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- Use Chat for questions, technical assistance, comments, etc.
- Click "Live Transcript" or "Captions" to see subtitles on desktop computers. For mobile device users, you may need to turn the option on from Zoom settings, meetings section (before joining)
- The recording of today's workshop will be posted soon at EarthquakeCountry.org/sansimeon20.

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Today's Earthquake Country Alliance Webinar:

San Simeon Earthquake 20th Anniversary

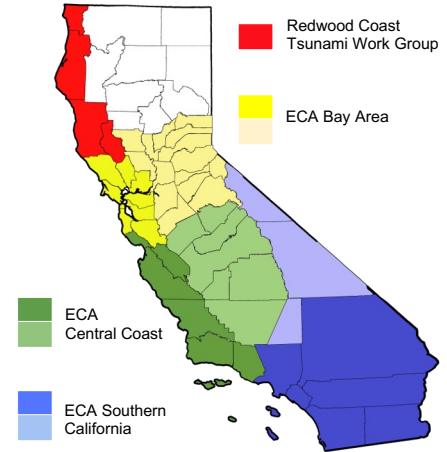


EarthquakeCountry.org/sansimeon20

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Earthquake Country Alliance

- 4000+ *Public-Private-Grassroots* leaders
- Subject matter expert *Committees* develop resources and programs
- *Regional Alliances* organize meetings and outreach activities
- California's Office of Emergency Services provides FEMA NEHRP funding for ECA earthquake mitigation activities
- USC's Southern California Earthquake Center (SCEC.org) administers ECA



Join: EarthquakeCountry.org/join



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Co-Chairs, ECA Central Coast

Anthony Rodriguez

Foodbank of Santa Barbara County

Stacy Silva

Santa Barbara County Office of Emergency Management

EarthquakeCountry.org/centralcoast

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Today's Agenda

Welcome and Webinar Overview

Anthony Rodriguez (Operations & Disaster Services Specialist, Foodbank of Santa Barbara County)
Scotty Jalbert (Emergency Manager, County of San Luis Obispo)

Geologic Setting of the San Simeon Earthquake

Russell Graymer (Geologist, U.S. Geological Survey)

San Simeon Earthquake Fire and Rescue Emergency Response

Dan Turner (Fire Chief, retired, CAL FIRE San Luis Obispo)

San Simeon Earthquake Damage/Retrofit, 20 Years Later

Alan Hanson (Simpson Strong-Tie, Retired, and ECA SoCal Co-Chair)

CEA Response to the San Simeon Earthquake (and current opportunities)

Janiele Maffei (Chief Mitigation Officer, California Earthquake Authority)

Final Discussion

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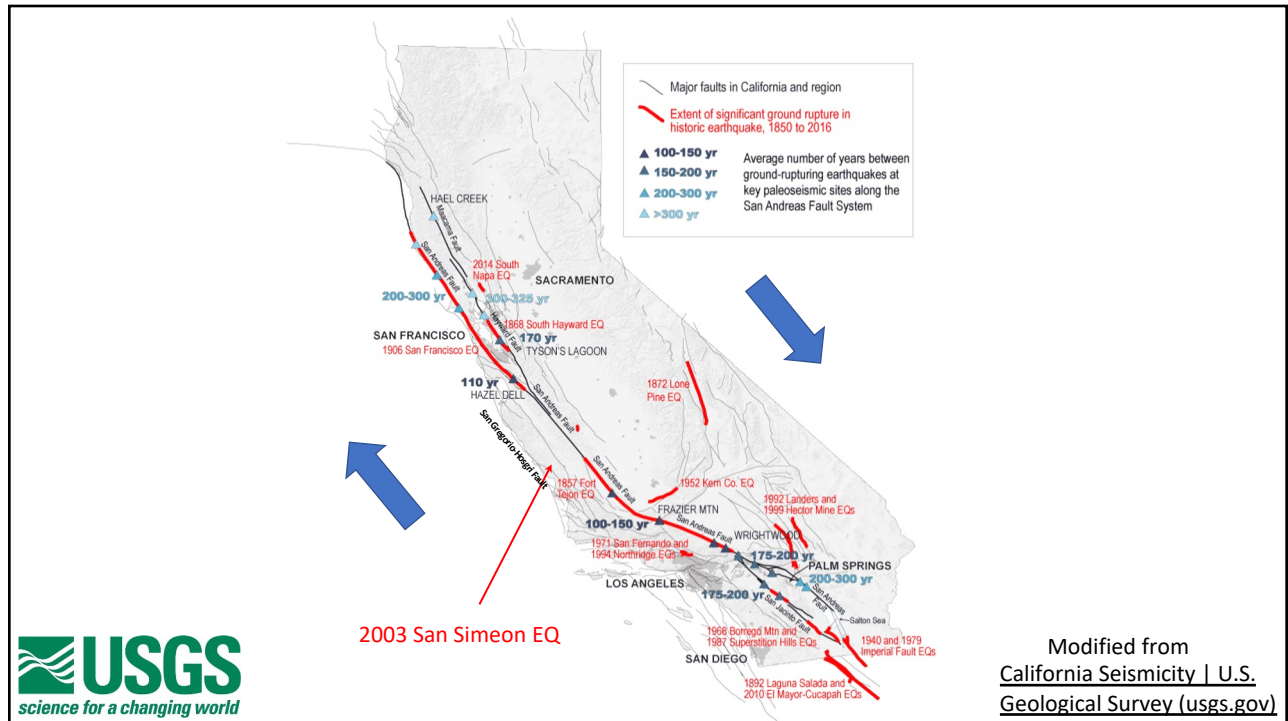
Geologic Setting of the San Simeon Earthquake

R.W. Graymer

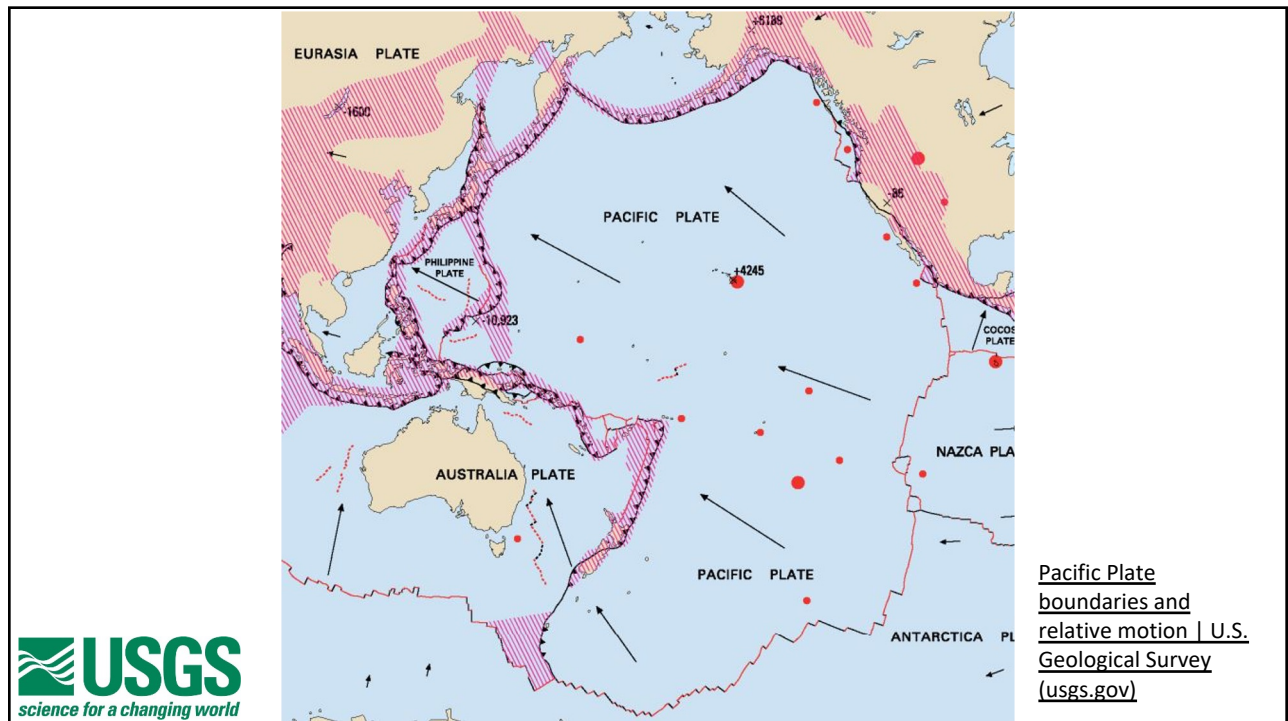
Geology, Minerals, Energy, and Geophysics Science Center
U.S. Geological Survey



