

<http://earthquake.usgs.gov/earthquakes/map/>

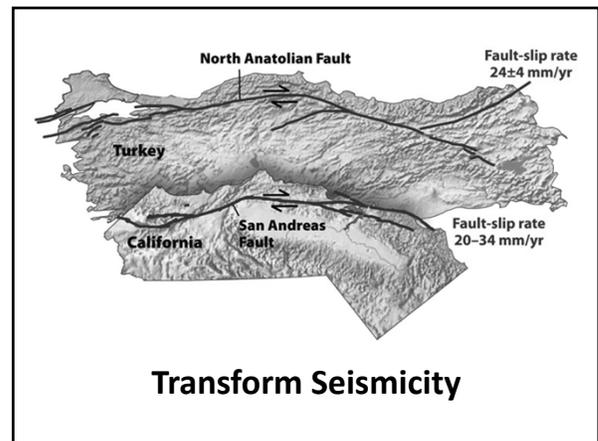
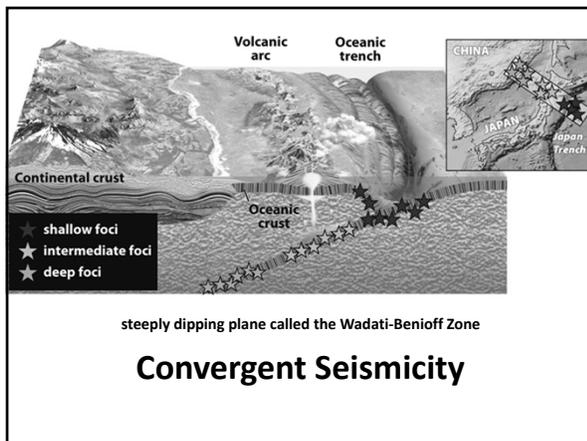
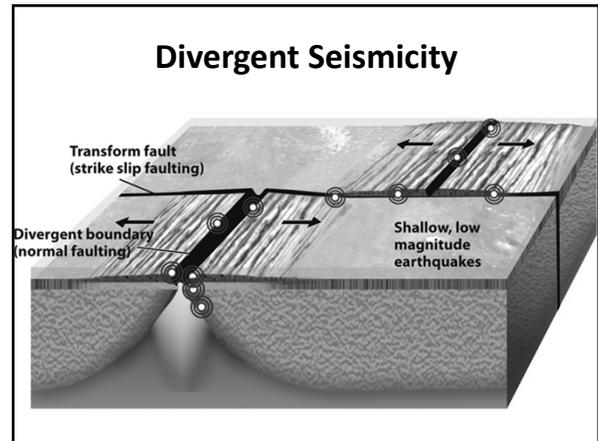
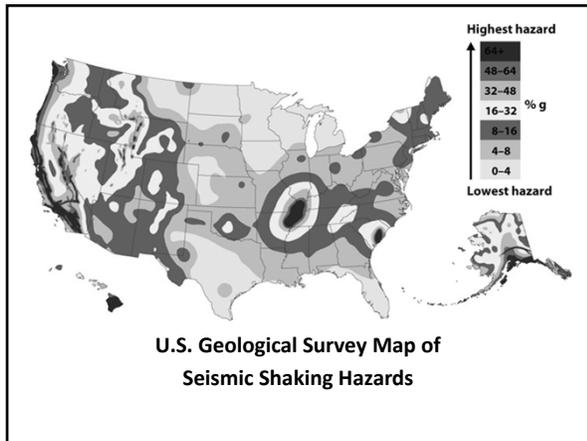
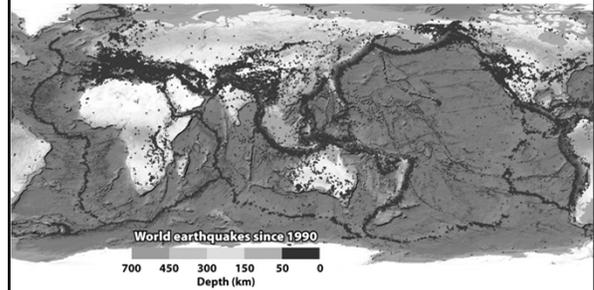
Earthquakes happen every day, every hour somewhere in the world.

95% of seismicity in Hawaii is due to volcanism – magma movement.

Other 5% is due to tectonic forces on the seafloor

>380 major cities lie on or near unstable regions of Earth's crust
(potential for devastation is high)

Most Earthquakes Occur at Plate Boundaries, but Intraplate Seismicity Is Also Common.



