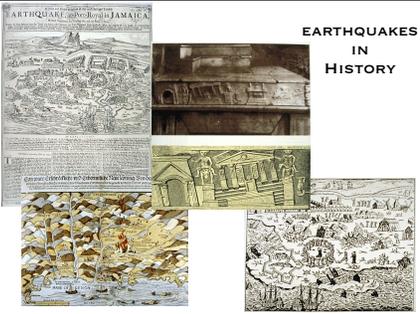


EARTHQUAKES



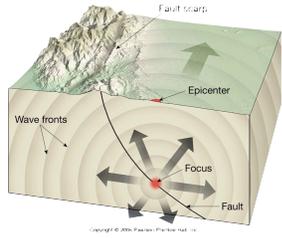
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EARTHQUAKES IN HISTORY



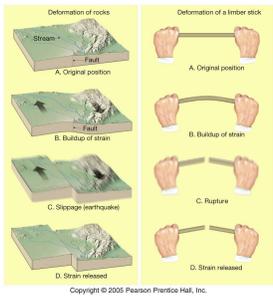
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EARTHQUAKE TERMINOLOGY



3

ELASTIC REBOUND

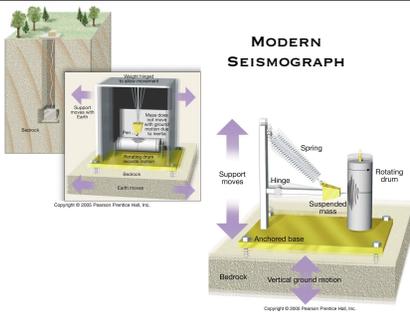


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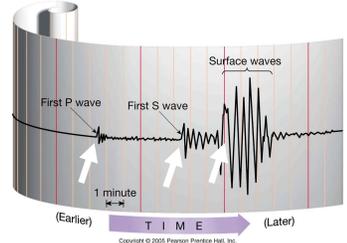


MODERN SEISMOGRAPH

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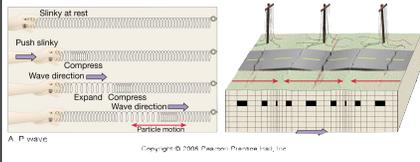
SEISMOGRAPH RECORD



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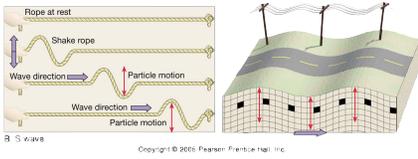
P(RIMARY) WAVES



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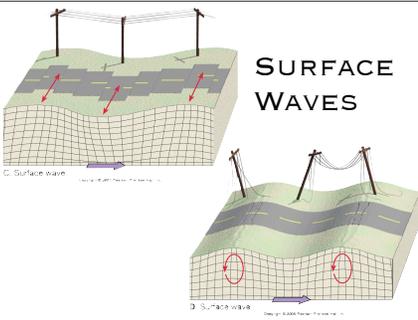
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S(ECONDARY) WAVES



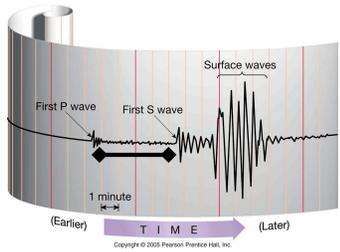
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SURFACE WAVES



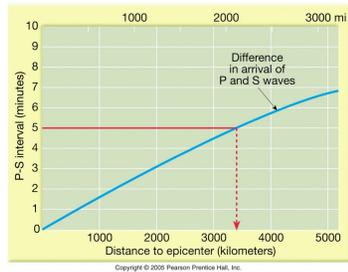
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SEISMOGRAPH RECORD



11

DISTANCE TO AN EARTHQUAKE



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TABLE 11.3 Earthquake Magnitude and Energy Equivalence