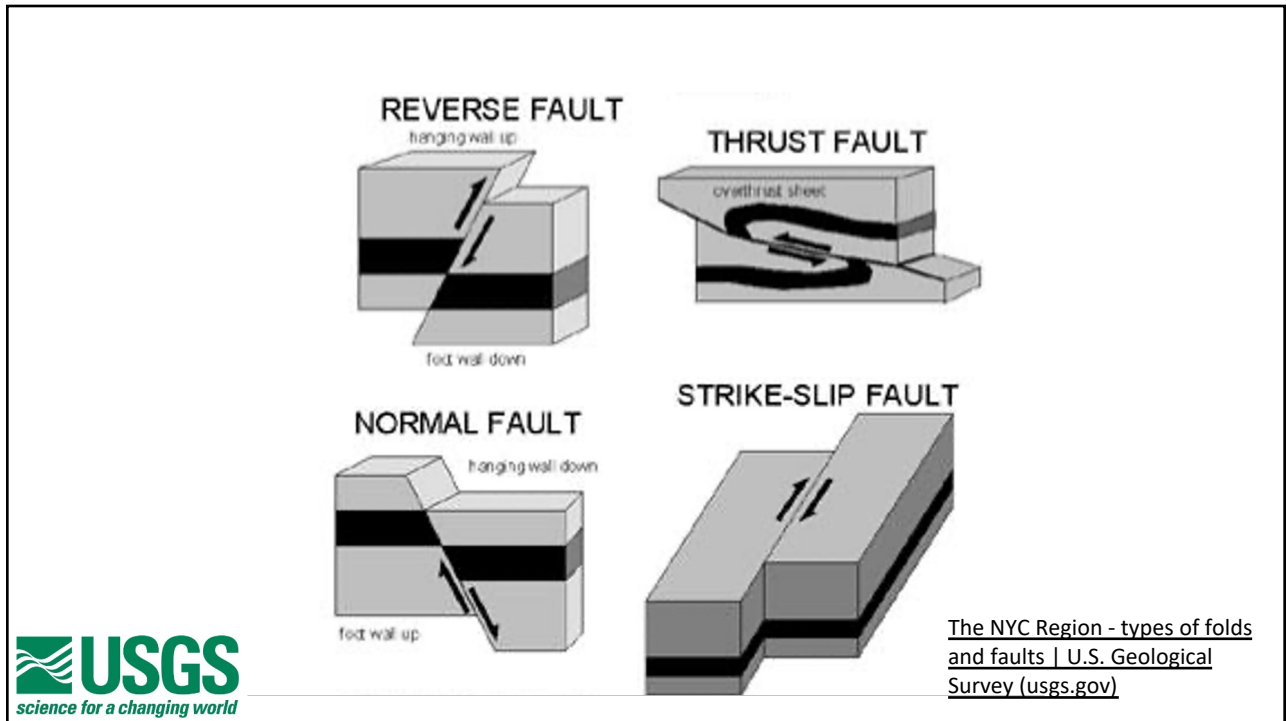
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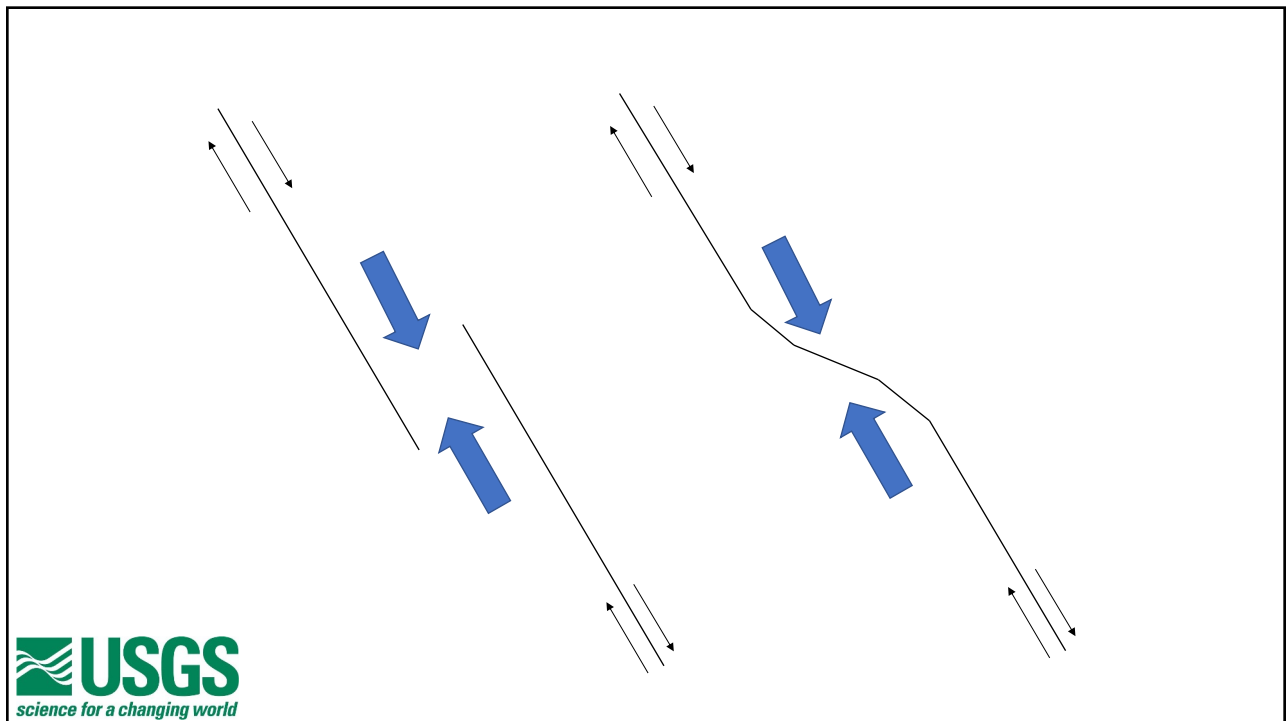
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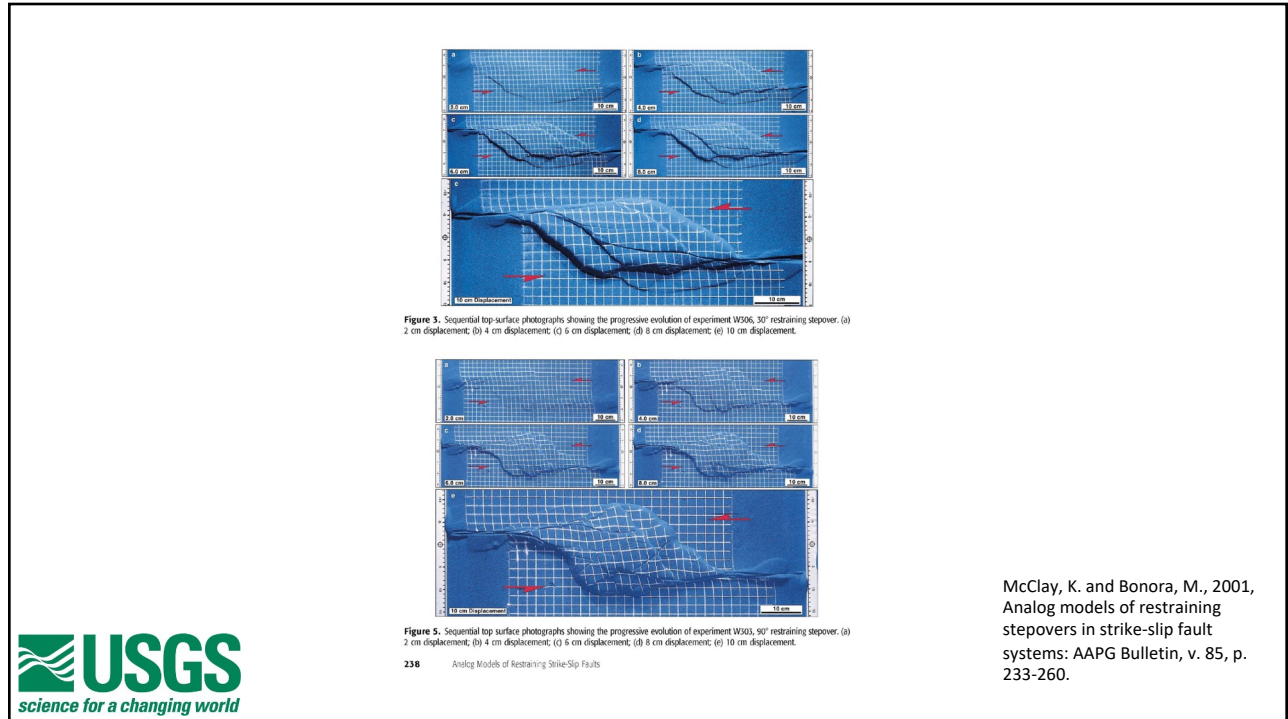
