

## **Earthquakes**

Big US Quakes:

April 18, 1906: San Francisco

October 17, 1989: Loma Prieta

March 27, 1964: Alaska

Earthquake:

When rocks are subject to heat, they can bend or behave in a *ductile* fashion. This typically occurs at depth.

When rocks break and move, energy is released in the form of seismic waves. Rocks typically break near the surface, where they are cool and *brittle*.

Elastic Rebound Theory

Stress and Strain

Seismic Waves can be classified into two types:

**Body Waves: Travel through the whole Earth**

1) P Waves

2) S Waves

**Surface Waves: Travel at the surface.**

1) Rayleigh Waves

2) Love Waves

## Measuring and Locating Earthquakes

Seismograph: the device used for recording movements in the crust.

Seismogram: paper record from the seismograph.

## Determining the Epicenter of an Earthquake

Terms: Focus or hypocenter, and epicenter

## Depth of Focus:

- 1) Shallow: 0-70 km deep
- 2) Intermediate: 70-350 km deep
- 3) Deep: 350-670 km

Why no deeper?

How do you find the epicenter? Use of a Travel Time Curve

Example:

## Measuring the Size of an Earthquake

There are two main parameters that are utilized when studying the sizes of quakes.

1) Intensity: the effect on people. Scale: Modified Mercalli Scale

2) Magnitude: the amount of energy released.

a) Richter Scale: a logarithmic numerical scale

(a 5 vibrates ten times stronger than a 4, etc, )

(about 32 times more energy is released between a 4 and a 5, so a magnitude 6 is almost 1000 times more powerful than a 4)

b) Moment magnitude: incorporates the strength of rock, surface area of rupture, and the amount of rock displacement along the fault

Where do earthquakes occur in the US?

Effects of Earthquakes:

1) Ground Motion

2) Fire

3) Landslides

4) Liquefaction

5) Displacement of Land Surface

Production of Scarps

6) Aftershocks and Foreshocks

7) Tsunamis or Seismic Sea Waves

## **World Distribution of Earthquakes**

- 1) Circum Pacific Belt
- 2) Mediterranean-Himalayan Belt

Benioff-Wadati Zones and Island Arcs

First Motion Studies: the balloon diagrams

Earthquakes at Plate Boundaries

- 1) Divergent
- 2) Transform
- 3) Convergent

>significance of subduction angle

Earthquake Prediction and Seismic Risks

Prediction Parameters

- 1) Precursors
  - a) magnetism
  - b) electrical resistivity
  - c) microseisms
  - d) water levels in wells
  - e) radon emission
  - f) changes in geyser behavior
  - g) ground deformation
  - h) critter behavior
  - i) foreshocks
- 2) Seismic Gaps