

The Great
Southern California

Shake Out

November 12–16, 2008

From the scientist's perspective to the citizen's

Prof. Keith Porter, Univ. Colorado at Boulder
AAAS Annual Meeting 20 Feb 2010



Earthquake Country **Alliance**
We're all in this together.

The challenge considered here

- ShakeOut scientists' interests vs. the public's or planners'
 - Scientific debate vs. a clear concise story for planning
 - Probabilistic modeling vs. a single realistic outcome
 - Advancing the state of the art vs. using best current knowledge
 - Novelty vs. major impacts affecting the bulk of society

Motivation for the Scenario: FAQs

- What will a big earthquake be like?
- Could a Katrina-like catastrophe happen here?
- To prepare, what are the best uses of limited resources?

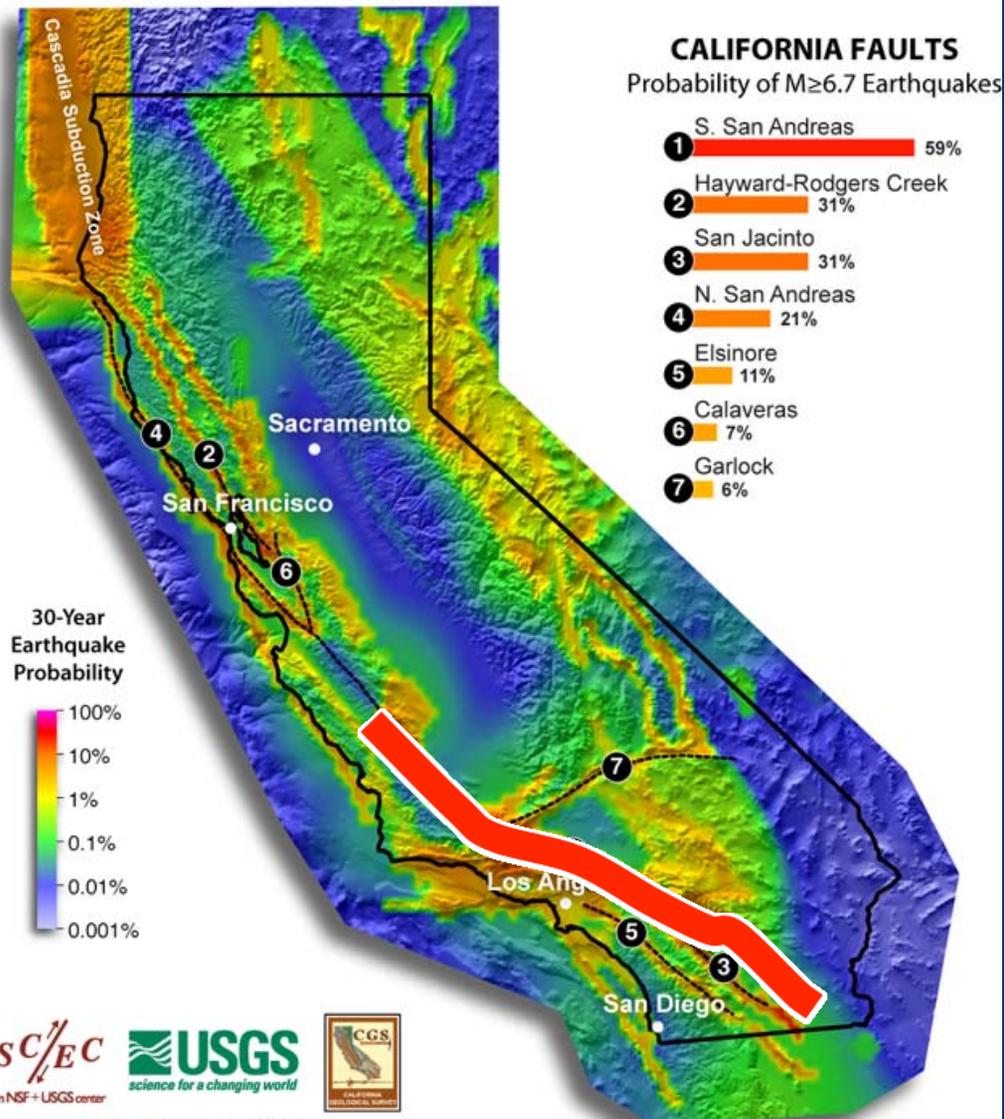
Scenario Components

Earth sciences

Physical damage

Societal impacts

The ShakeOut message:

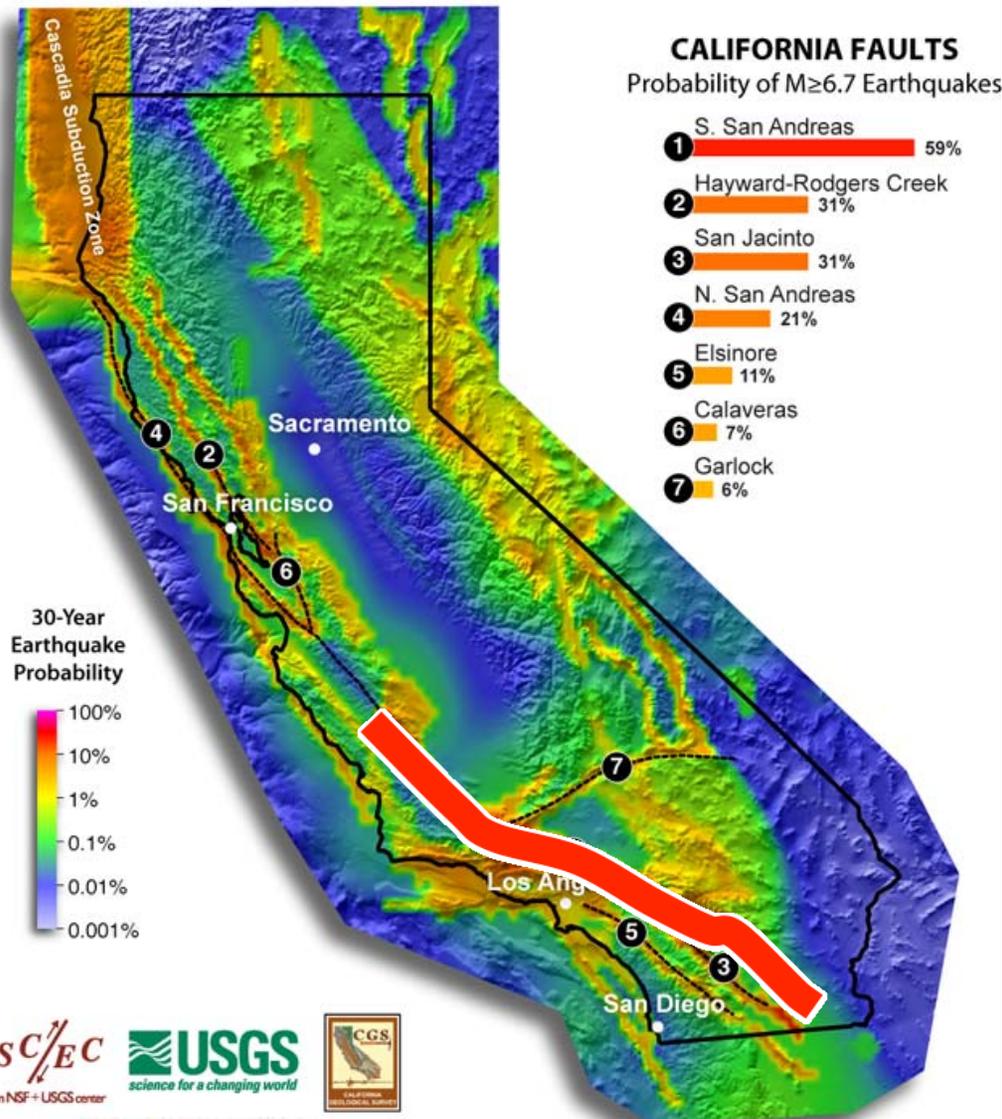


“Every Californian should be ready for this earthquake”

Shake
Out

CEA CALIFORNIA EARTHQUAKE AUTHORITY

Not:



“Look at the new great science we can do. Isn’t it cool? Now how about that grant?”