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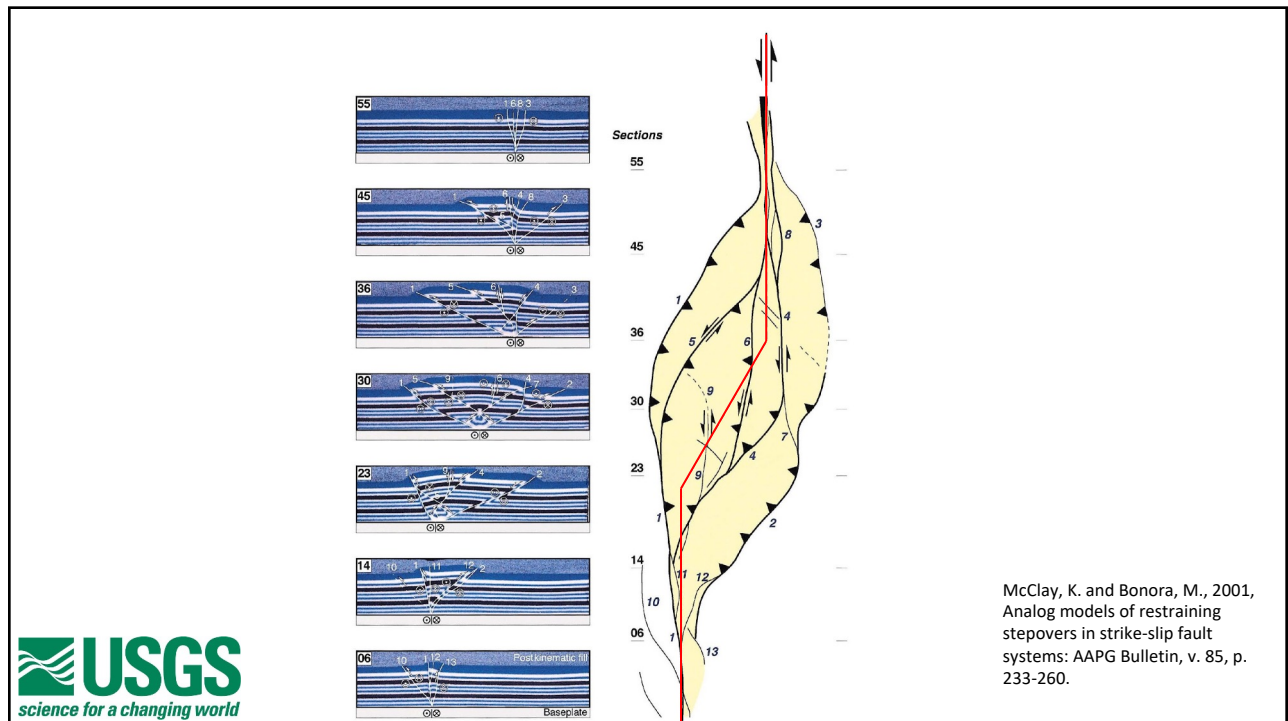
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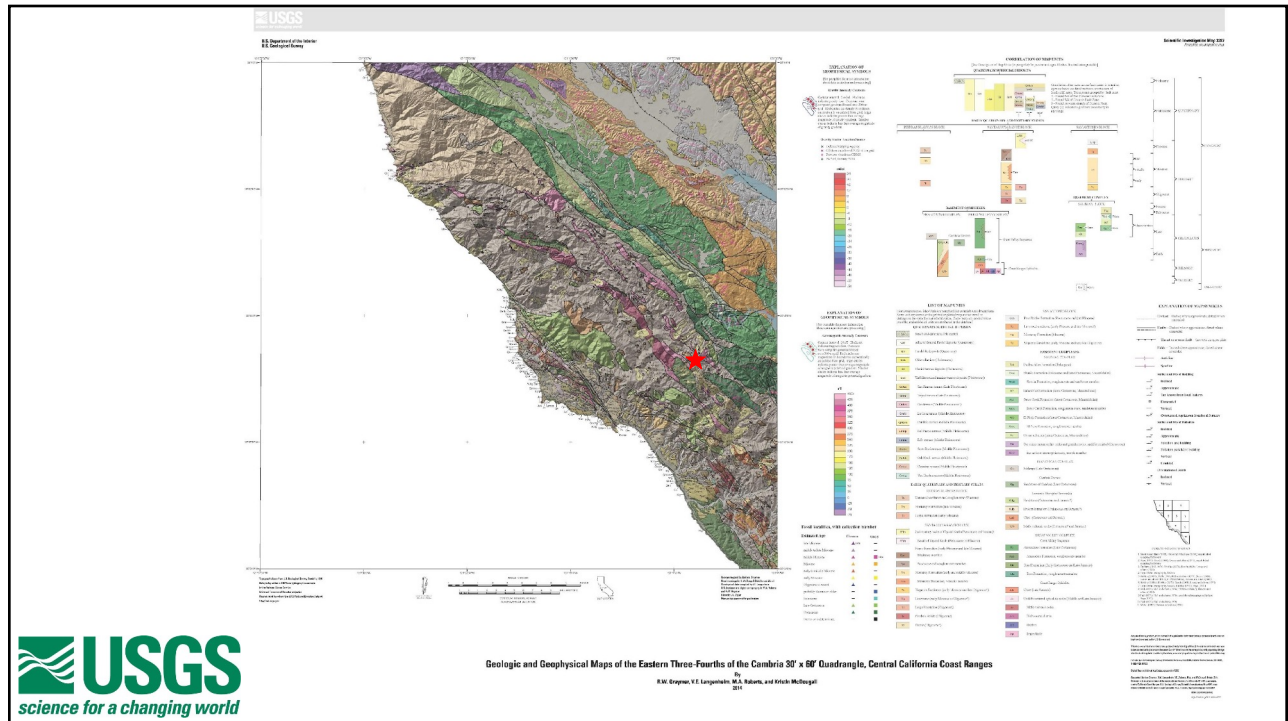
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