


Earthquakes

Geology 8L
2 April 2007
Lecture Slides Modified from USGS Presentation

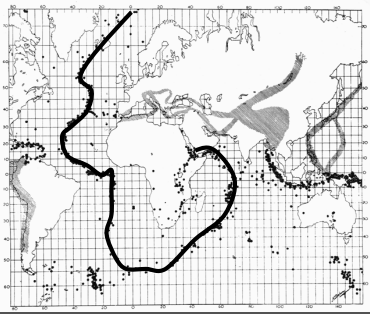

science for a changing world
USGS Earthquake Hazards Program

Earthquakes 101 (EQ101)

Lisa Wald
USGS Pasadena

U.S. Department of the Interior
U.S. Geological Survey

Global Distribution of Earthquakes






Plate Tectonics

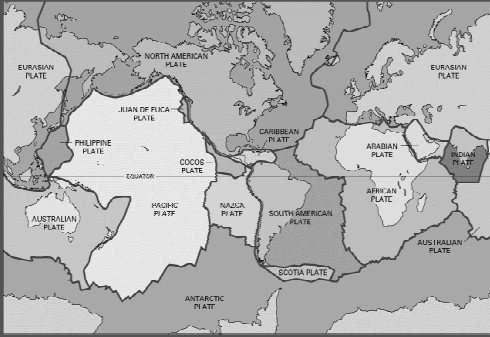
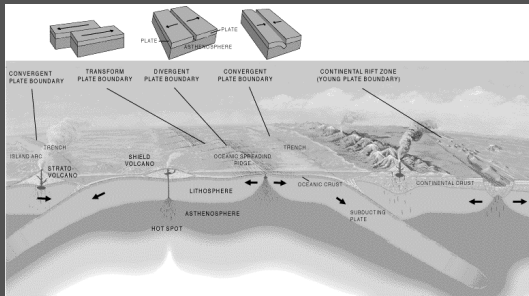
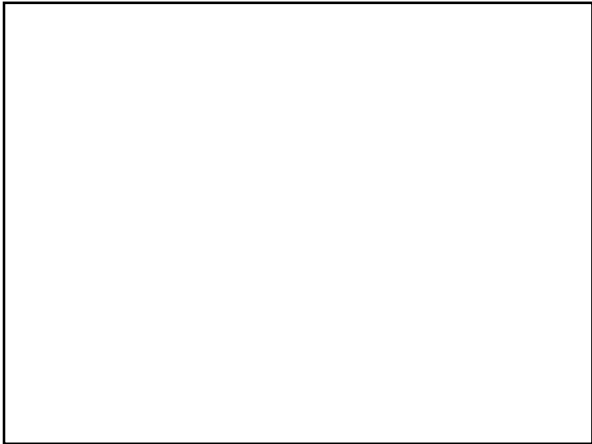
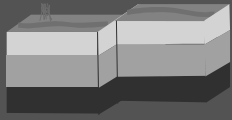


