

Earthquake Prediction - Parkfield

Lecture Objectives

Understand USGS Parkfield experiment

Implications of Parkfield on prediction, mitigation

Reading

USGS Earthquake Prediction:

<http://quake.wr.usgs.gov/research/seismology/wg02/>

-figure out how they are making their prediction;
valid methodology and conclusions?

Optional Reading

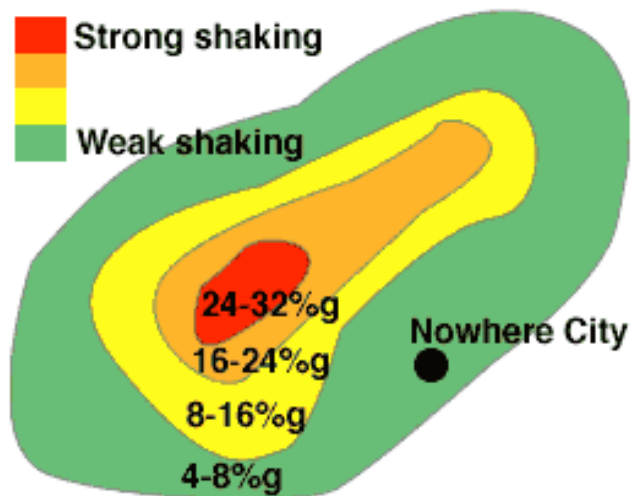
Wang et al. (2004) Probabilistic hazard assessments

Quiz on Seismic Hazard Maps

Building codes are based upon the USGS peak ground acceleration maps, which are designed to predict the maximum shaking expected in 2500 years. But their maps are also disseminated with the probability given over other time spans.

For a “100-year” map, what is the probability of maximum shaking?

How to read a hazard map



Suppose the map on the left is the map given:

a 50-year time interval
a 5% chance of exceedence
a [PGA](#) map

We would read the shaking hazards for Nowhere City as:

The earthquake peak ground acceleration (PGA) that has a 5% chance of being exceeded in 50 years has a value between 4 and 8% g.

If maximum shaking is 100% in 2500 years,

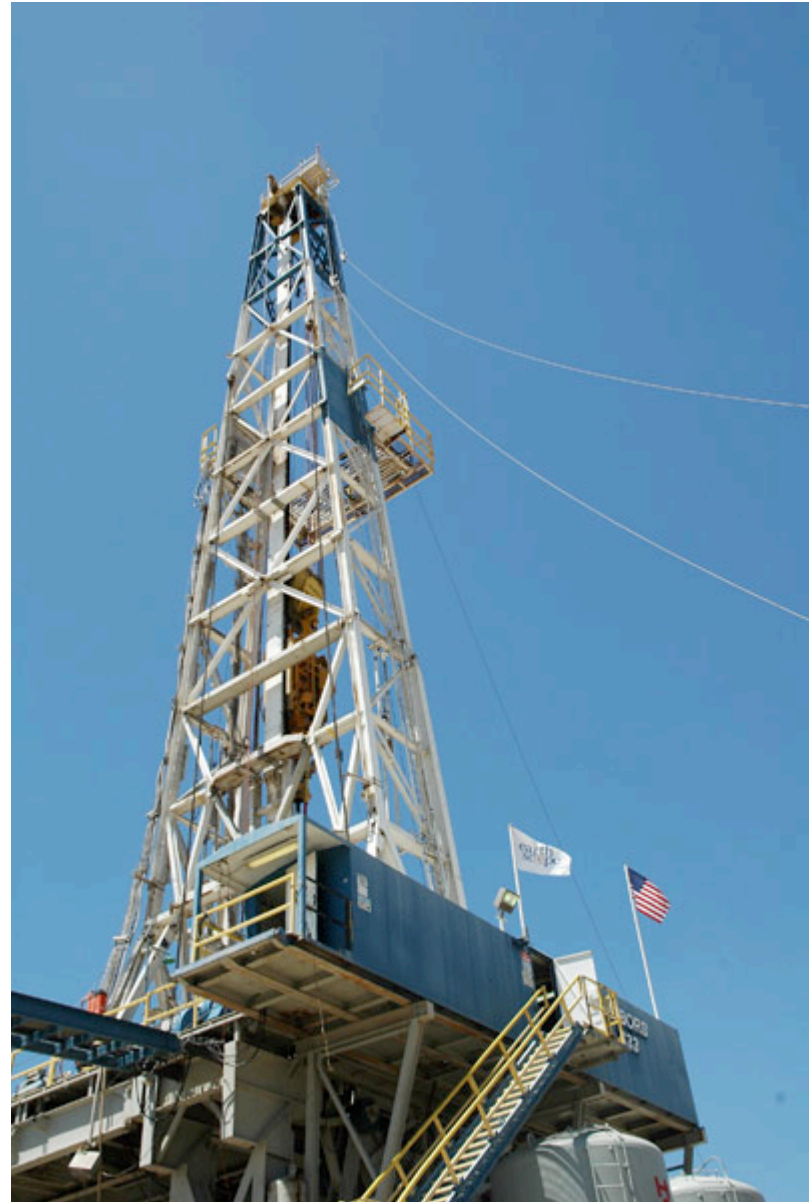
Then:

= 2% in 50 years ($2500/50$; $100/50 = 2$)

= 4% in 100 years ($2500/100$; $100/25 = 4$)

*The 2004
Parkfield
event,
earthquake
predication,
and drilling the
San Andreas*

*(figures courtesy of
the USGS)*



Prediction: a declaration in advance; foretelling on the basis of observation, experience, or scientific reason

Predication: an act of proclaiming or preaching; assertion of a quality or attribute.

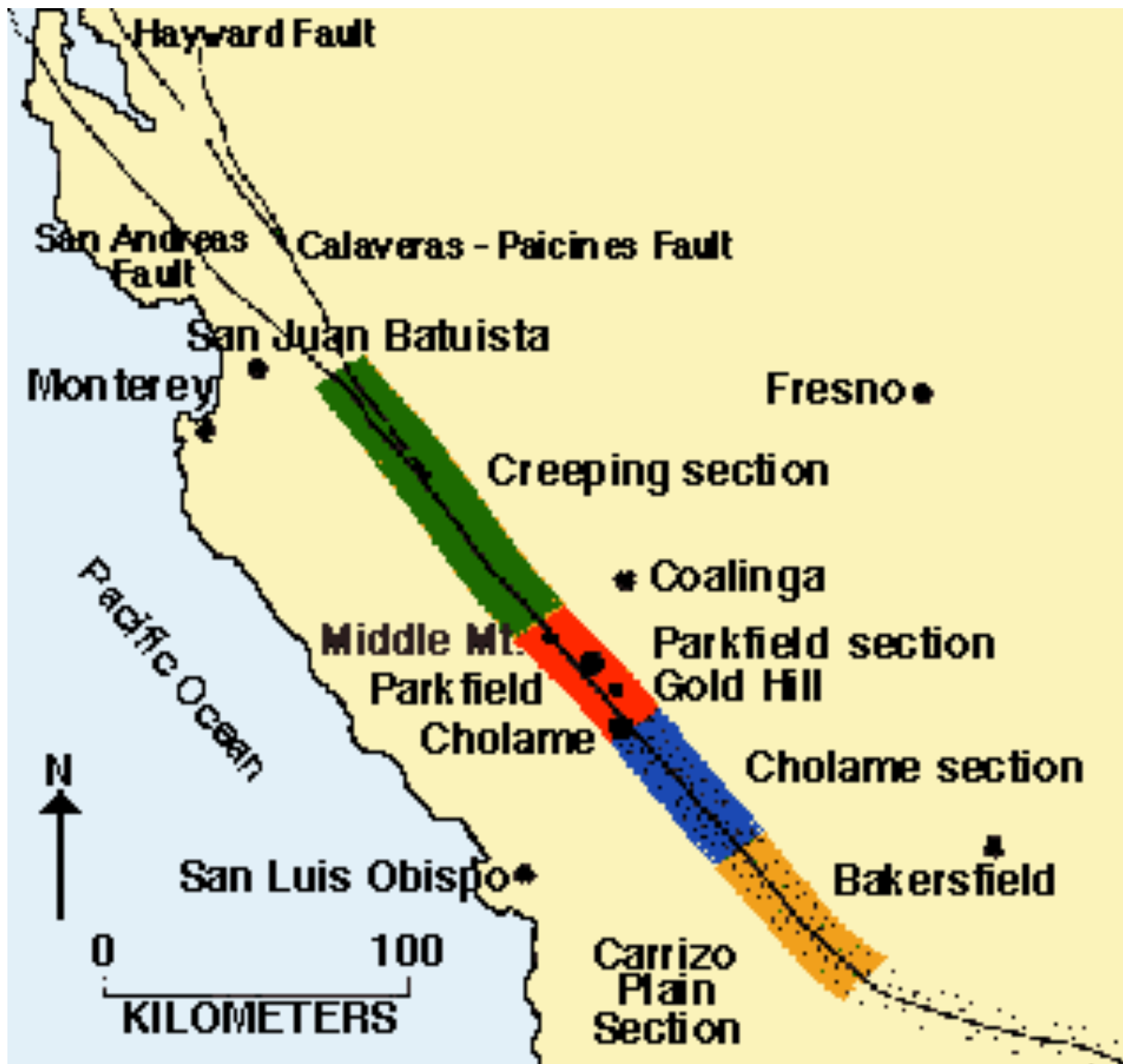
What is so special about Parkfield?