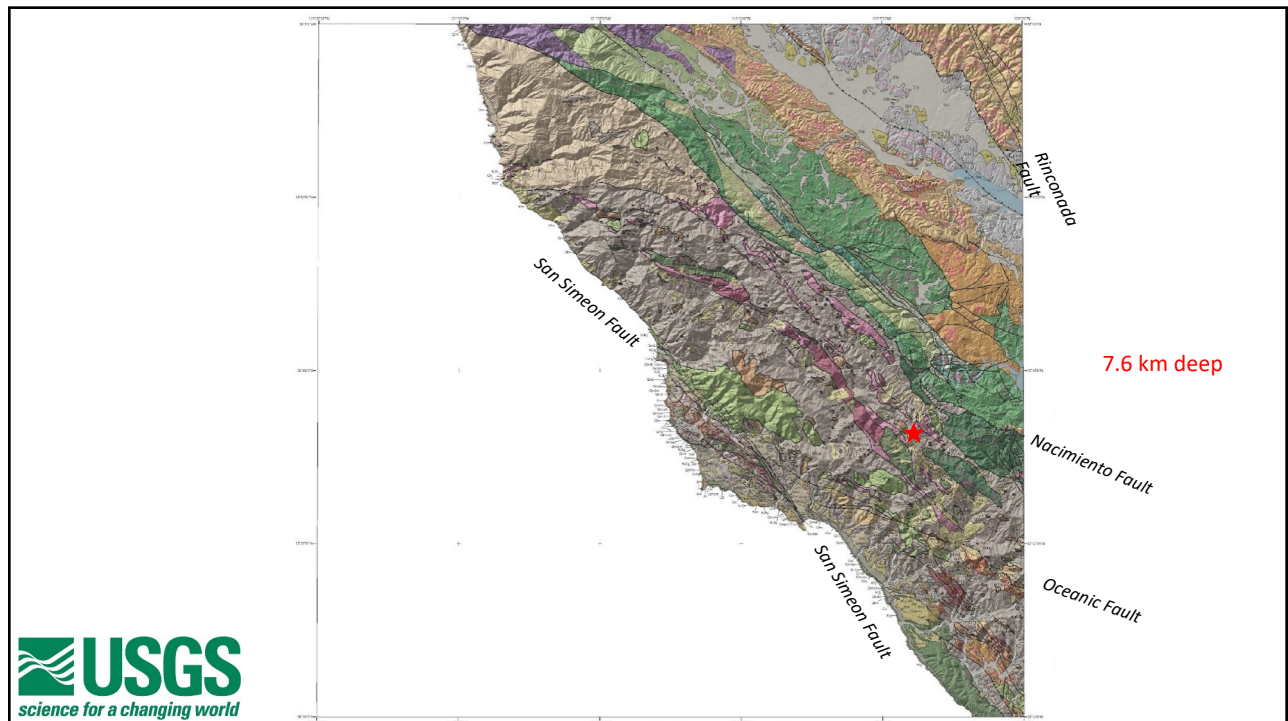
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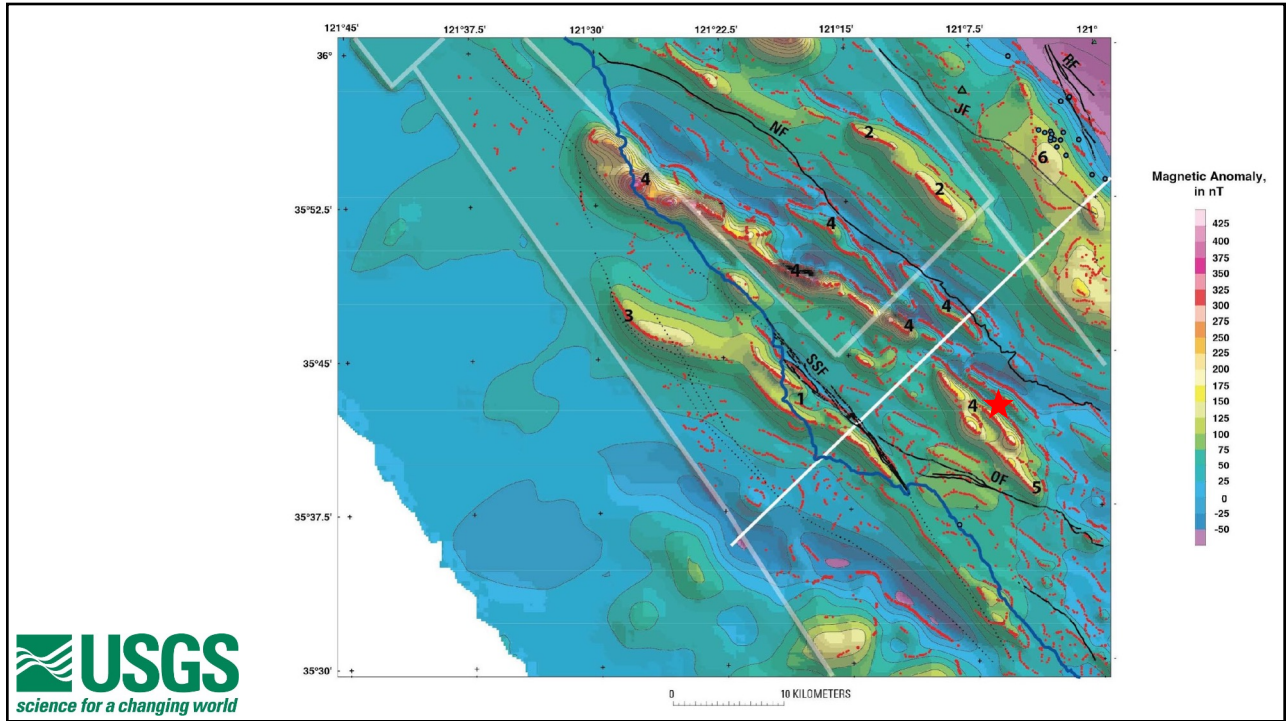
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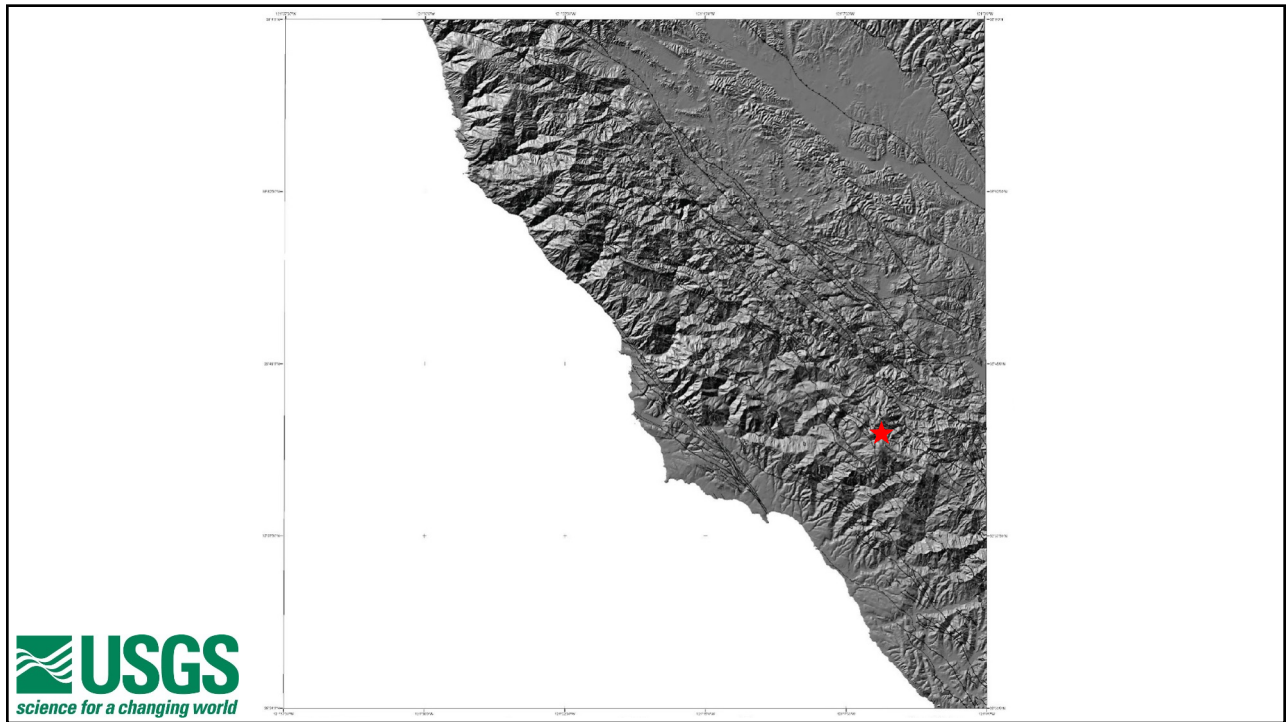