Plate Boundaries





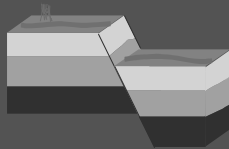
Three Types of Faults



Strike-Slip



Thrust



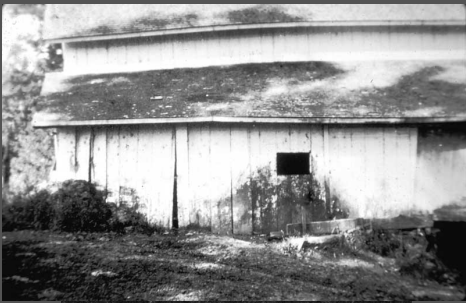
Normal



Strike-slip Fault Example



Strike-slip Fault Example



1906 San Francisco Earthquake

Normal Fault Example



Dixie Valley-Fairview Peaks, Nevada earthquake
December 16, 1954

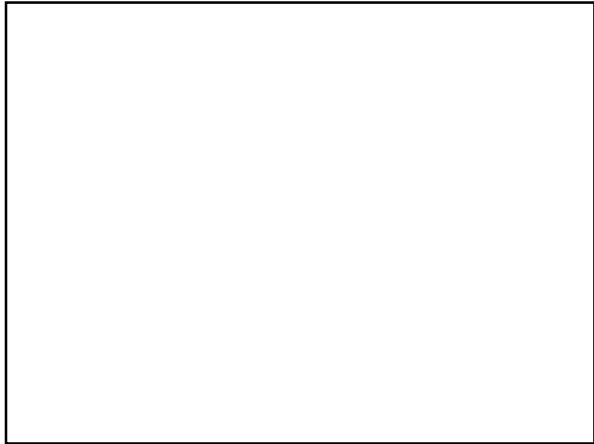


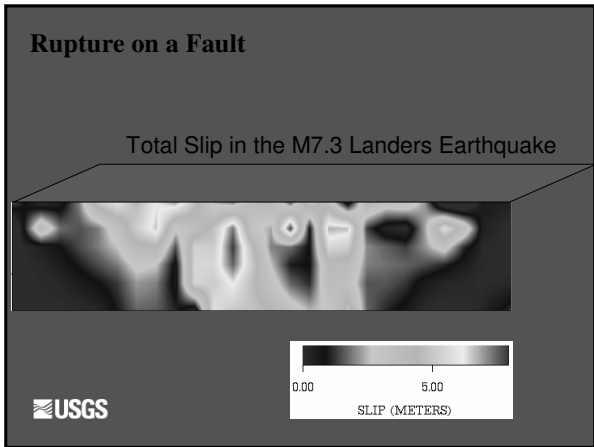
Thrust Fault Example

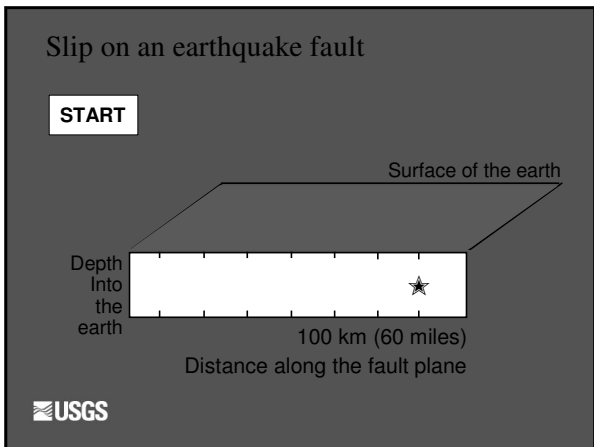


Thrust Fault Example

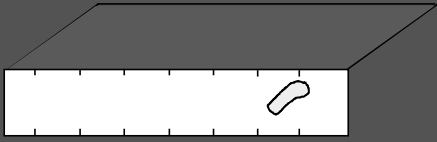




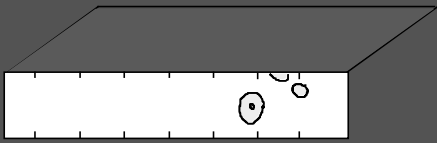




Slip on an earthquake fault
Second 2.0



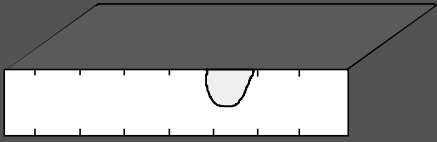
Slip on an earthquake fault
Second 4.0



Slip on an earthquake fault
Second 6.0



Slip on an earthquake fault
Second 8.0



USGS

Slip on an earthquake fault
