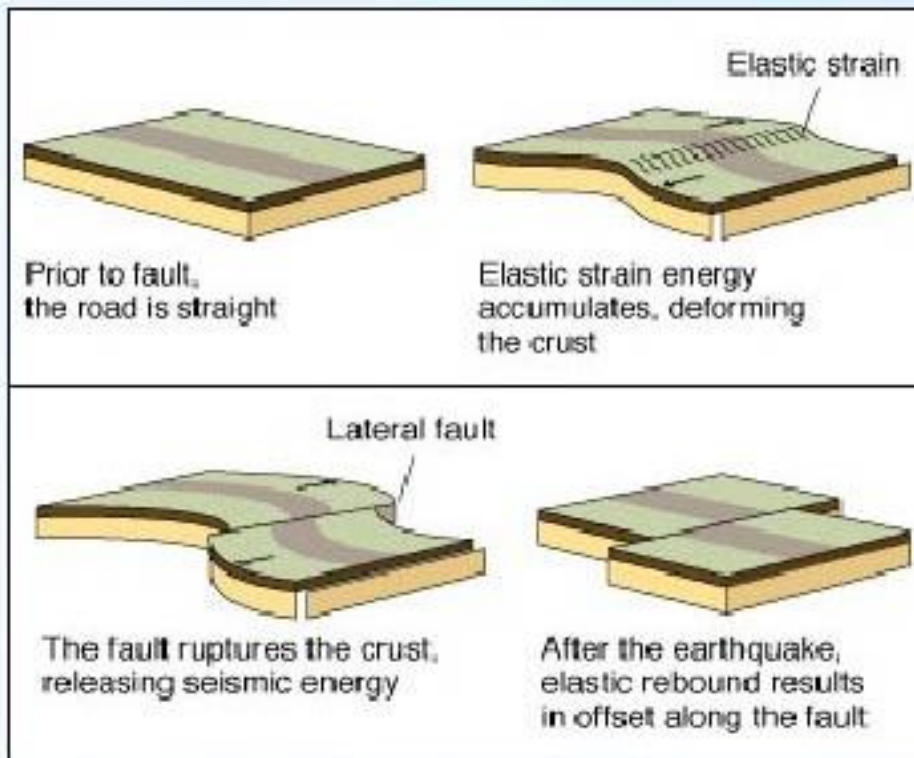


How earthquakes occur?