- A) Smallest town in California
- B) On the San Andreas Fault
- C) Magnitude 6 earthquakes occurred there in 1857, 1881, 1901, 1922, 1934, and 1966.
- D) Starting point of the 1857 M 8 Ft. Tejon earthquake.

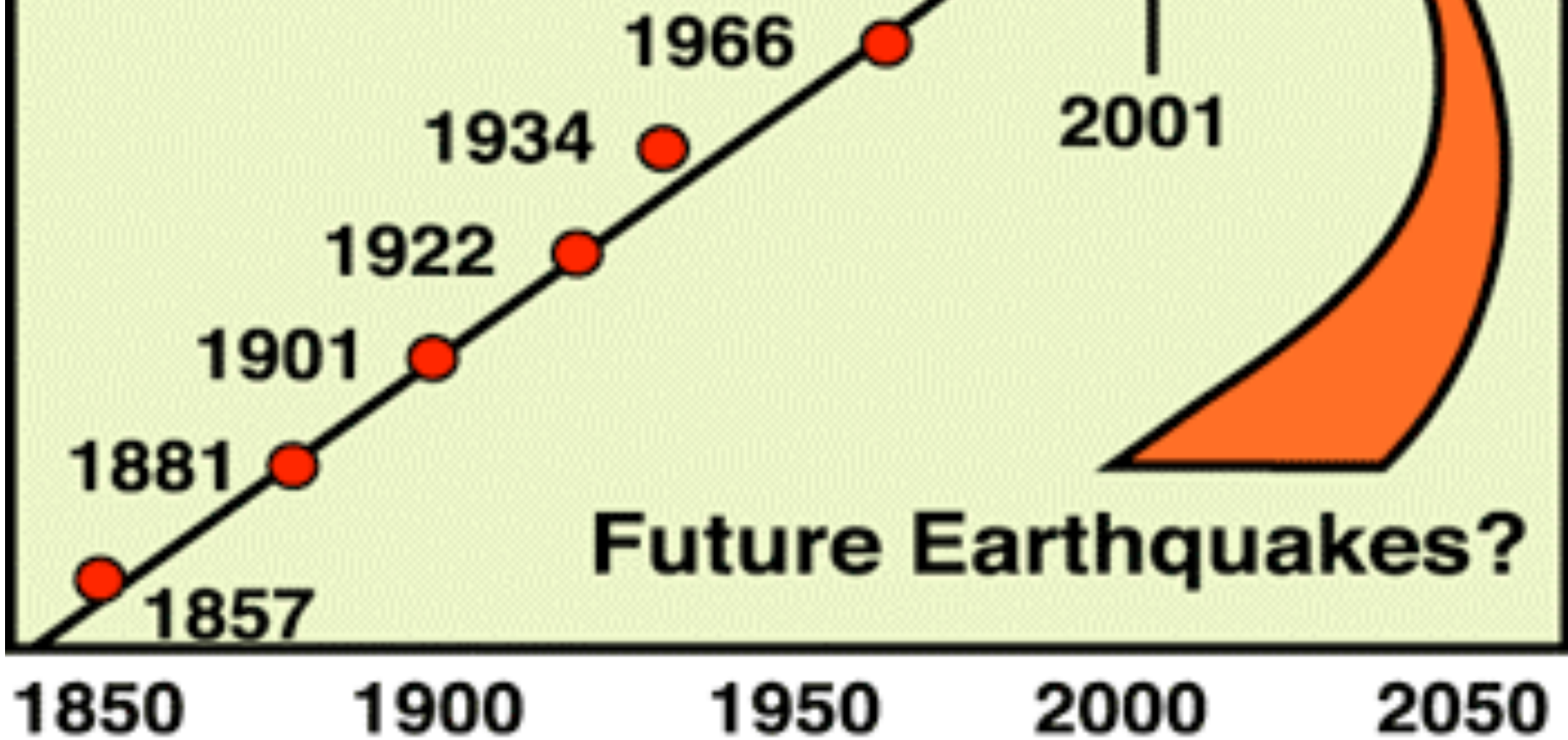
If the historical gap between earthquakes is 24, 20, 21, 12, and 32 years, (average: 22, last one in 1966) when will the next earthquake occur?

