**Internal processes:**

Earthquakes vs. humankind

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**The earthquake cycle**

- **Crustal strain**
  - Time

- **Number of earthquakes**
  - Time

  - Seismic quiescence
  - Aftershocks
  - Aftershocks

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**Global seismicity**

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**Loma Prieta and seismic gaps**

- **Locked**
- **Creeping**

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**Reading:**

- This week: Ch 4
- Next week: Ch 5
Earthquake forecasting

The Parkfield experiment

In 1985 the USGS predicted an earthquake at Parkfield in January 1988 ± 5 years

...still waiting

Seismic hazard

Building codes

Earthquakes don’t kill people, buildings do
Building codes

Turkey, 1999:
Poor building standards blamed for much of the death

Insurance

The cycle goes on…

Earthquake prediction

“There will be an earthquake a week from Wednesday at Parkfield”

What is a useful prediction?

What is a useful prediction?

Earthquake early warning
an active area of research
Earthquake prediction in China

Possible earthquake precursors:
- Rapid surface deformation
- Rapid increase in small earthquake activity
- Changes in physical properties of rocks e.g. conductivity, P-velocity
- Change in the level of water in wells
- Strange animal behavior

Earthquake prediction in China

Success: Haicheng, NE China, February 1975
- predicted an imminent earthquake, evacuation ordered
- nine hours later a large earthquake struck destroying many homes but there was little loss of life

Failure: Tangshan, NE China, 1976
- predicted an earthquake in the Tangshan region over the “next two months”
- no immediate precursors, no evacuation
- more than 250,000 people died

But, what of false alarms?

The future of earthquake prediction

This is currently being pursued in the US, Russia, China and Japan
...don’t expect results in the foreseeable future

When we are ready to try predictions consider:
- legal implications
- political implications
- property values
- practical implications
...we would need a serious educational campaign

Earthquake warning

Could provide a few to tens of seconds of warning

This is a research effort here at UW!
“Earthquake control”

Unlocking faults
• fluid injection to “smooth” fault motion
• nuclear explosion to trigger stress release on the fault