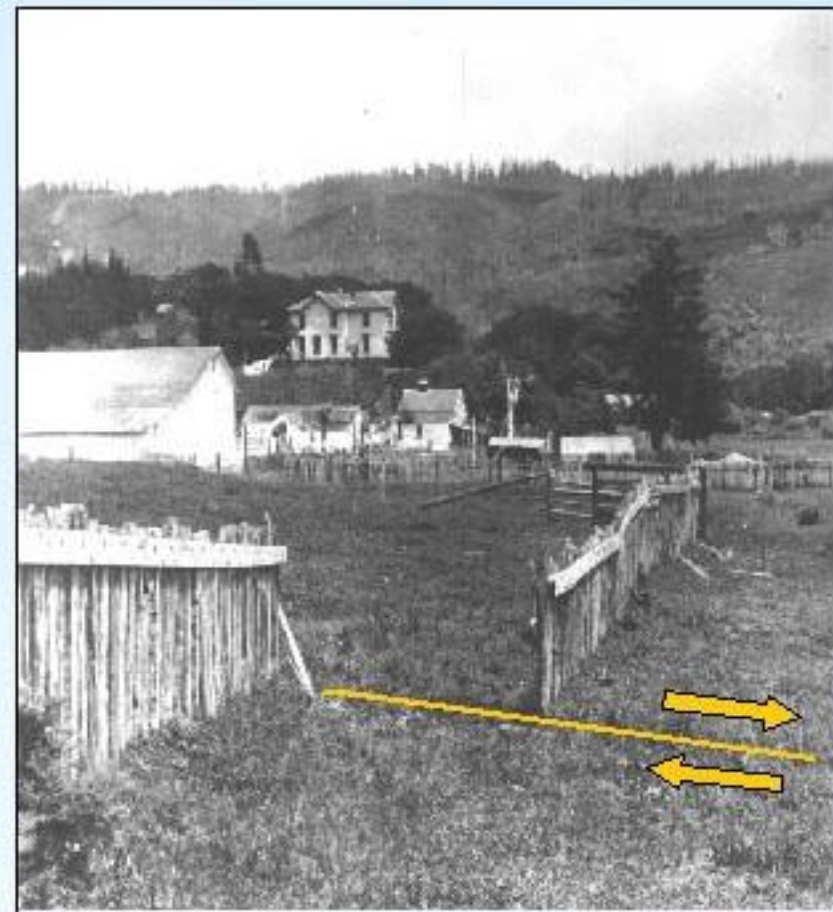
Elastic rebound theory

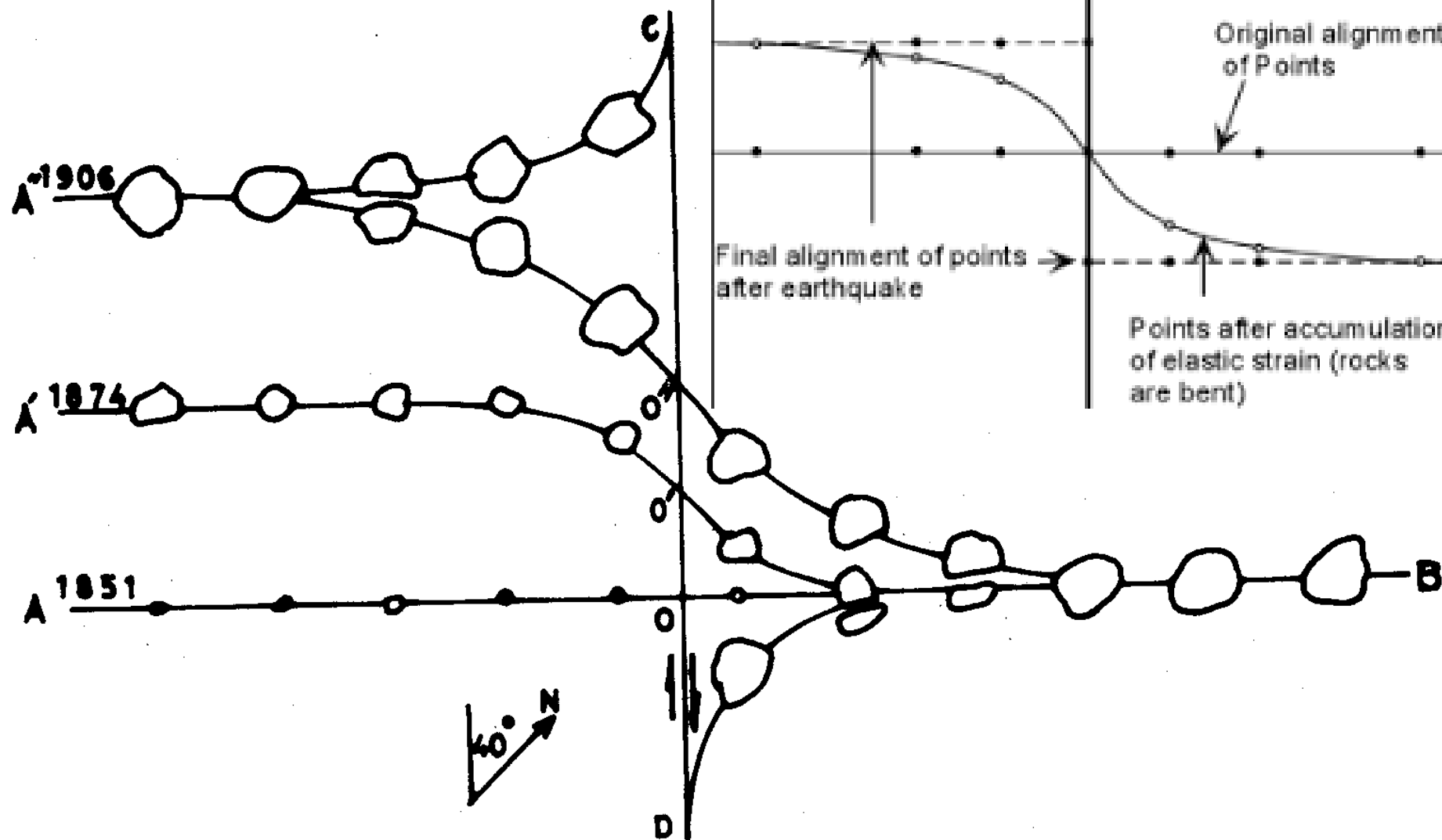
Elastic Rebound Theory

Relates Faulting and Earthquakes