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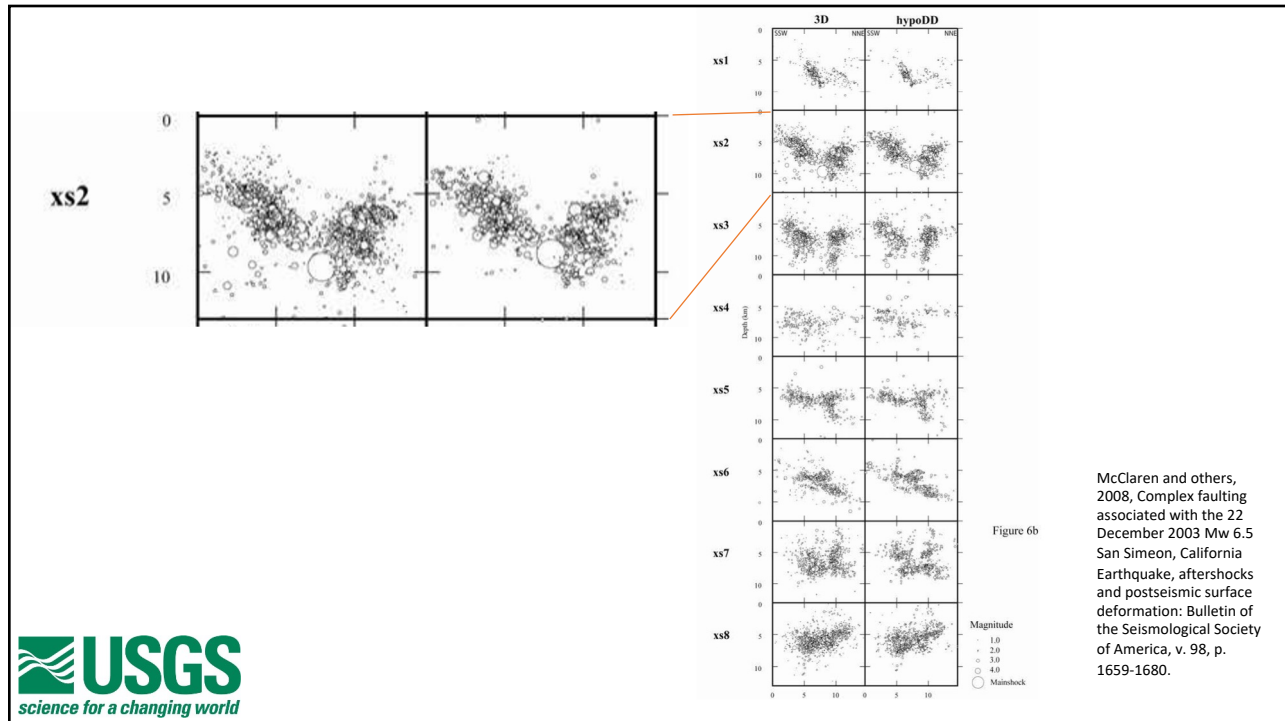
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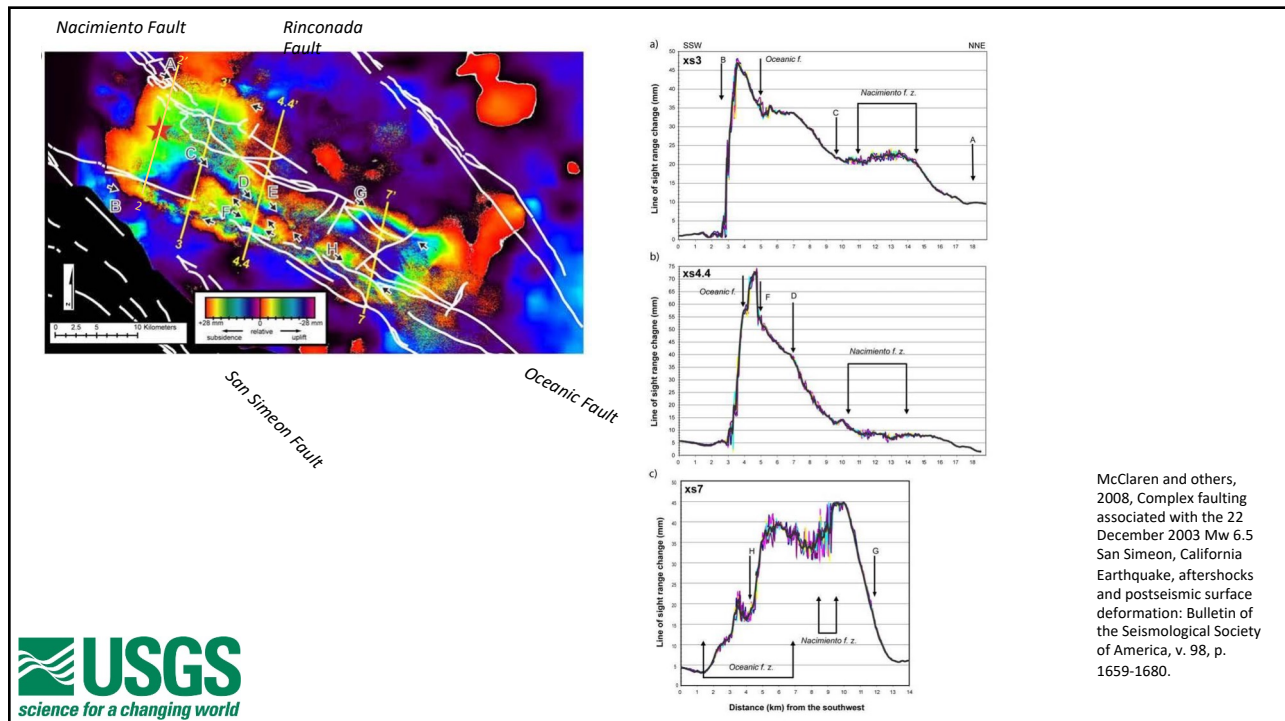
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16

