthquake epicenter location.**



Earthquakes around the world mostly happen near tectonic plate boundaries



80% - Circum-Pacific Belt, border of the Pacific Ocean.

15% - Alpine-Himalayan Belt, from southern Asia to the Mediterranean region.

5% - parts of the Arctic, Atlantic, and Indian Oceans. Antarctica and Australia experience the least amount of earthquake activity then any other areas of the world.

Graph shows 15,000 larger magnitude (>5) earthquakes over 10-year period.