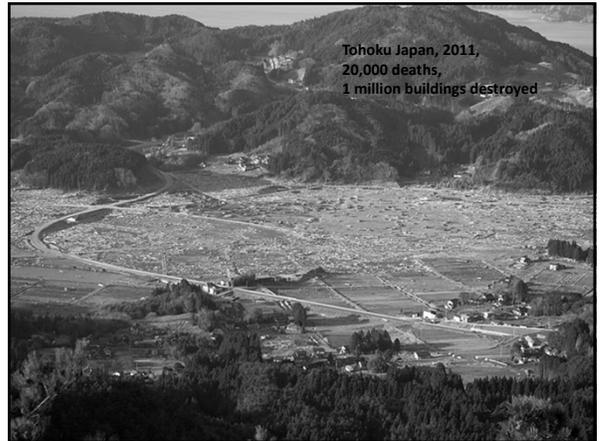
Divergent, Convergent, and Transform Margins Are the Sites of Frequent Earthquake Activity. KOBE – 1995, 5100 deaths



An Earthquake is Sudden Shaking of the Ground. Sichuan Quake, 2008, 87,000 deaths



Kashmir, 2005, 75,000 deaths



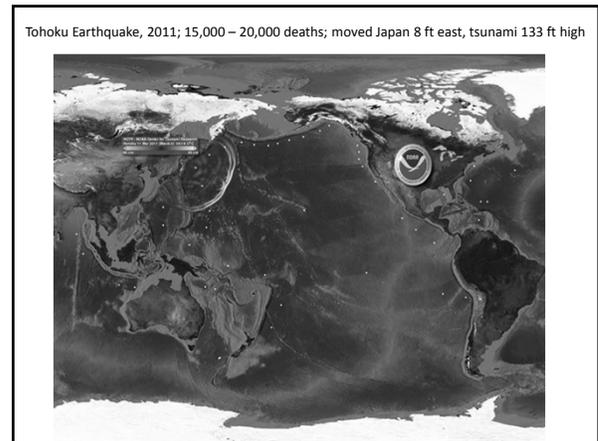
Tohoku Japan, 2011, 20,000 deaths, 1 million buildings destroyed



MEGATHRUST EARTHQUAKE

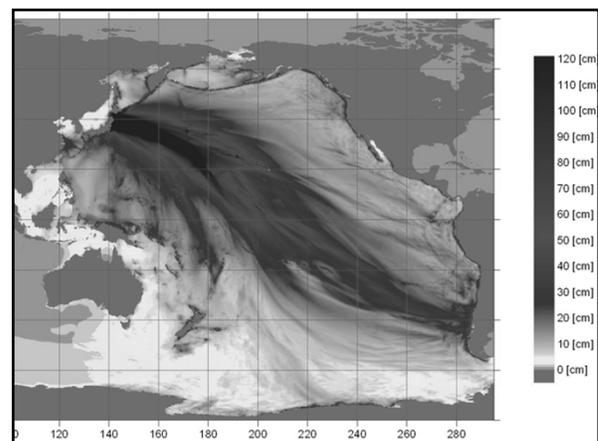
OCCURS WHEN "LOCKED" SUBDUCTION ZONE RUPTURES

1. Strain accumulates.
2. Crust shortens.
3. Uplift occurs.
4. Plates unlock.
5. Crust extends rapidly culminating in a Megathrust Earthquake