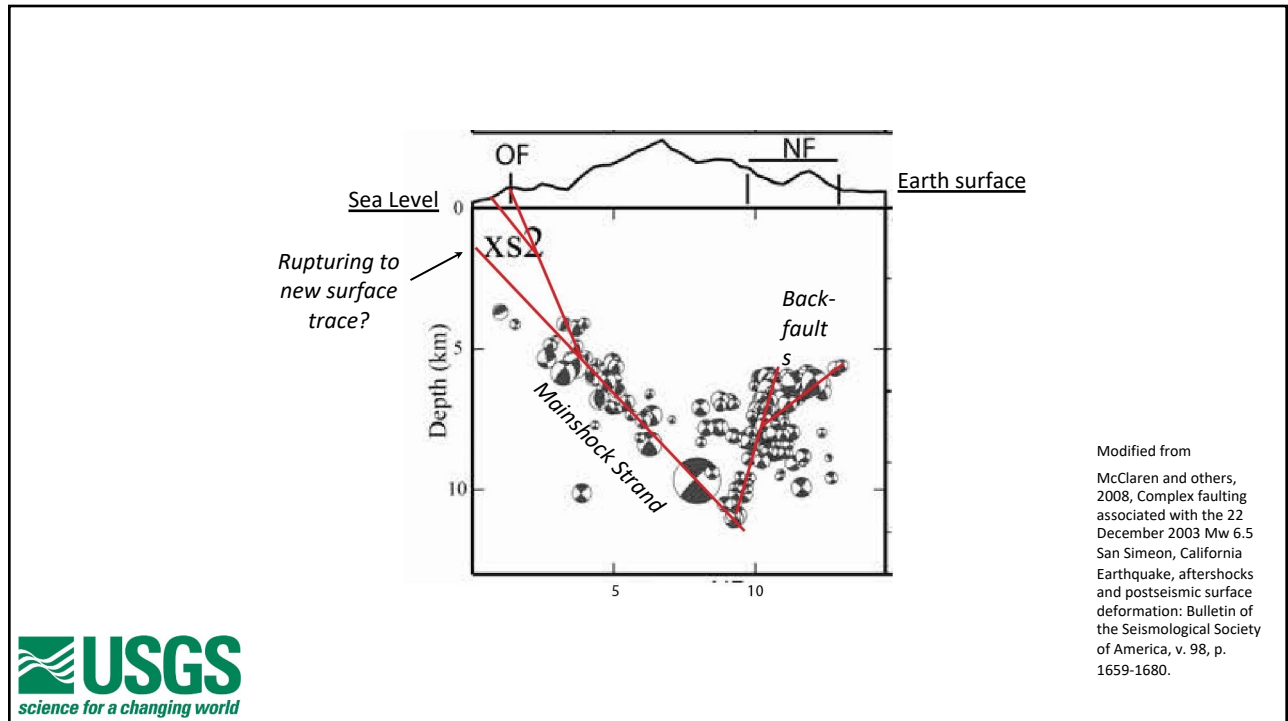


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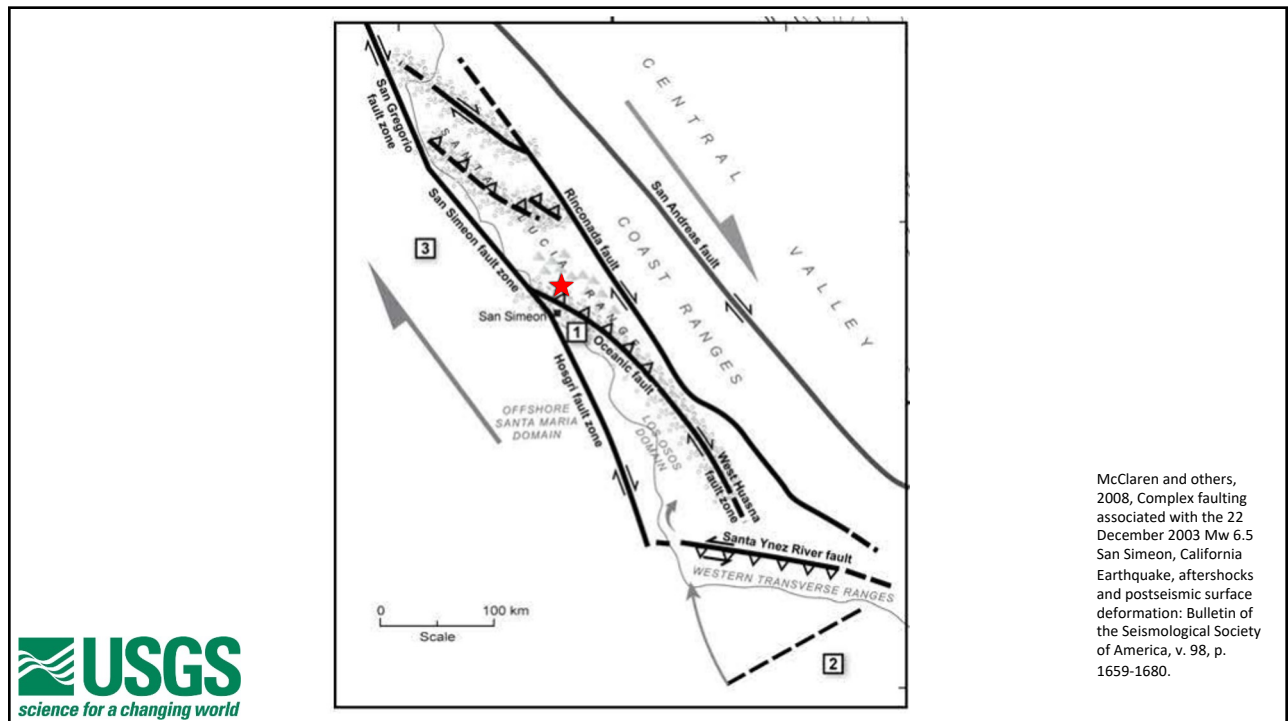


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Summary

San Simeon Earthquake was a thrust/reverse (compressional) earthquake on the Oceanic Fault, a lesser-known part of the San Andreas Fault System.

The Oceanic Fault is marked by uplift and high topography on the northeast. The Oceanic Fault is not a single "crack", but a zone of cracks, with more perhaps forming.

The San Simeon Earthquake triggered slip on a complex suite of faults, including back-faults.

Compression on the Oceanic Fault results from a restraining geometry as well as regional compression across the San Andreas system.

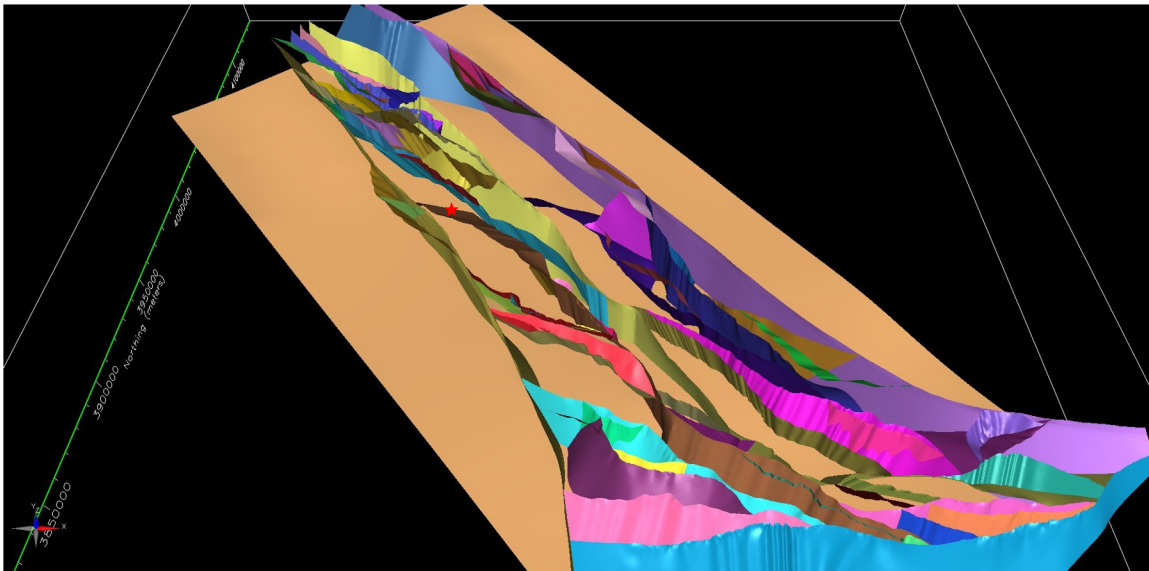
Significant earthquakes are not limited to the "major" strike-slip faults.

Significant earthquakes are not all strike-slip earthquakes, but in California include thrust/reverse earthquakes. The type of earthquake affects the shaking.

It is necessary to understand the complete picture of faults in the San Andreas Fault System to understand the earthquake hazard.



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Q&A

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Please take our survey:

SurveyMonkey.com/r/SXDWJV5

Questions?

info@earthquakecountry.org

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San Simeon Earthquake Fire and Rescue Emergency Response

- Dan Turner, Fire Chief (retired)
CAL FIRE San Luis Obispo
- Operational Area Fire & Rescue Coordinator
for San Luis Obispo County

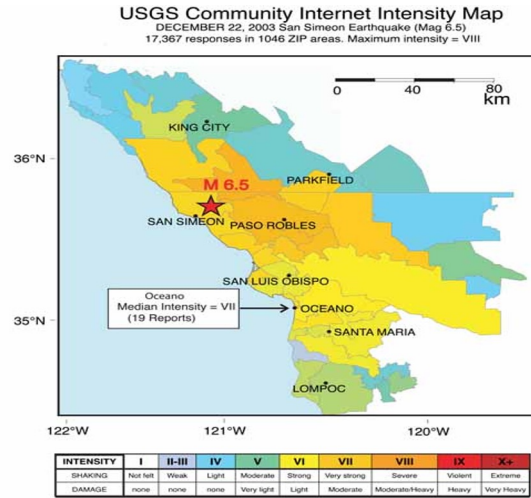


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Countywide Fire-Rescue Impact/Action Immediate Steps

- **Direct stations and staff to Earthquake Deployment Plan**

- **Default organization**
 - Countywide ICS
 - ICP- Dept Operations Center
 - Each Battalion a Branch
 - Each Station a Division
- **Response to immediate emergencies**
 - Collapses
 - Fires
 - Rescues
 - Assess “trapped” versus “isolated”
 - Initiate rural area primary search operations
- **Quick Countywide Agency Assessment**
 - Situation report
 - Capacity Status



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Names Matter...“San Simeon EQ” did cause focus on San Simeon.

Hearst Castle is in San Simeon



Multiple immediate problems countywide

- Structural collapses
- Structure fires-some near epicenter at Oak Shores
- Multiple buildings damaged requiring searches
- Local resources immediately overwhelmed
- Neighbor agencies also overwhelmed
- Triaging life-threatening emergencies from lesser needs

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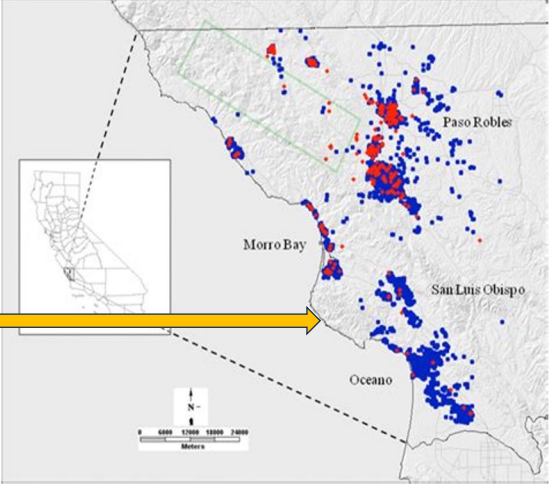


Paso Robles downtown impact

- Structural collapses in main business district
- Known fatalities
- Multiple buildings damaged requiring searches
- Local resources immediately overwhelmed
- Neighbor agencies also overwhelmed

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Diablo Canyon Nuclear Power Plant...hmmmm?