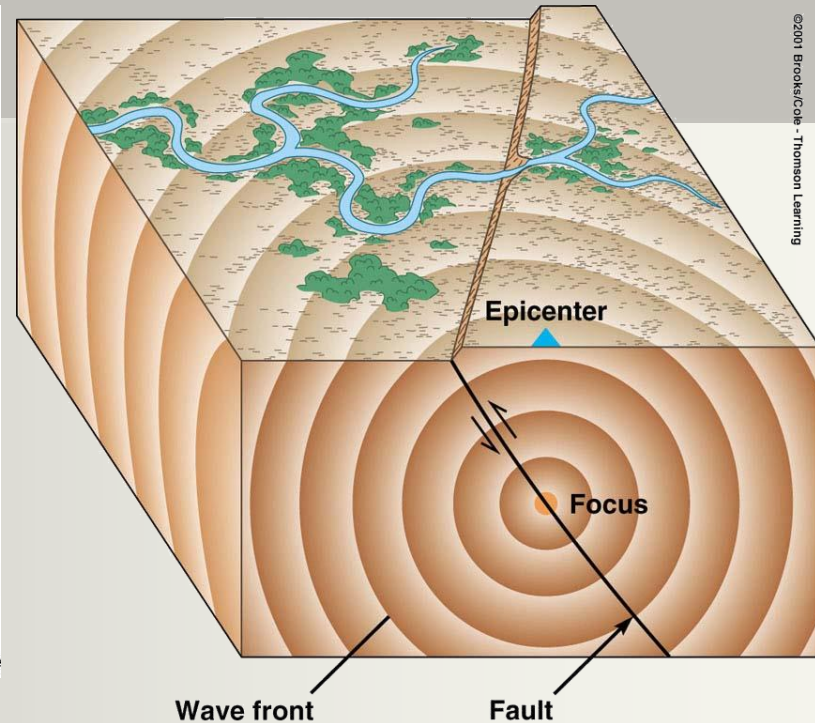
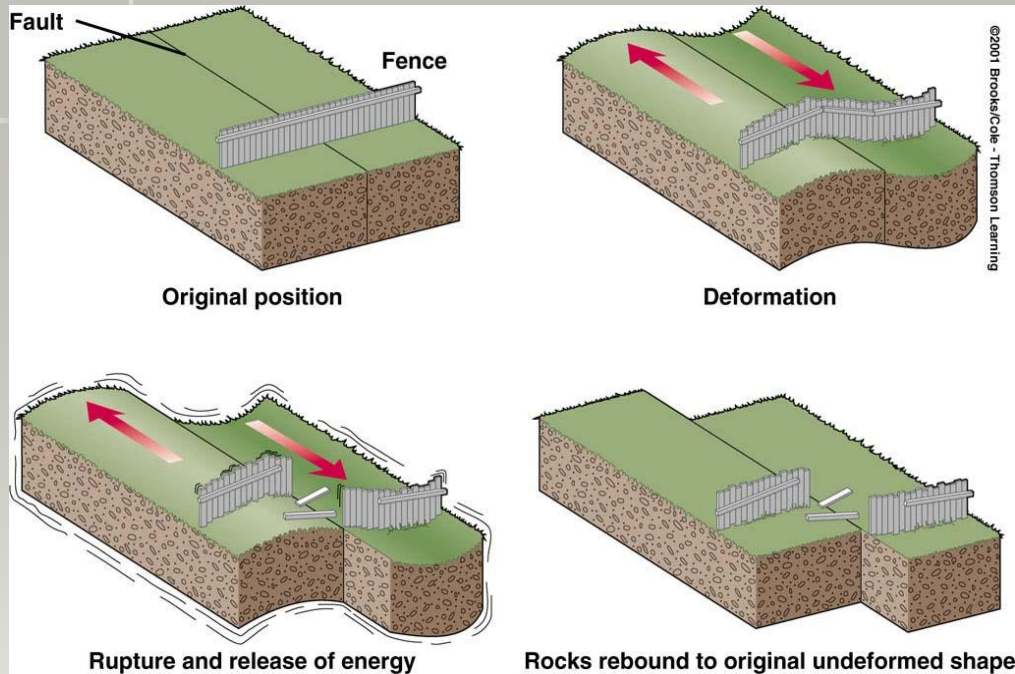
- Fence offset in 1906 quake on San Andreas Fault