Second 10.0



USGS

Slip on an earthquake fault
Second 12.0



USGS

Slip on an earthquake fault
Second 14.0



USGS

Slip on an earthquake fault
Second 16.0



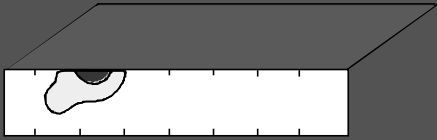
USGS

Slip on an earthquake fault
Second 18.0



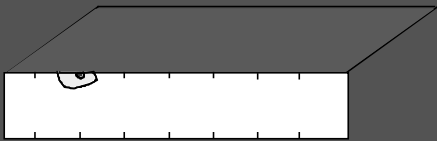
USGS

Slip on an earthquake fault
Second 20.0



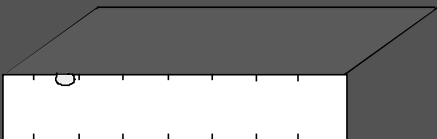
USGS

Slip on an earthquake fault
Second 22.0



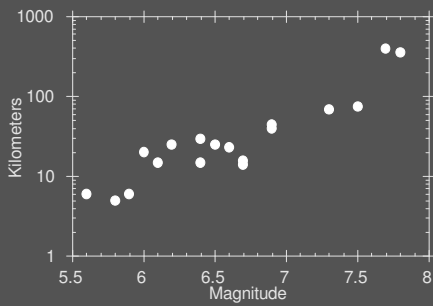
USGS

Slip on an earthquake fault
Second 24.0

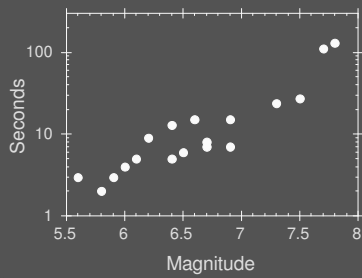


USGS

Bigger Faults Make Bigger Earthquakes



Bigger Earthquakes Last a Longer Time



What Controls the Level of Shaking?

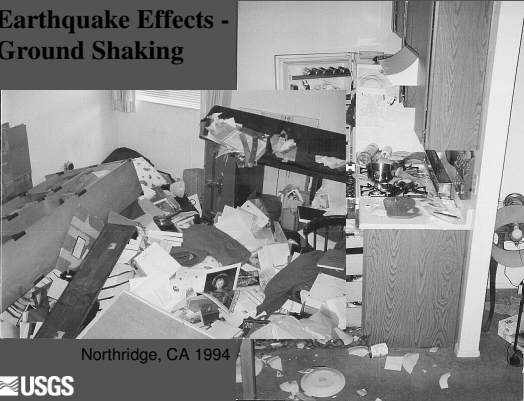
- **Magnitude**
 - More energy released
- **Distance**
 - Shaking decays with distance
- **Local soils**
 - amplify the shaking



