Earthquake preparedness and warning systems
Earthquake prediction

• Location, time, intensity

• One successful prediction in Haicheng, China, 1975

• Problems: (i) we don’t know the strain field and friction coefficient everywhere along the fault plane; (ii) we don’t understand all the physical factors involved in earthquake processes
Earthquake potential and preparedness

- Current research is based on statistical analysis of paleo-seismicity and foreshocks, measures of ground motion (GPS), imaging of seismogenic zones.
- Results help construct seismic hazard maps, which guide building codes and development of emergency response procedures.
- Results help determine medium and long-term earthquake potential.
Seismic hazard map (peak shaking)

Peak Acceleration (%g) with 10% Probability of Exceedance in 50 Years
site: NEHRP B-C boundary

Nov. 1996

For California portion: U.S. Geological Survey - California Division of Mines and Geology
For Nevada and surrounding states: USGS

Image courtesy of USGS.
Seismic hazard map (peak shaking)

Peak Accel. (%g) with 10% Probability of Exceedance in 50 Years
USGS Map, Oct. 2002

Image courtesy of USGS.
Seismic hazard map (peak shaking)

Peak Acceleration (%g) with 10% Probability of Exceedance in 50 Years
USGS Map, Oct. 2002

Image courtesy of USGS.
Assessing building vulnerability

- location relative to active faults
- type of soils on which building rests
- age and type of building
Earthquake preparedness: 7 steps

1. Before
   - Identify potential hazards in your home and begin to fix them

2.
   - Create your disaster plan

3.
   - Create your disaster supply kits

4.
   - Identify your home’s potential weaknesses and begin to fix them

5. During
   - During earthquakes and aftershocks: Drop, cover and hold on

6. After
   - After the shaking stops, check for damage and injuries needing immediate attention

7.
   - When safe, follow your disaster plan
Deep-ocean Assessment and Reporting of Tsunamis (DART)

Image courtesy of NOAA.
Deep-ocean Assessment and Reporting of Tsunamis (DART)

Image courtesy of NOAA.
Image from public domain.
Where can we expect the next “Big One” in the contiguous 48 states?

- Cascadia subduction zone
- Last earthquake: 26 January 1700, ~9pm, $M > 9.0$
- Archeoseismology: tree stumps, tsunami deposits in PNW estuaries and tsunami records in Japan
- Recurrence: 300-500 years for the last ~10,000 yr