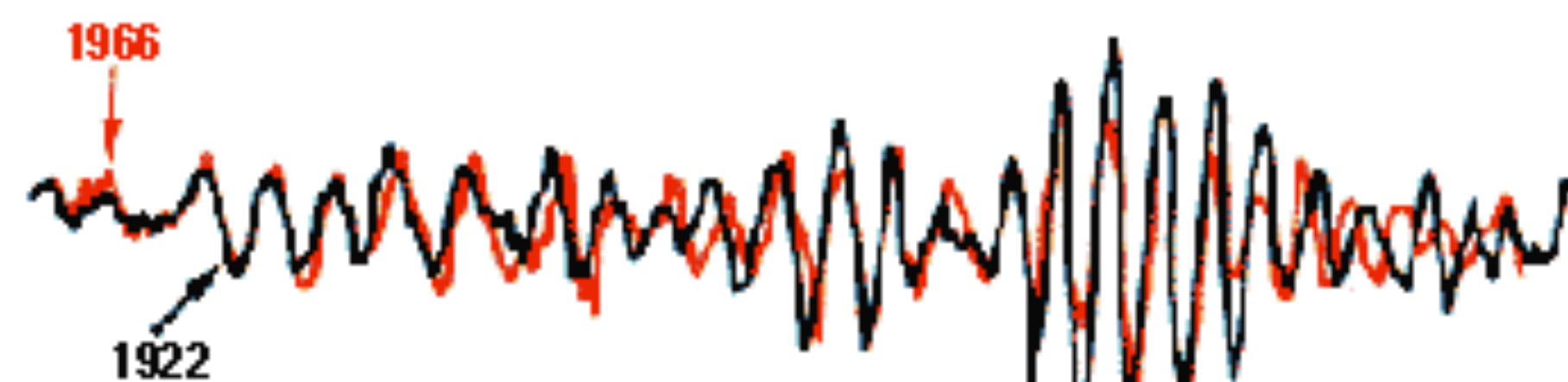
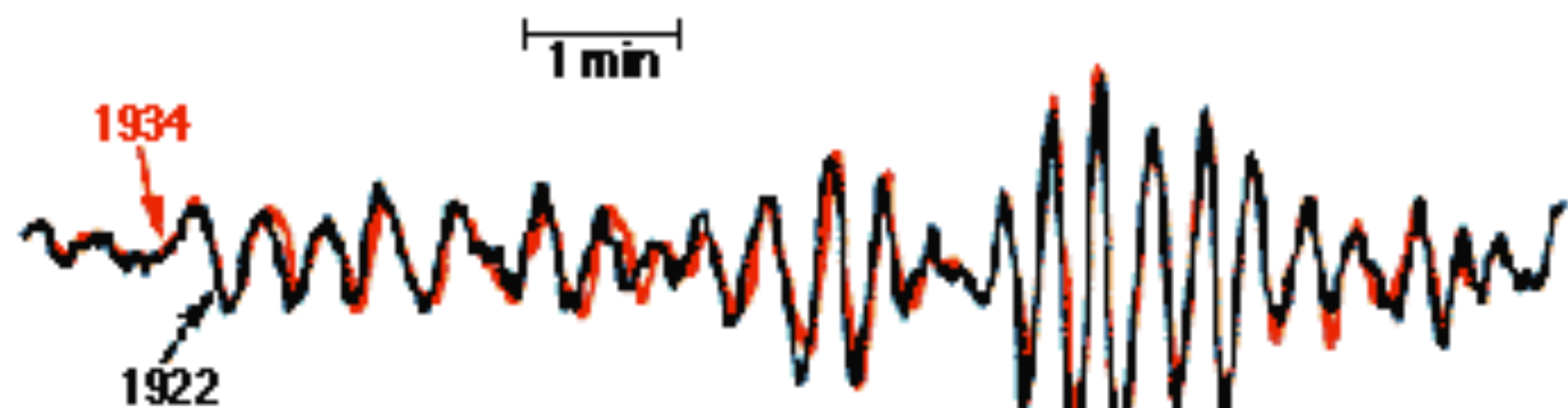
- A) $1966 + 22?$
- B) Don't know