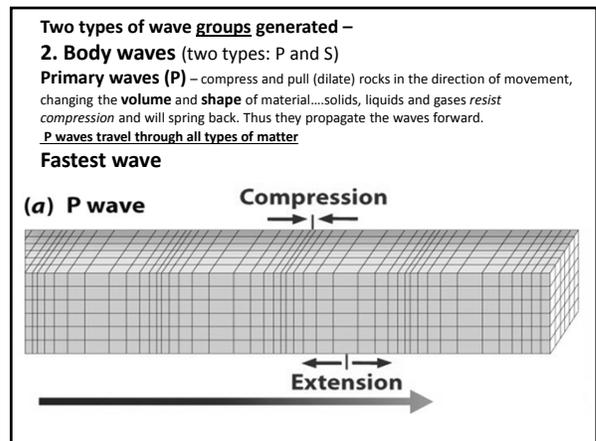
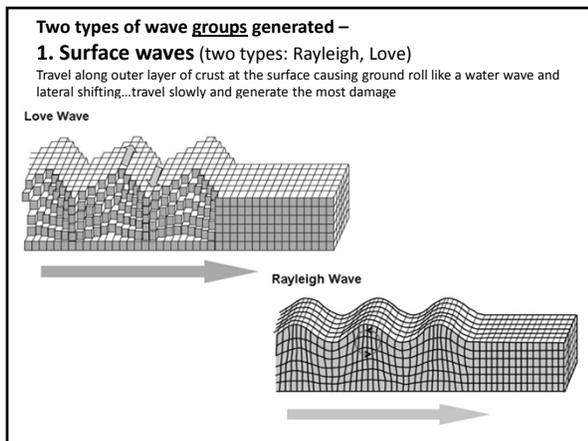
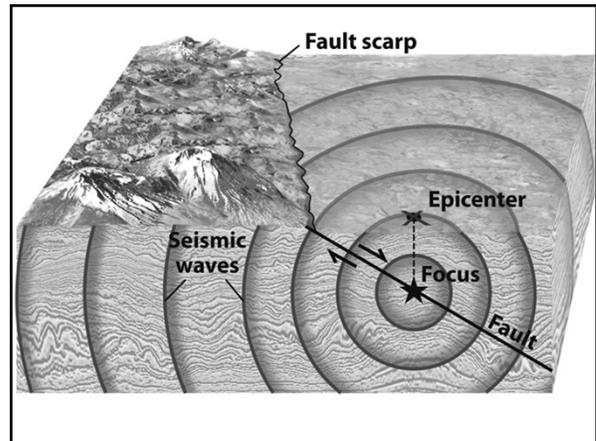
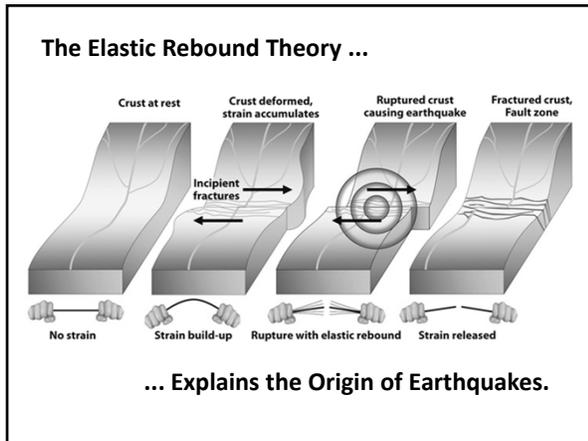
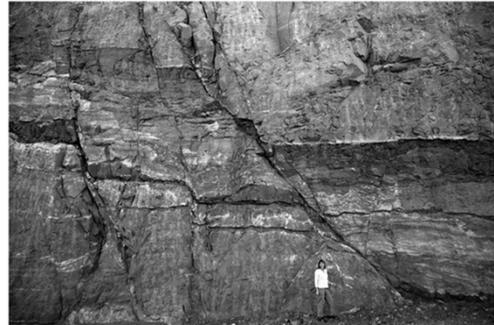
Tsunami Video

<http://www.guardian.co.uk/world/video/2011/mar/14/japan-tsunami-amateur-footage-video?hntCMP=ILNETXT3486>
<http://www.guardian.co.uk/world/video/2011/mar/11/japan-earthquake-tsunami-video>
<http://www.youtube.com/watch?v=5-zfCBCq-8I&feature=relmfu>
http://www.youtube.com/watch?v=w3AdFjklR50&playnext=1&list=PL8ECD3140BD29355F&feature=results_main
<https://dl.dropbox.com/u/68500077/2011KesenumaB.mp4>





Eventually a fault, or other preexisting weakness, is no longer able to accommodate the buildup of strain and ruptures!



Secondary waves (S) – motion is 90 degrees to direction of propagation (up and down), involves only changing the **shape** of transmitting media...fluid and gas do not resist shape change hence they will not spring back and will not transmit the wave forward. S waves travel only through solids.

Second fastest wave

S wave

A SEISMOGRAM is made by a SEISMOMETER.

S-P interval = distance from epicenter

Seismometers in Denver and Phoenix are used to triangulate ...

(a) Seismogram of earthquake

(b) P, S wave difference

(c) Triangulation of epicenter

Seismology Is the Study of Seismic Waves in Order to Improve Understanding of Earth's Interior.

Wave refraction is used to identify a discontinuity.

Refraction and reflection of seismic body waves

Increased density allows wave to travel faster...causing slow **refraction** (bending)
 Refraction also happens suddenly when wave crosses density front.
 Waves also **reflect** off density interfaces.

A.

B.

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Seismic shadow zones - Measuring Earth's Interior

P wave shadow zone

S wave shadow zone

Network of epicenters around Earth's surface defines the interior zones

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