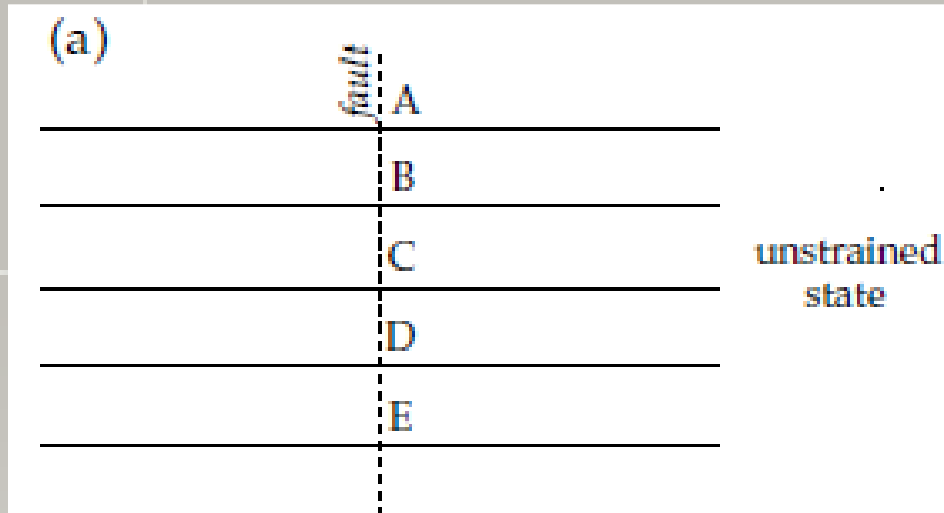
How earthquakes occur?

Elastic rebound theory

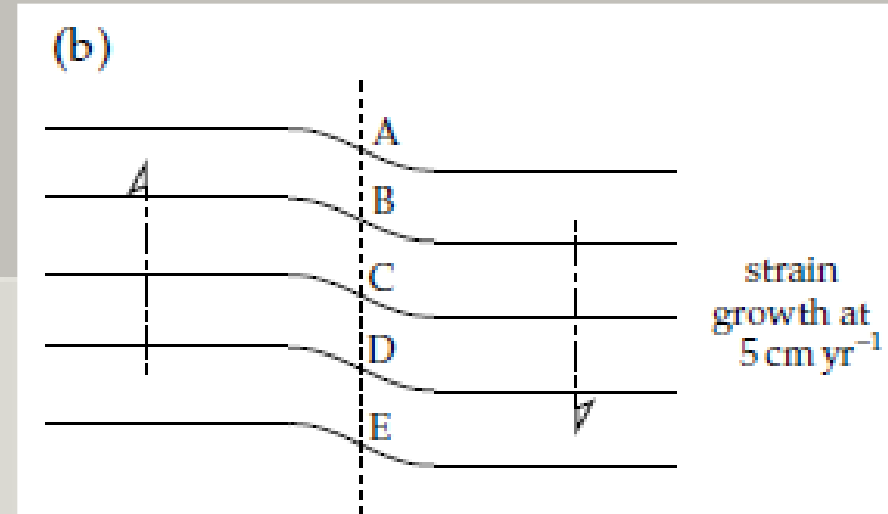


- Because of friction, the blocks do not slide, but are deformed.
- When the stresses within rocks exceed friction, rupture occurs.
- Elastic energy, stored in the system, is released after rupture in waves that radiate outward from the fault.