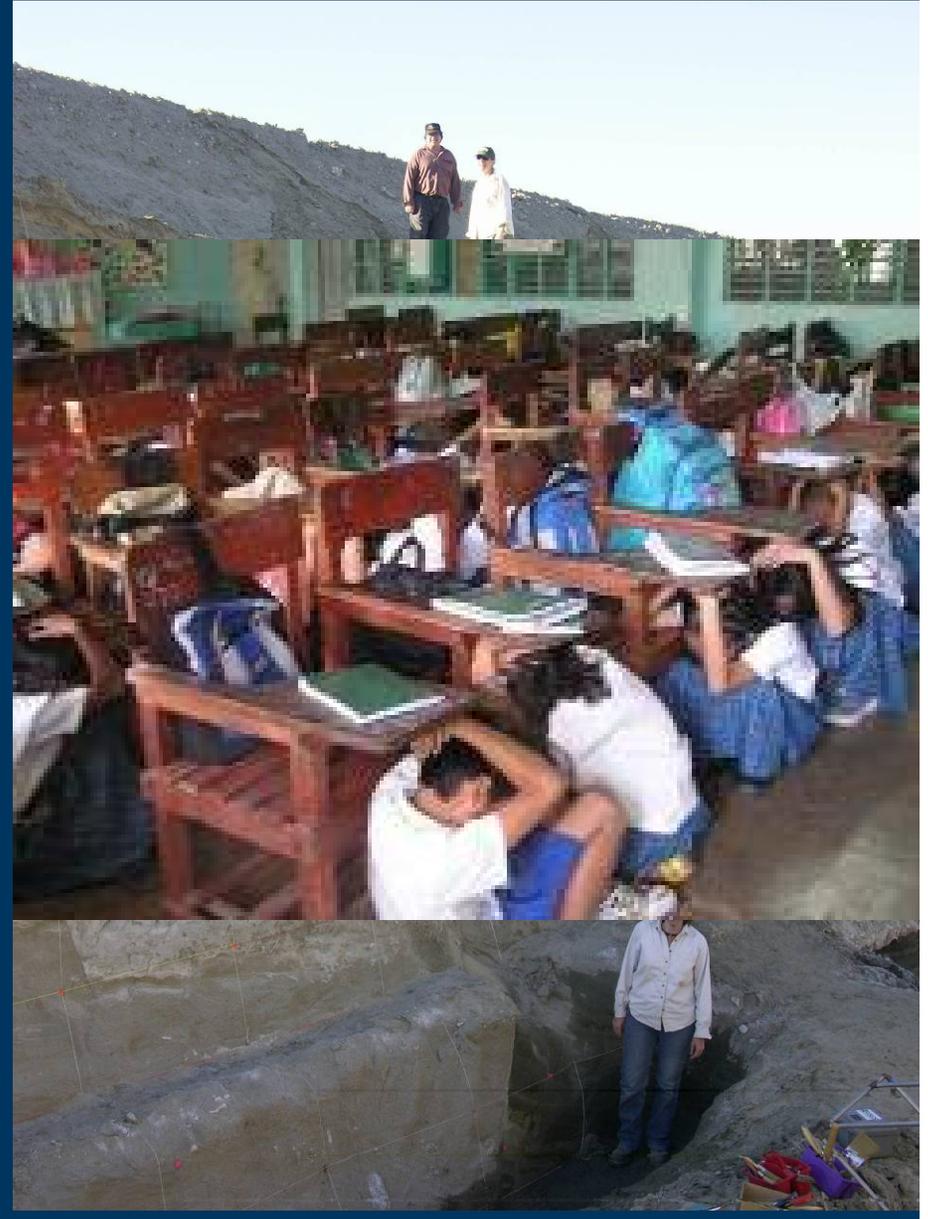
Good science to serve resiliency

Teaching opportunities

- *Paleoseismology*
- Cut into the fault
- Find evidence of earthquake
- Date sediments above and below
- Earthquake dates between the two

Resiliency

- Duck, cover, and hold on



10 Lessons from ShakeOut

1. Use availability; relate to experience

Compare with
2008 Northridge
earthquake:

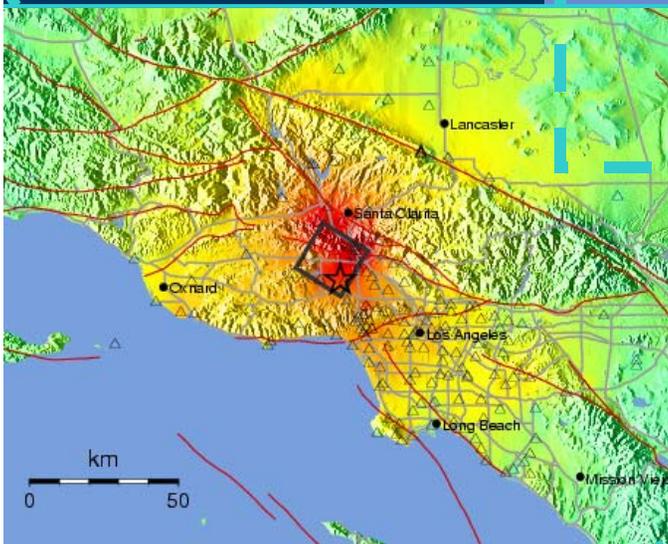
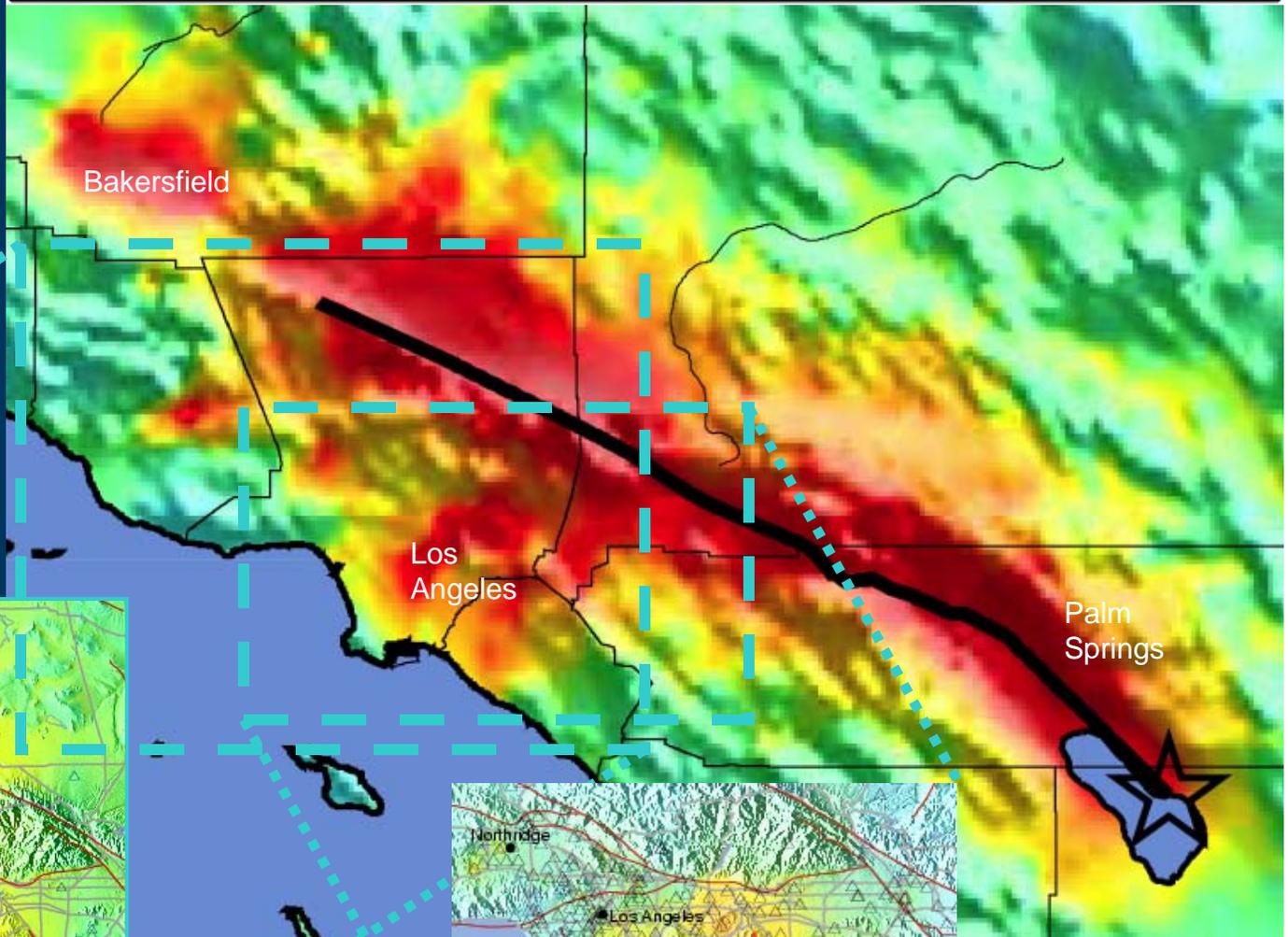
- 50% smaller!
- Magnitude 6.7
- 57 deaths
- \$40 billion damage

SHAKING:

WEAK

STRONG

SEVERE



Shake
Out

1. Use availability; relate to experience



1989 Loma Prieta



1989 San Francisco



1971 San Fernando



5/2/83 M6.5 Coalinga



1994 Northridge CA



1933 Long Beach

2. Avoid sensationalism

- Five highrise steelframe buildings collapse
- *Steel frame is safer than other types*



