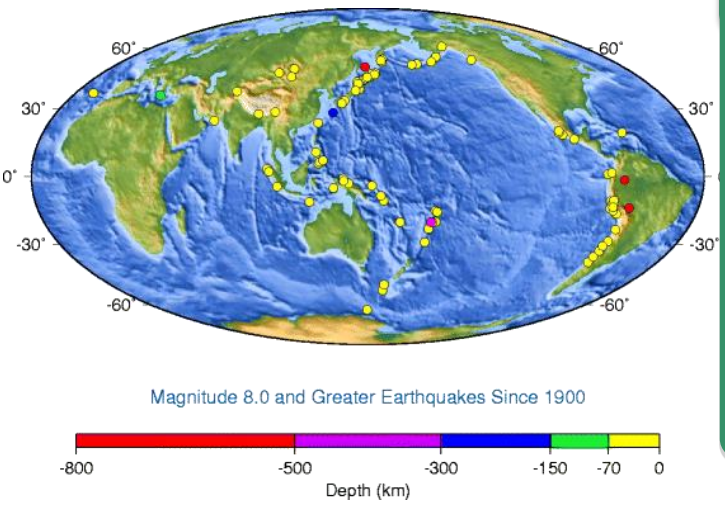
Earthquakes

Earthquake Zones

- More than 900,000 earthquakes are recorded each year, but only a portion of them is felt. Major earthquakes are very rare.
- Most earthquakes take place along plate boundaries.
- The Pacific Ocean and its plate boundaries are responsible for 80% of the earthquakes, and the Mediterranean-Asiatic Belt region is responsible for 15% of the earthquakes. The other 5% is scattered.

Study Tip

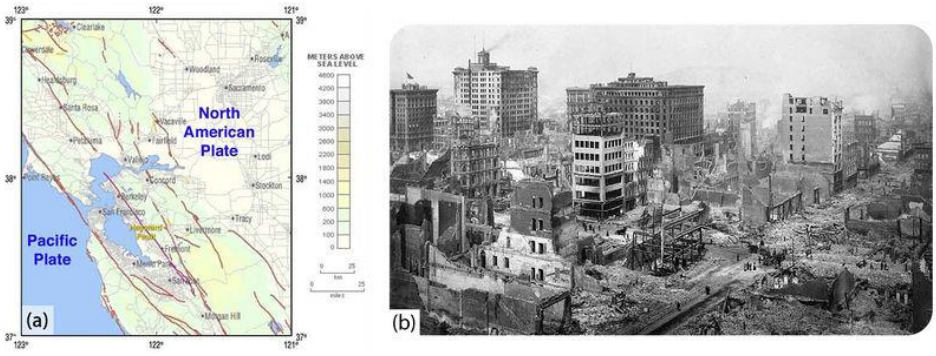
The intensity and characteristic of a certain earthquake can be attributed to its location near a fault.



Earthquake epicenters for magnitude 8.0 and greater events since 1900

Transform Plate Boundaries

- Transform plate boundaries (plates sliding past each other) have shallow focus earthquakes, because the fault is at the surface.
- The California San Andreas fault is made up of many smaller faults. Earthquakes occur nearly 10,000 times a year. However, a large percentage of these earthquakes are too small to be felt
- New Zealand has a transform plate fault that causes nearly 20,000 earthquakes a year, although only a small percentage of these earthquakes are strong enough to be felt.



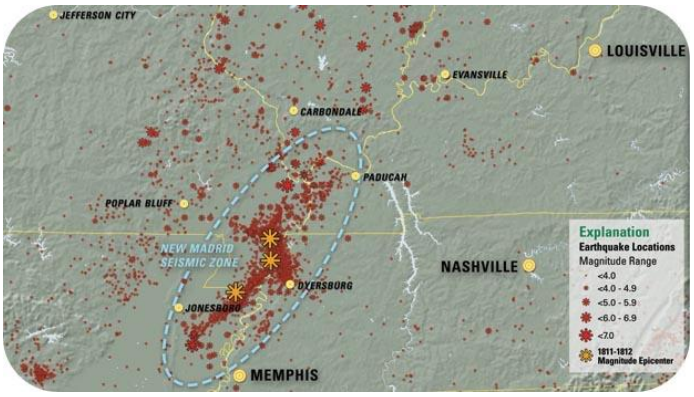
(a) The San Andreas Fault zone in the San Francisco Bay Area. (b) The 1906 San Francisco earthquake.

Convergent Plate Boundaries

- Earthquakes form all around convergent plate boundaries as one plate converges into another. The plate needs to heat up enough to deform before the earthquake stops. These earthquakes also mark the motions of subducting lithosphere.
- Convergent plate earthquakes surround the Pacific Ocean basin.
- An example of ocean-ocean convergence is Japan's Tōhoku earthquake.
- An example of ocean-continent convergence is the Pacific Northwest's Cascades. The Cascades are active volcanoes produced by the subduction of three small plates beneath North America
- An example of continent-continent convergence is Asia's Gujurat earthquake.

Intraplate

- Instead of occurring on plate boundaries, intraplate earthquakes occur within plates. They are caused by stress from plate motion, and usually happen along older faults or rifts that have been weakened.
- Past examples are Virginia in 2011, and New Madrid in 1812. Although not as large as earthquakes at plate boundaries, they can still do a lot of damage.



The New Madrid seismic zone is located in the interior of the North American plate (near Missouri, Arkansas, Tennessee, Kentucky, and Illinois), but many earthquakes occur there.

Concept Check

- Where do earthquakes usually occur?
- Describe transform plate earthquakes.
- Describe convergent plate earthquakes.
- Describe intraplate earthquakes.