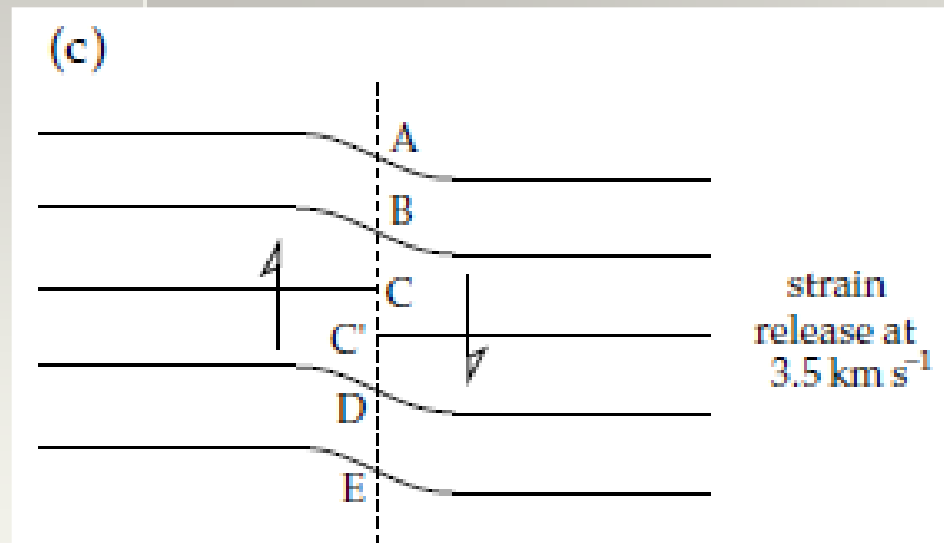
Elastic rebound model of the origin of earthquakes.



(a) Unstrained state of a fault segment.



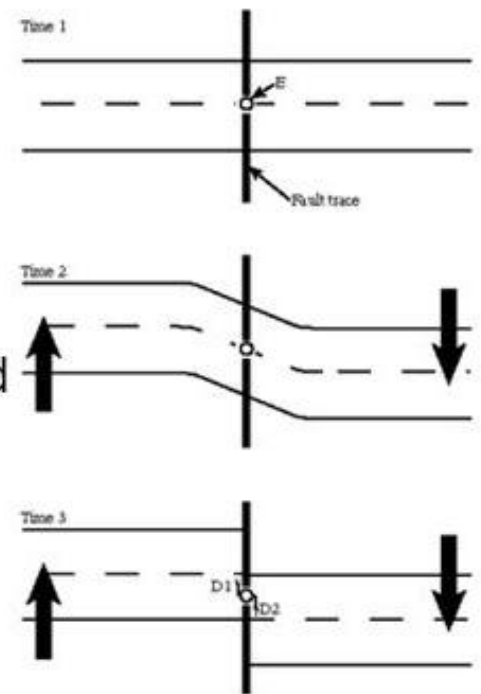
(b) Accumulation of strain close to the fault due to relative motion of adjacent crustal blocks.



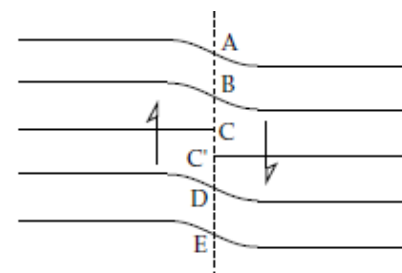
(c) "Rebound" of strained segment as an earthquake with accompanying release of seismic energy.