Historical M 6 Parkfield Earthquakes

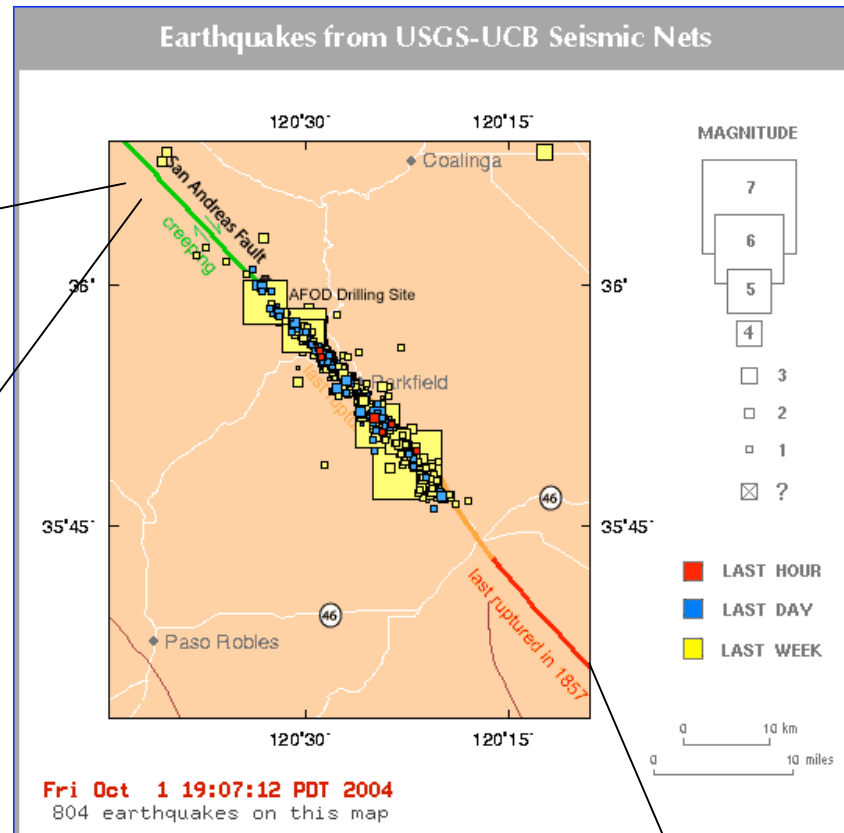




Parkfield and the San Andreas



Creeping fault at Hollister, CA



- North of town, always creeping (aseismic creep*)
- South of town, rarely breaks but large when it does.
- Because of the earthquakes, lots of seismic instruments installed.