Earthquake Magnitude	Energy Released* (Millions of Ergs)	Approximate Energy Equivalence
0	630,000	1 pound of explosives
1	20,000,000	
2	630,000,000	Energy of lightning bolt
3	20,000,000,000	
4	630,000,000,000	1000 pounds of explosives
5	20,000,000,000,000	
6	630,000,000,000,000	1948 Bikini atomic bomb test
7	20,000,000,000,000,000	1984 Northridge Earthquake
8	630,000,000,000,000,000	1989 Loma Prieta Earthquake
9	20,000,000,000,000,000,000	1906 San Francisco Earthquake
		1980 Eruption of Mount St. Helens
		1964 Alaskan Earthquake
		1960 Chilean Earthquake
10	630,000,000,000,000,000,000	Annual U.S. energy consumption

*For each unit increase in magnitude, the energy released increases about 31.6 times.
SOURCE: U.S. Geological Survey.

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TABLE 11.2 Earthquake Magnitudes and Expected World Incidence

Richter Magnitudes	Effects Near Epicenter	Estimated Number per Year
<2.0	Generally not felt, but recorded.	600,000
2.0-2.9	Potentially perceptible.	300,000
3.0-3.9	Felt by some.	49,000
4.0-4.9	Felt by most.	6200
5.0-5.9	Damaging shocks.	800
6.0-6.9	Destruction in populous regions.	266
7.0-7.9	Major earthquakes. Inflict serious damage.	18
8.0	Great earthquakes. Cause extensive destruction to communities near epicenter.	1.4

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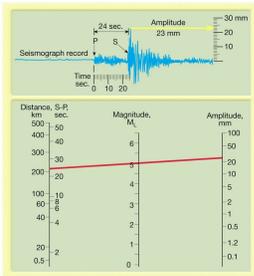
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TABLE 11.1 Modified Mercalli Intensity Scale

- I Not felt except by a very few under especially favorable circumstances.
- II Felt only by a few persons at rest, especially on upper floors of buildings.
- III Felt quite noticeably indoors, especially on upper floors of buildings, but many people do not recognize it as an earthquake.
- IV During the day, felt indoors by many, outdoors by few. Sensation like heavy truck striking building.
- V Felt by nearly everyone, many awakened. Disturbances of trees, poles, and other tall objects sometimes noticed.
- VI Felt by all; many frightened and run outdoors. Some heavy furniture moved, few instances of fallen plaster or damaged chimneys. Damage slight.
- VII Everybody runs outdoors. Damage negligible in buildings of good design and construction; slight to moderate in well-built ordinary structures; considerable in poorly built or badly designed structures.
- VIII Damage slight in specially designed structures; considerable in ordinary substantial buildings with partial collapse; great in poorly built structures (fall of chimneys, factory stacks, columns, monuments, walls).
- IX Damage considerable in specially designed structures. Buildings shifted off foundations. Ground cracked conspicuously.
- X Some well-built wooden structures destroyed. Most masonry and frame structures destroyed. Ground badly cracked.
- XI Few, if any (masonry) structures remain standing. Bridges destroyed. Broad fissures in ground.
- XII Damage total. Waves seen on ground surfaces. Objects thrown upward into air.

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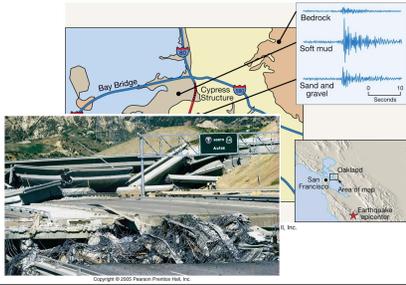
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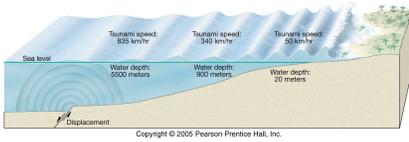
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DIFFERENT MATERIALS RESPOND DIFFERENTLY TO EARTHQUAKES.