Elastic Rebound Theory

- explanation for how energy is spread during earthquakes
- plates/blocks of earth shift on opposite sides of a fault
- these are subjected to force (Time 1)
- they accumulate energy (Time 2)
- they slowly deform until their internal strength is exceeded
- a sudden movement occurs along the fault
- accumulated energy is released
- rocks snap back to their original undeformed shape (Time 3)



D C *surface*



strain
release at
 3.5 km s^{-1}

dilatation

compression

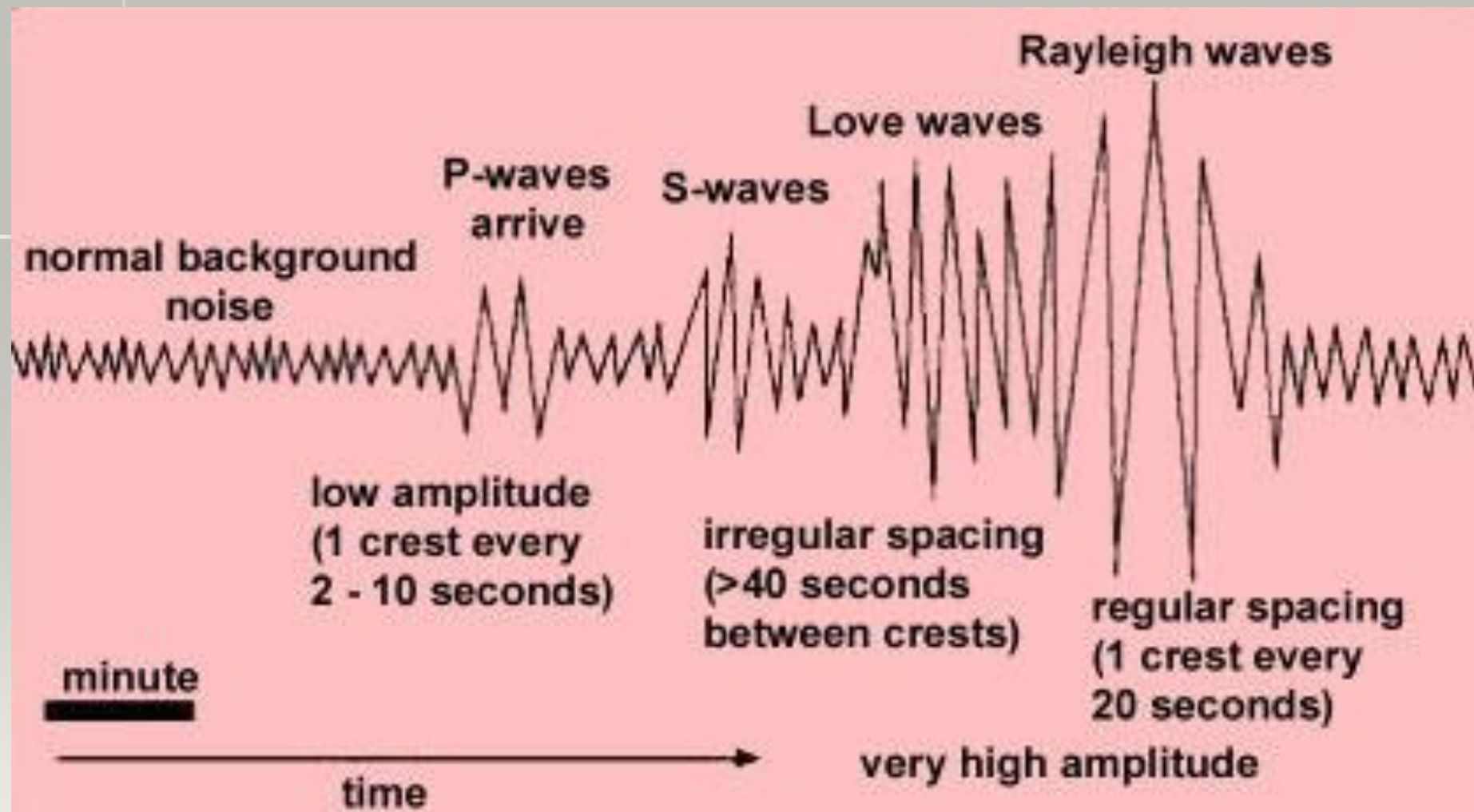
*auxiliary
plane*

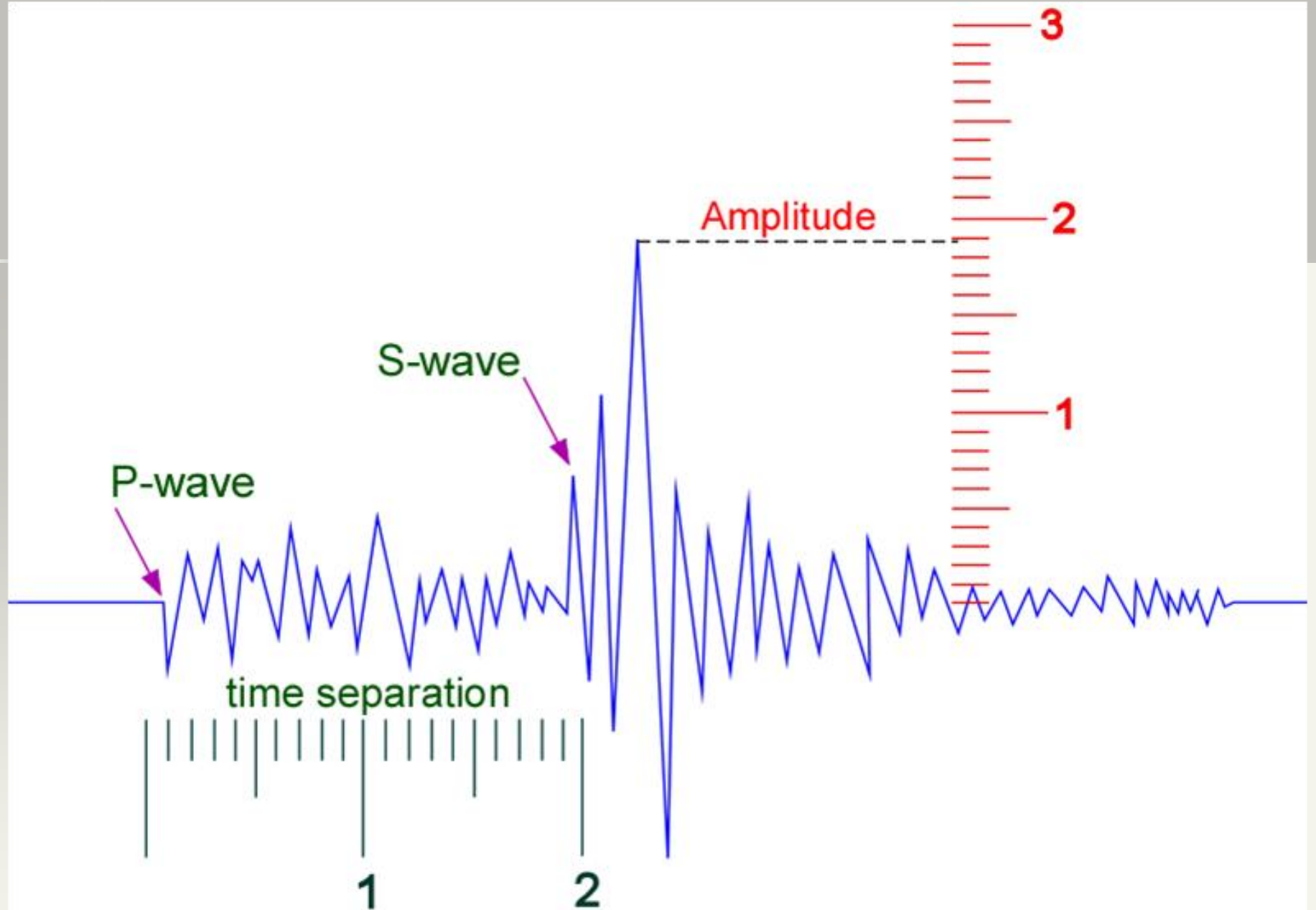
H

dilatation

fault-plane

compression





Typical seismometer amplitude trace