30

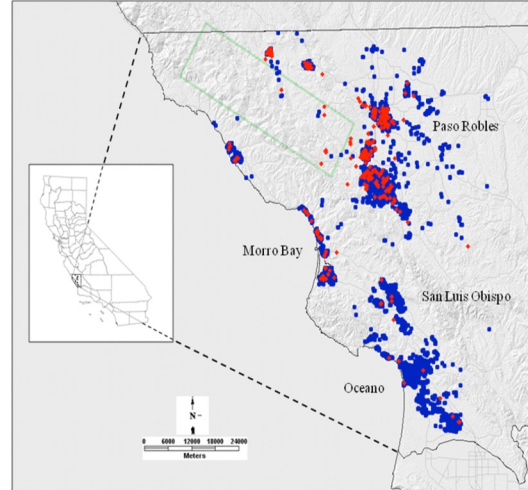
Fire-Rescue Mutual Aid

Next Steps

- Deploy staff to County EOC
- Deploy staff to Paso Robles EOC
- Deploy staff to Pismo Beach EOC
- Coordinate with other EOC's in the county
- Make Situation Report to Regional Office

- Order out of area resources through OES and CAL FIRE
 - Major Incident Management team
 - Fire engine strike teams
 - Hand crew strike teams
 - Heavy Rescue resources
 - Helicopters

- Prepare Operational Support Plans for multi-day operations
 - Major Incident base



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Rural Primary and Secondary Search

•In rural areas following the earthquake

...

- No phones
- No power
- No one to hear if they scream

- Takes lots of resources and time

•Responder presence can reduce stress on locals if they know someone is out there... the world did not end



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Major Incident Management Team's Mission

LONG TERM SUPPORT NEEDED:

Operational support
Field teams working 24 / 7
Coordination

Planning support
Where, what ,when, who

Logistical Support
Feeding
Sleeping
Supplies

Public Information Support
Media
Officials
Public

INITIAL MISSION

Support for first responders

- Hand Crews
- Fire/Rescue teams
- Other responders

Take load off of local responders...

They may be victims too



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Major Incident Management Team's Mission

LONG TERM SUPPORT NEEDED:

Operational Coordination
Planning support
Logistical Support
Public Information Support

SECONDARY MISSION

Transitioned to support for

- Building inspectors
- Other specialists
- Investigatory teams
- OES
- FEMA




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And then “they” arrive...

- Elected officials have an important role
- They DO create an impact however
- You need to prepare for that impact
 - Operational briefings
 - They want to talk to:
 - Elected officials
 - Responders
 - Public/Victims
 - Site visits
 - Media opportunities

Pool photo by Nick Lis...

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Q&A

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info@earthquakecountry.org

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San Simeon Earthquake Damage/ Retrofit, 20 Years Later

Alan Hanson
(Simpson Strong-Tie, Retired)

37



11:15 AM,
December 22
2003
Paso Robles
Earthquake
Occurs.....

38

Extensive Damage to Acorn Building- Two Women Died in URM Structure



39

Results of Lawsuit:

As a result of the incident a wrongful death lawsuit was filed by the relatives of the 2 women killed in the earthquake against the trusts which owned the unreinforced masonry Acorn Building. The jury found the owners negligent in the care and maintenance of the building, due to not retrofitting it, in violation of city ordinances. The jury awarded \$2.4 million to the plaintiffs.

(No retrofitted buildings collapsed)

40

Following the San Simeon Earthquake the
 Cities of Paso Robles and San Luis Obispo
 Accelerated Their Mandatory URM
 Reinforcement Programs

The State of California enacted A.B. 2533,
 which required signage if a URM building was
not retrofitted

41

Sign Required if Building is Unreinforced:

Earthquake Warning

This is an unreinforced masonry building.



You may not be safe inside or near
 unreinforced masonry buildings during an
 earthquake.

42

Other Damage- Complete Building Collapse



43

Buildings had to be Braced to Prevent Collapse



44

Unbraced Parapets Were a Common Problem



45

Many had not been Retrofitted



46

Another Parapet Wall Failure



47

Gunite URM Repair



48

Some Buildings Were Reinforced Before the Earthquake



49

Others Were More Recent Retrofits



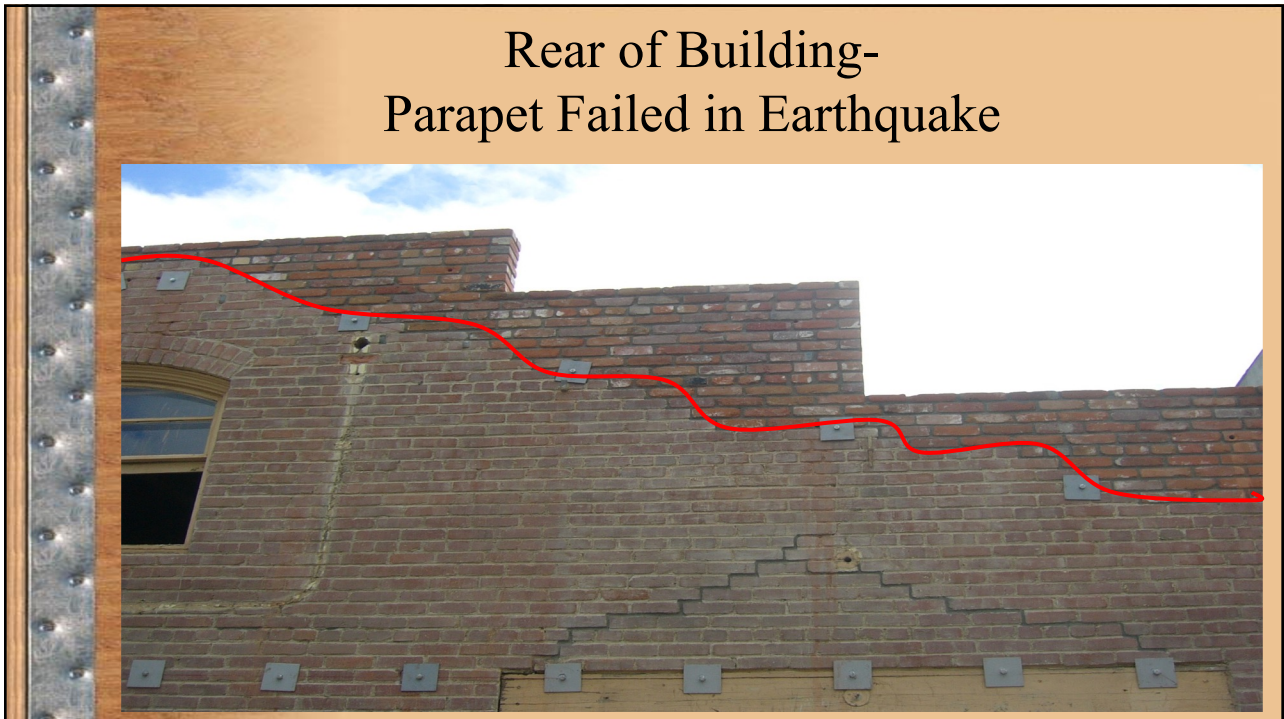
50

Post-earthquake projects



51

Rear of Building- Parapet Failed in Earthquake



52

Typical Repair Method is to Connect Roof Rafters and Floor Joists to Walls



53

Severe Damage to Mission in San Miguel (Just north of Paso Robles)



54

Walls Braced for Aftershocks



55

SST CC's Support Window Header



56

City of SLO Seismic Program



57

Rear of Retrofitted Building (Anchors can be Epoxy or Through-Bolt Method)