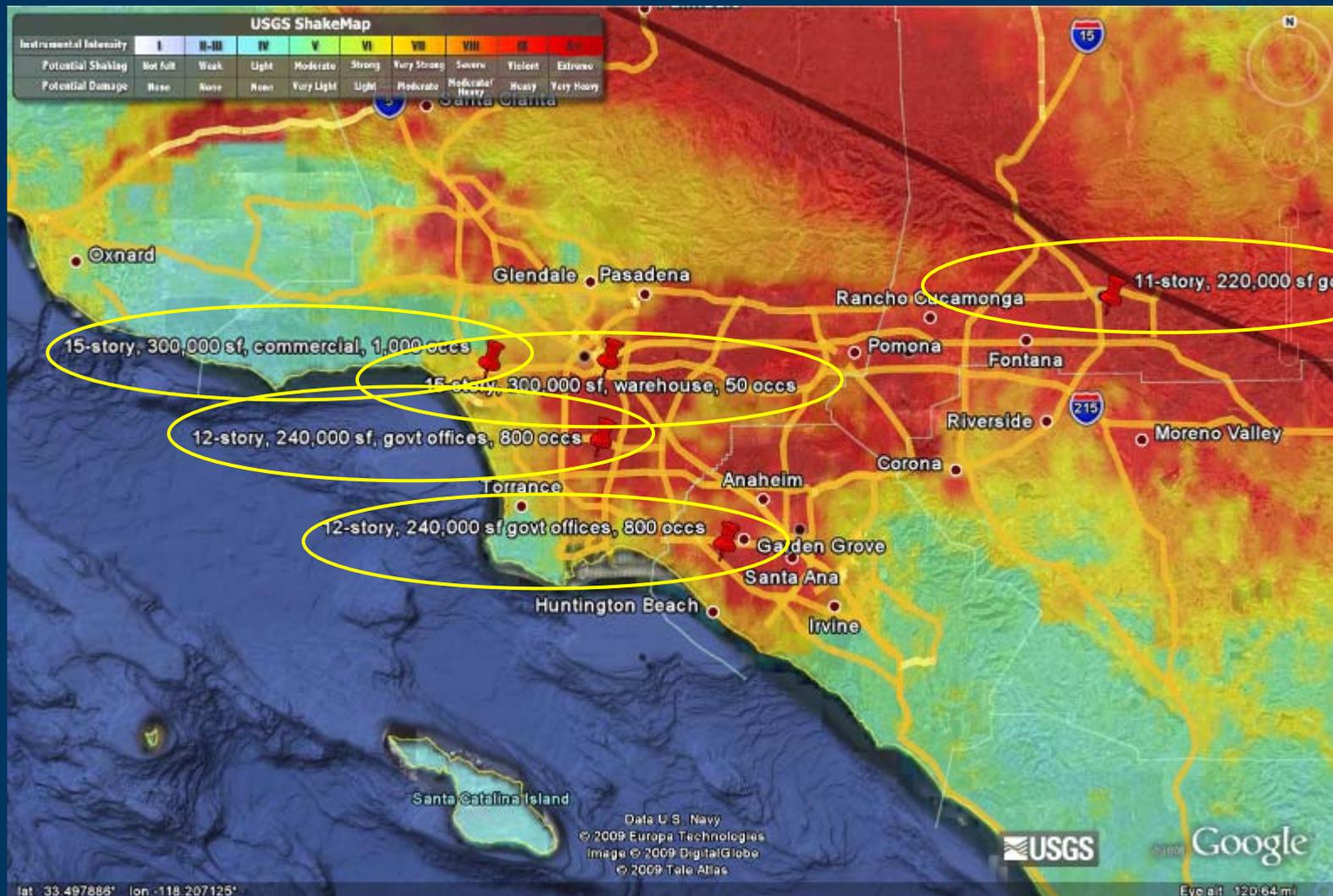
Crack in steel weld



Collapsed steel building

3. Avoid probability

We estimated 0-10 SF collapses, chose 5



ake
Out

4. Get to the point

Widespread Strong Ground Shaking
+ Shaking of Long Duration + Landslides =

300,000 buildings significantly damaged – 1 in 16

1,600 fires requiring response; **1,200** large fires

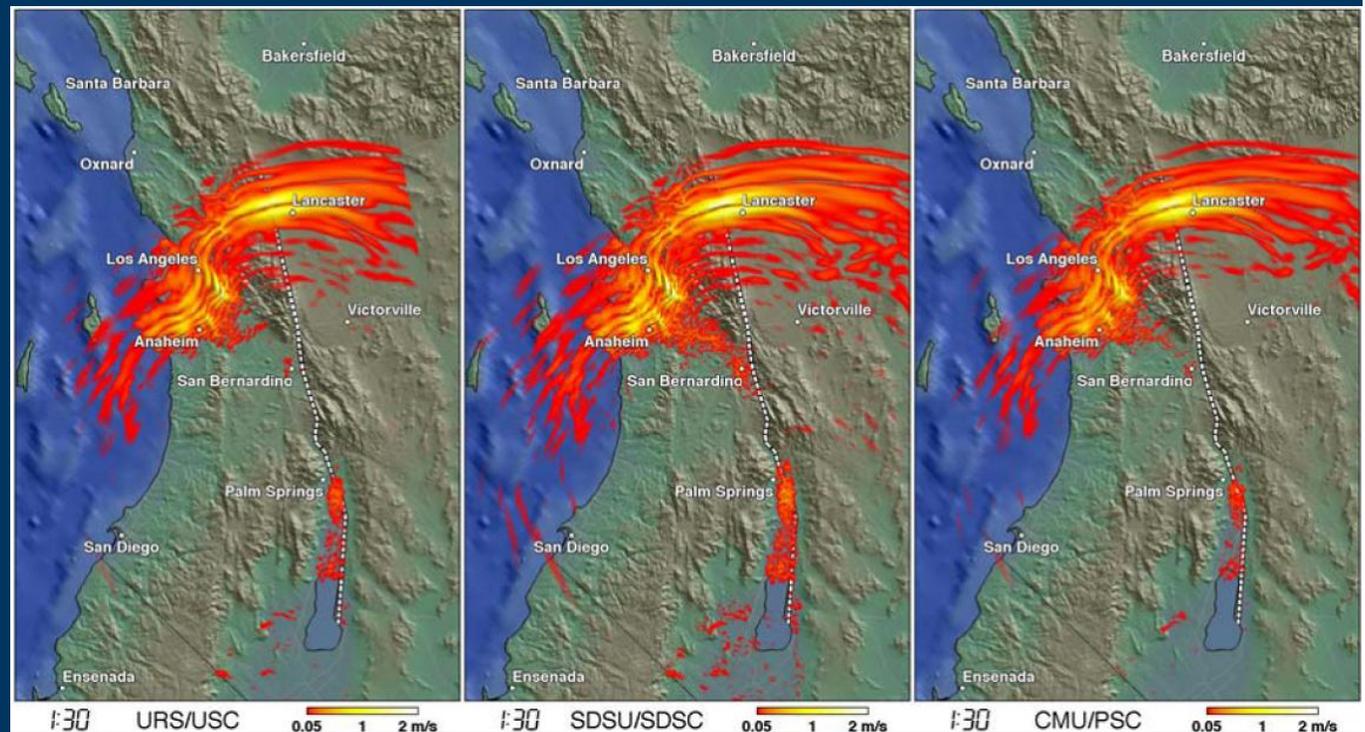
\$213 billion damages

255,000 displaced persons – 1 in 60

53,000 injuries, **1,800** deaths

5. Emphasize consensus

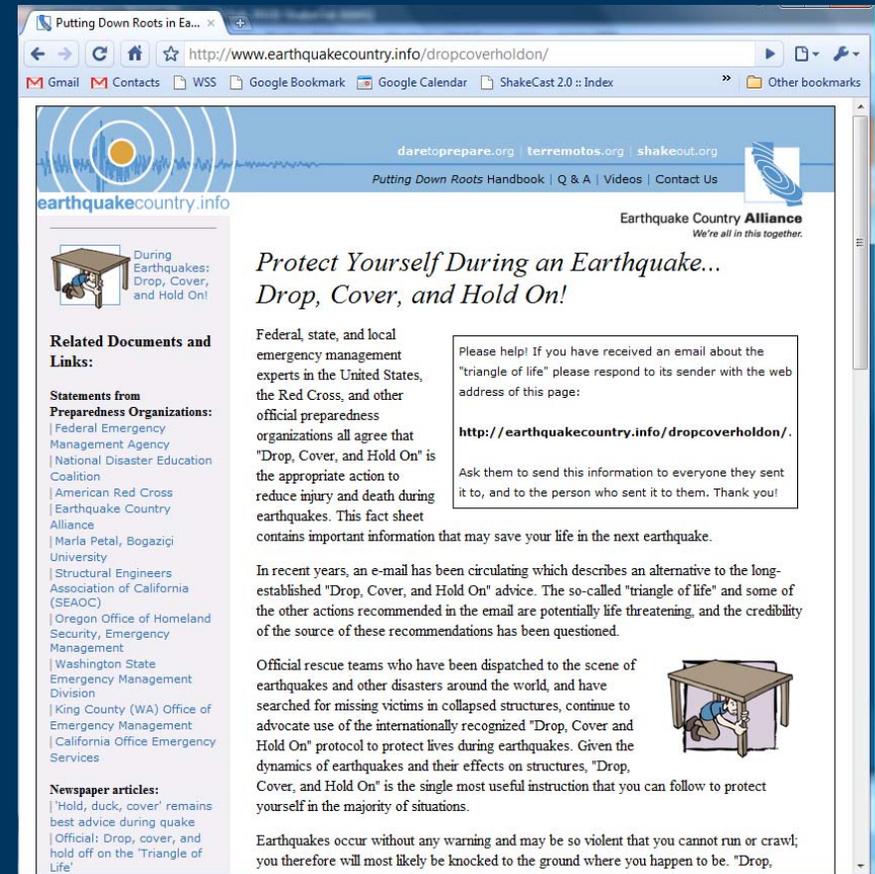
- 1 rupture segment, 1 direction
- 4 physics-based kinematic models give consistent results (factor of 2)
 - 3 use Magistrale CVM
 - Caltech/UCSD: Harvard CVM
 - Agreement represents an advance
- Dynamic model too late for use, but we could have played it up



Hudnut et al.,
Suess et al., Raleigh

6. Confront misinformation

- “Triangle of life” threatens life safety
- Explain the wrong assumptions, e.g.,
 - Buildings don’t always collapse and crush furniture
 - Occupants can’t always anticipate where the void spaces are
 - They can’t always move to those places
- Cite authorities who rebut the misinformation
 - Cal OES
 - USGS
 - American Red Cross
 - Snopes.com
 - Etc.