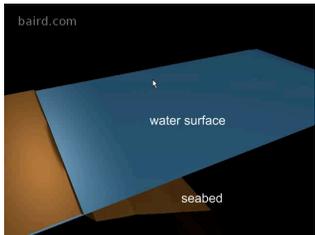
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TSUNAMIS



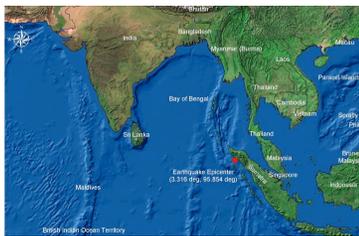
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TSUNAMI WAVES

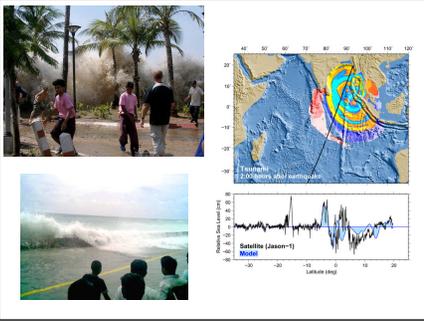


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**CASE STUDY:
DECEMBER 26, 2004, INDIAN
OCEAN TSUNAMI**



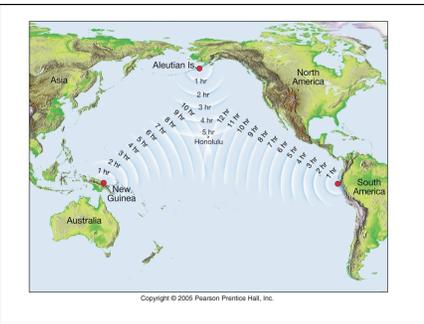
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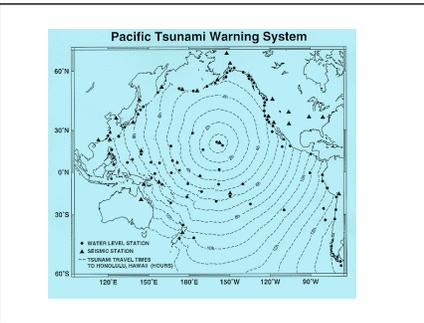
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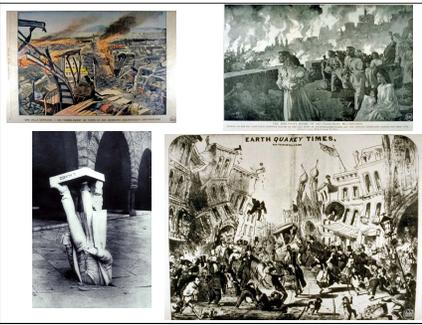


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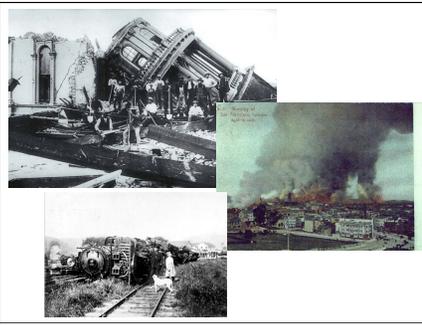
CASE HISTORY:
1906 SAN FRANCISCO EARTHQUAKE



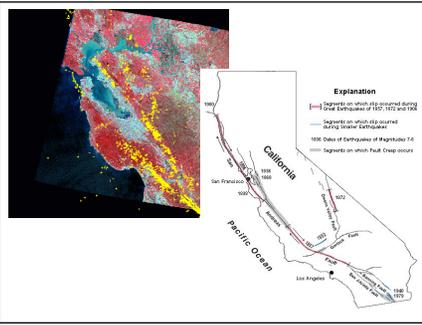
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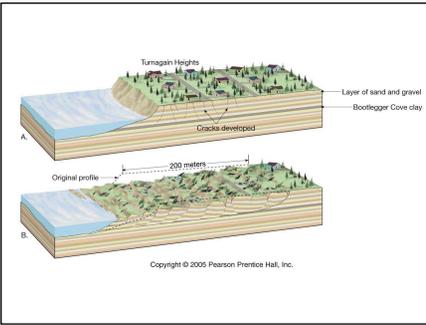
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NEXT LECTURE
THE EARTH'S INTERIOR

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