Earthquake Effects - Ground Shaking



Earthquake Effects - Ground Shaking



Earthquake Effects - Ground Shaking



KGO-TV News ABC-7

Earthquake Effects - Ground Shaking



Kobe, Japan 1995



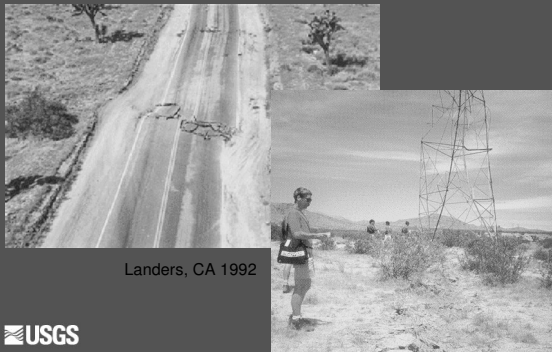
Earthquake Effects - Ground Shaking



Kobe, Japan 1995



Earthquake Effects - Surface Faulting



Landers, CA 1992



Earthquake Effects - Liquefaction



Source: National Geophysical Data Center



Niigata, Japan 1964

Earthquake Effects - Landslides



Source: National Geophysical Data Center



Turnnagin Heights, Alaska, 1964

Earthquake Effects - Fires



Loma Prieta, CA 1989



KGO-TV News ABC-7

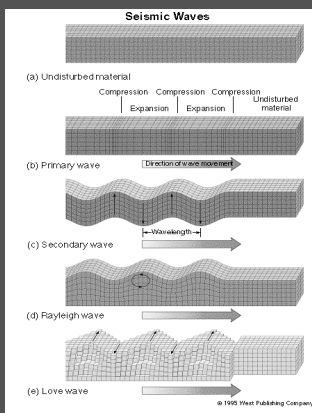
Earthquake Effects - Tsunamis

1957 Aleutian Tsunami

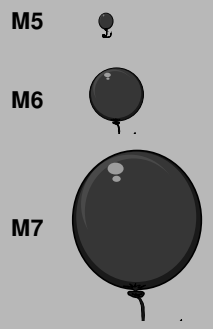
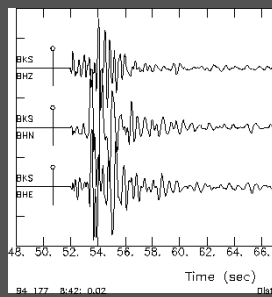


Photograph Credit: Henry Helbush. Source: National Geophysical Data Center

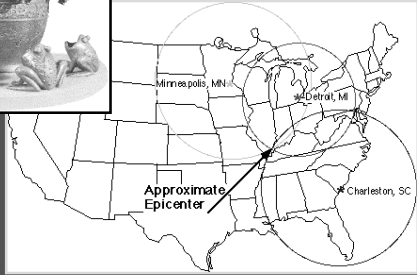
Seismic Waves



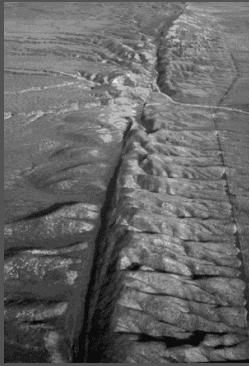
Earthquake Magnitude



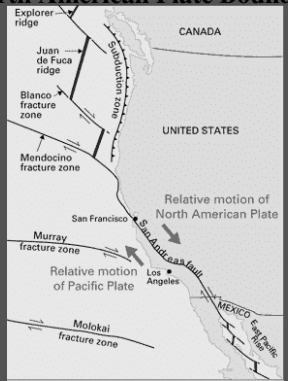
Earthquake Location



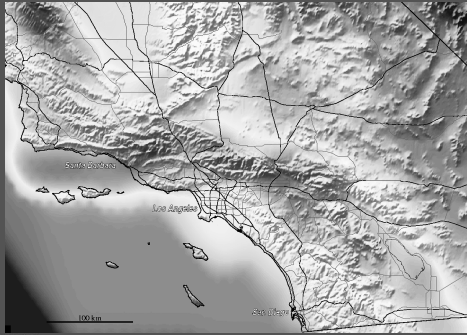
The San Andreas Fault



Pacific-North American Plate Boundary

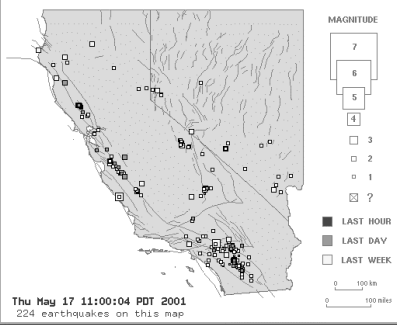


Shaking Hazard in Southern California



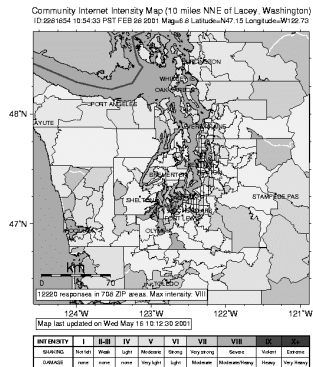
Real-time Earthquake Information

Index Map of Recent Earthquakes in California-Nevada
USGS-UCB-Caltech-UCSD-UNR



Did You Feel It?

Community Internet Intensity Maps



USGS Earthquake Hazards Program

U.S. Department of the Interior
U.S. Geological Survey

Where to go for more information:

<http://pasadena.wr.usgs.gov/>
<http://earthquake.usgs.gov/>

The End

