Chapter 16 Earthquakes

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 release 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

1) P Waves

2) S Waves

Surface Waves

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?

Figure 16.14

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 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