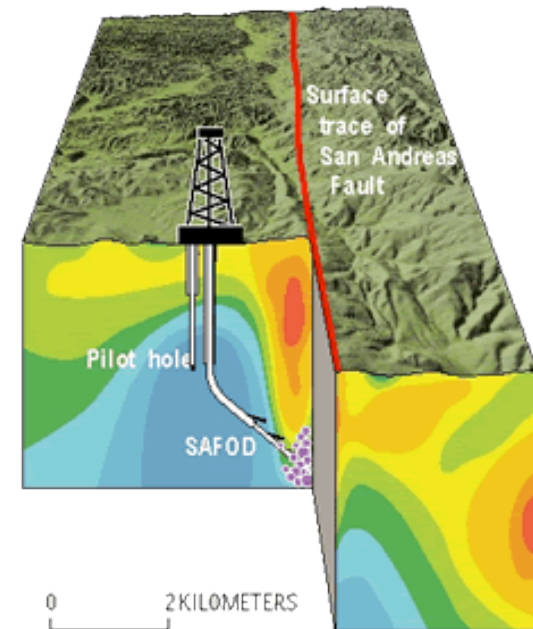
•Not to be confused with “a seismic creep”

Start of M 8 1857 “Fort Tejon” earthquake (end near San Bernardino)



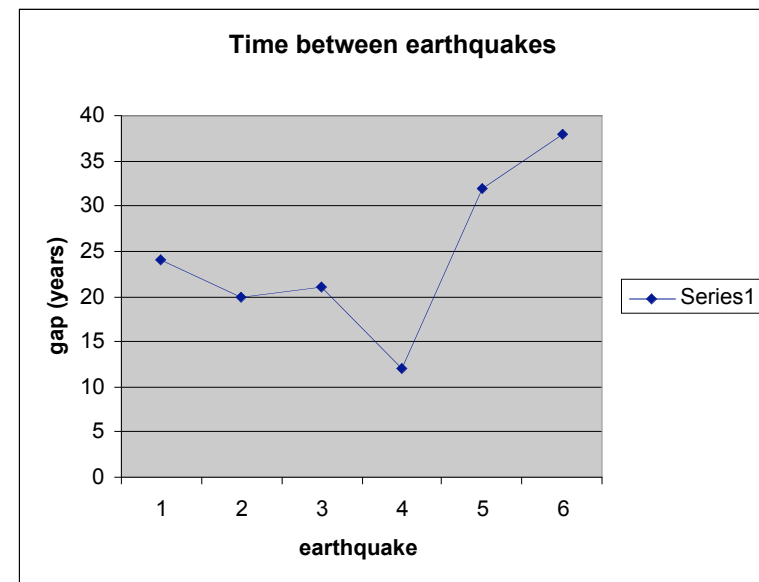
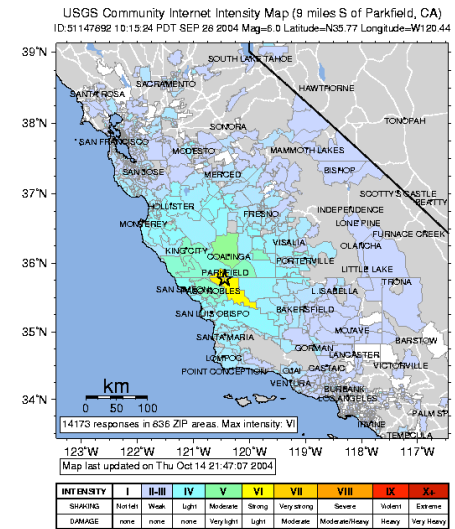
How to find out? Drill it!

- Now drilling (SAFOD) is under way to study the San Andreas where the earthquakes occur.
- Original plan was to drill before the earthquake and then see what happens.....
- Check progress (pictures) at: <http://www.earthscope.org/safod/index.html>
- Part of “Earthscope Project” - . <http://www.earthscope.org/>
- There are opportunities and material for K-12.



The 2004 earthquake

- Magnitude 6 – about the right size.
- A little bit further south than expected.
- 16 years late.
- Are earthquakes like:
 - Clockwork?
 - Clock running down?
 - Or dice?
- Nobody really knows, but most estimates of seismic risk assume that earthquakes are somewhat regular.



Where is the next point?