Putting Down Roots in Ea... x

http://www.earthquakecountry.info/dropcoverholdon/

Gmail Contacts WSS Google Bookmark Google Calendar ShakeCast 2.0 :: Index Other bookmarks

daretoprepare.org | terremotos.org | shakeout.org

Putting Down Roots Handbook | Q & A | Videos | Contact Us

earthquakecountry.info

Earthquake Country Alliance
We're all in this together.

 During Earthquakes: Drop, Cover, and Hold On!

**Protect Yourself During an Earthquake...
Drop, Cover, and Hold On!**

Federal, state, and local emergency management experts in the United States, the Red Cross, and other official preparedness organizations all agree that "Drop, Cover, and Hold On" is the appropriate action to reduce injury and death during earthquakes. This fact sheet contains important information that may save your life in the next earthquake.

Please help! If you have received an email about the "triangle of life" please respond to its sender with the web address of this page:

<http://earthquakecountry.info/dropcoverholdon/>

Ask them to send this information to everyone they sent it to, and to the person who sent it to them. Thank you!

In recent years, an e-mail has been circulating which describes an alternative to the long-established "Drop, Cover, and Hold On" advice. The so-called "triangle of life" and some of the other actions recommended in the email are potentially life threatening, and the credibility of the source of these recommendations has been questioned.

Official rescue teams who have been dispatched to the scene of earthquakes and other disasters around the world, and have searched for missing victims in collapsed structures, continue to advocate use of the internationally recognized "Drop, Cover and Hold On" protocol to protect lives during earthquakes. Given the dynamics of earthquakes and their effects on structures, "Drop, Cover, and Hold On" is the single most useful instruction that you can follow to protect yourself in the majority of situations.

Earthquakes occur without any warning and may be so violent that you cannot run or crawl; you therefore will most likely be knocked to the ground where you happen to be. "Drop,



7. Acknowledge limitations

Earth-science effects given to 19 study groups:

- Expert panel, research team, & combinations
 - 1 HAZUS analysis
 - 4 studies of particular building types
 - 10 lifeline studies
 - 4 other studies

Each group hypothesized realistic damages

- Informed by computer models
- Grounded in historic evidence
- Acknowledge need to extrapolate from past experience and limited analysis
- Identify what can be done and what new knowledge is needed to lessen impacts

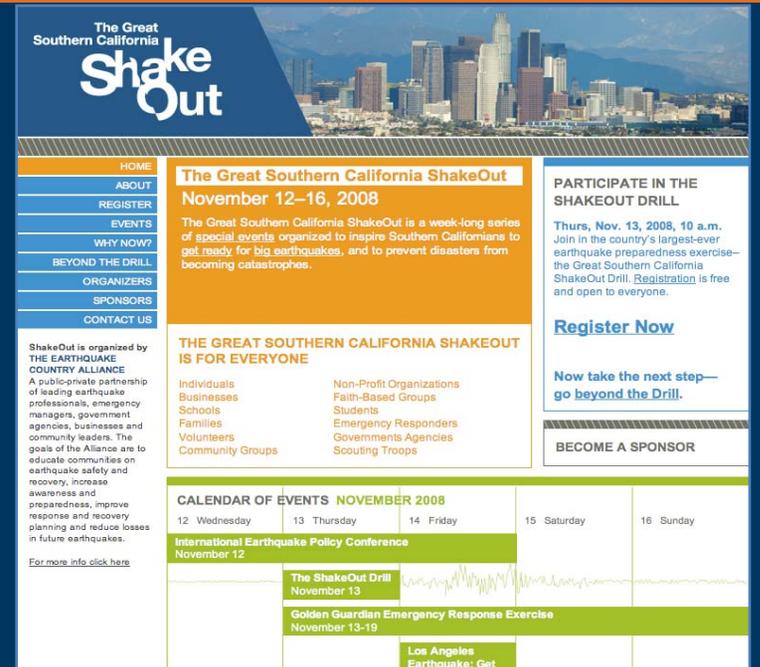
Earth sciences

Physical damage

Societal impacts

8. Temper lectures with activities

- www.shakeout.org
- Updated information, drill script
- “Learn what else you can do to get ready,
- “Be counted as an official participant of ShakeOut and the Drill on November 13th,
- “Ask others to register with you!”
- Participants created their own activities, e.g., LAUSD
 - Duck, cover & hold on
 - Building safety inspection drills
 - Executive communication activities



The Great Southern California ShakeOut

November 12–16, 2008

The Great Southern California ShakeOut is a week-long series of special events organized to inspire Southern Californians to get ready for big earthquakes, and to prevent disasters from becoming catastrophes.

PARTICIPATE IN THE SHAKEOUT DRILL

Thurs, Nov. 13, 2008, 10 a.m. Join in the country's largest-ever earthquake preparedness exercise—the Great Southern California ShakeOut Drill. [Registration](#) is free and open to everyone.

[Register Now](#)

Now take the next step—[go beyond the Drill.](#)

BECOME A SPONSOR

ShakeOut is organized by THE EARTHQUAKE COUNTRY ALLIANCE. A public-private partnership of leading earthquake professionals, emergency managers, government agencies, businesses and community leaders. The goals of the Alliance are to educate communities on earthquake safety and recovery, increase awareness and preparedness, improve response and recovery planning and reduce losses in future earthquakes.

[For more info click here](#)

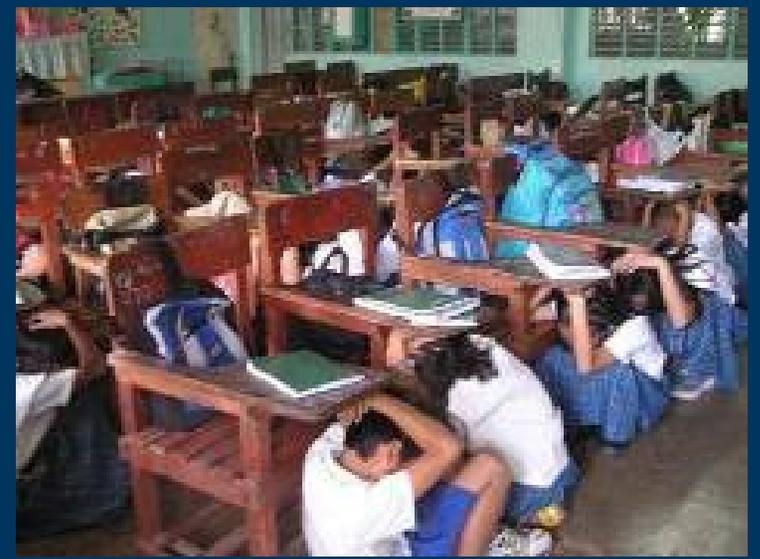
THE GREAT SOUTHERN CALIFORNIA SHAKEOUT IS FOR EVERYONE

Individuals
Businesses
Schools
Families
Volunteers
Community Groups

Non-Profit Organizations
Faith-Based Groups
Students
Emergency Responders
Governments Agencies
Scouting Troops

CALENDAR OF EVENTS NOVEMBER 2008

12 Wednesday	13 Thursday	14 Friday	15 Saturday	16 Sunday
International Earthquake Policy Conference November 12				
	The ShakeOut Drill November 13			
	Golden Guardian Emergency Response Exercise November 13-19			
		Los Angeles Earthquake: Get		



9. Use engaging imagery

10. Defend in depth

- Special study by C. Scawthorn, SPA Risk
 - Created procedures currently used by insurance industry
 - Degraded fire-resistive building features
 - Reduced pressure in water mains
 - Saturated communications
 - Traffic impacts
 - Numerous simultaneous ignitions
 - More fires than firefighting capabilities... *this is what leads to conflagrations*
- Frightening results, costly mitigation
 - 200,000,000 sf burned (~133,000 dwellings)
 - \$65 billion, 900 fatalities
- Review panel:
 - Donald Manning, retired chief, *LAFD*
 - Donald Parker, *California Seismic Safety*
 - Gerry Malais, *LAFD*
 - Michael Reichle, *California Geological Survey*
 - Larry Collins, *LAFD USAR Task Force 103*



10 Tips for Talking to Townies

1. Use availability
2. Avoid sensationalism
3. Avoid probability
4. Get to the point
5. Emphasize consensus
6. Deal with misinformation
7. Acknowledge limitations
8. Temper lectures with activities
9. Engaging imagery
10. Defense in depth

Conclusion

ShakeOut's success is largely attributable to understanding the needs of, and communicating with the public, while still doing good interdisciplinary science

Acknowledgments

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 - Hope Seligson, MMI Engineering
 - **Public Health**
 - Kim Shoaf, UCLA
 - **Disaster Sociology**
 - Dennis Mileti, Seismic Safety Commission
 - Jim Goltz, Governor's Office of Emergency Services
 - **Disaster Economics**
 - Anne Wein, USGS
 - Richard Bernknopf, USGS
- More than 300 Panelists, Experts, Special Studies
- Download reports at urbanearth.usgs.gov