58

It can be Difficult to Spot a URM Building



59

SLO Retrofit Underway



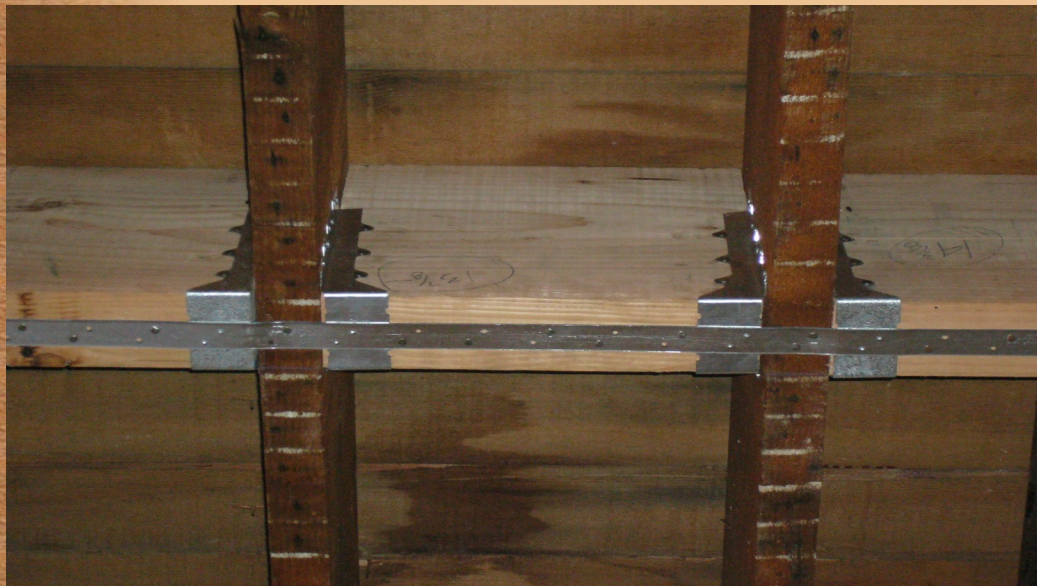
60

FSA Straps (typically used as floor-to-footing ties on raised-foundation homes)



61

Extensive Use of Blocking and Straps



62



Major Damage to
Single-Family
Homes, as well

63

Damage to Garage Returns



64

Patio Pulled Away and
Dropped About 4”



65

Piano Left Marks on Wall-
Lifted up 4-5 Inches



66

Garage and Foundation Slid Together



67



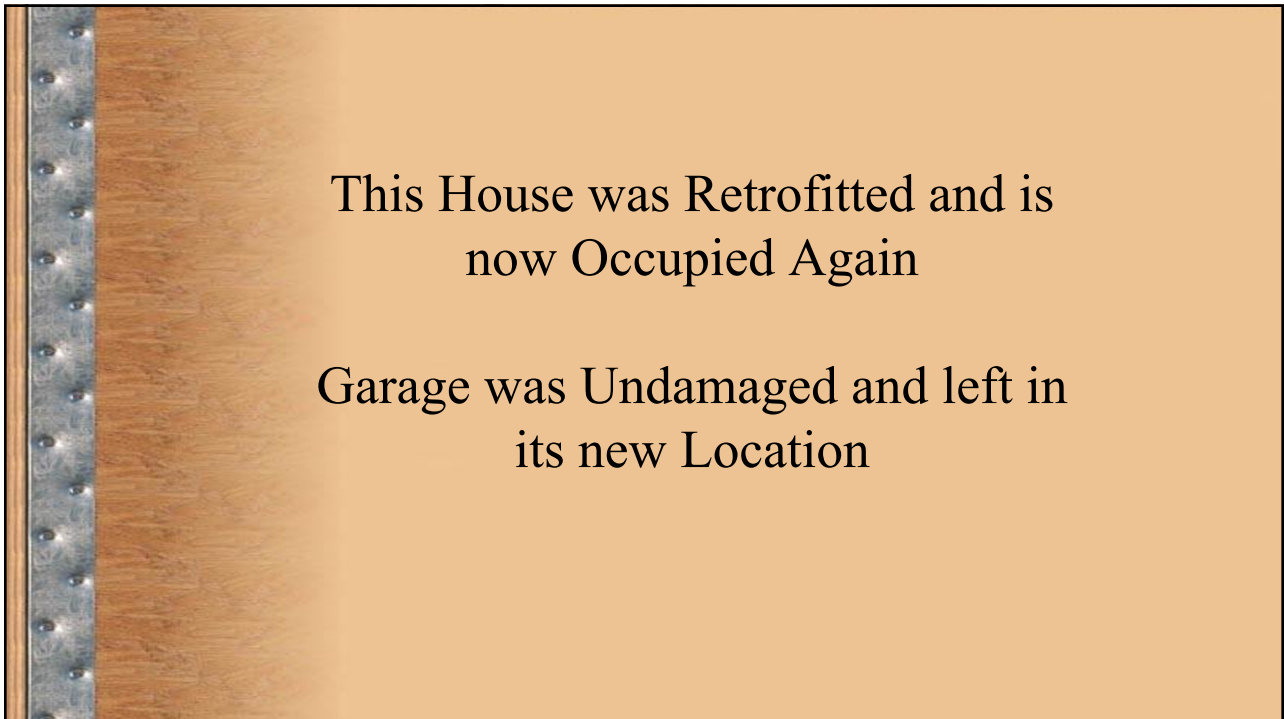
Garage/ Shop
Building
Moved
approximately 8"

68



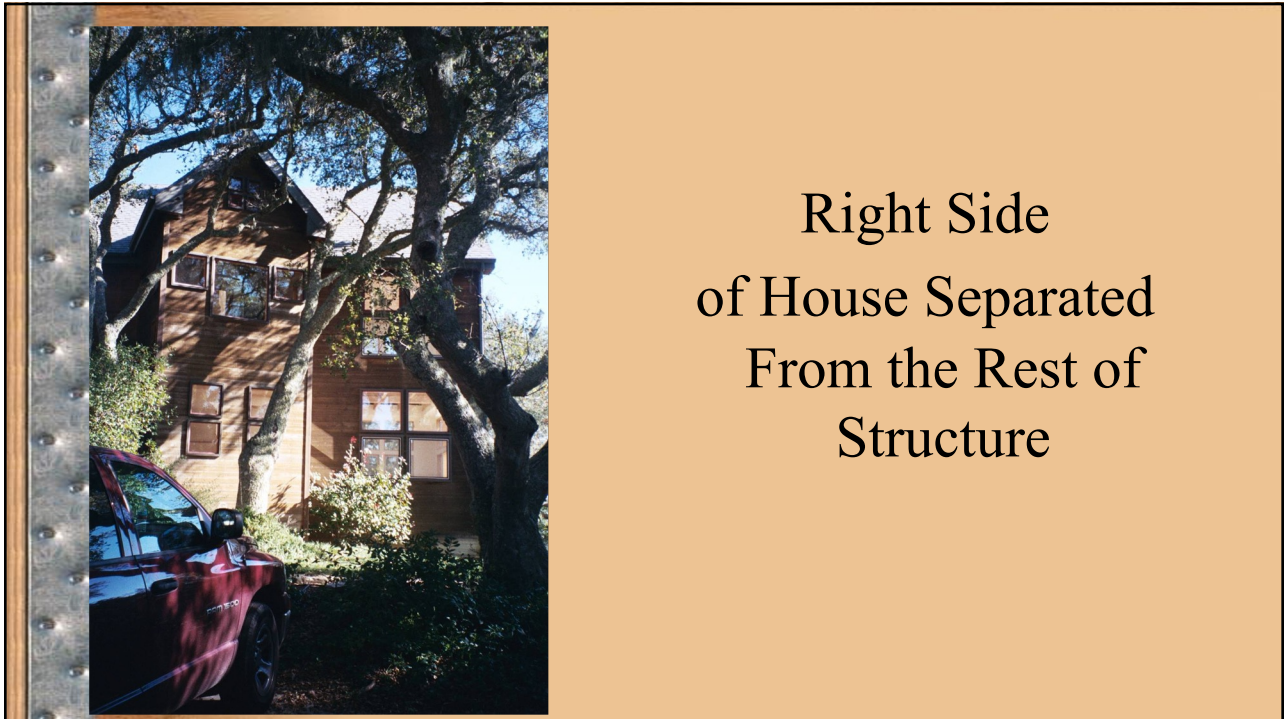
Note New Elbows to
Connect Plastic Pipe
to Hose Bib!

69



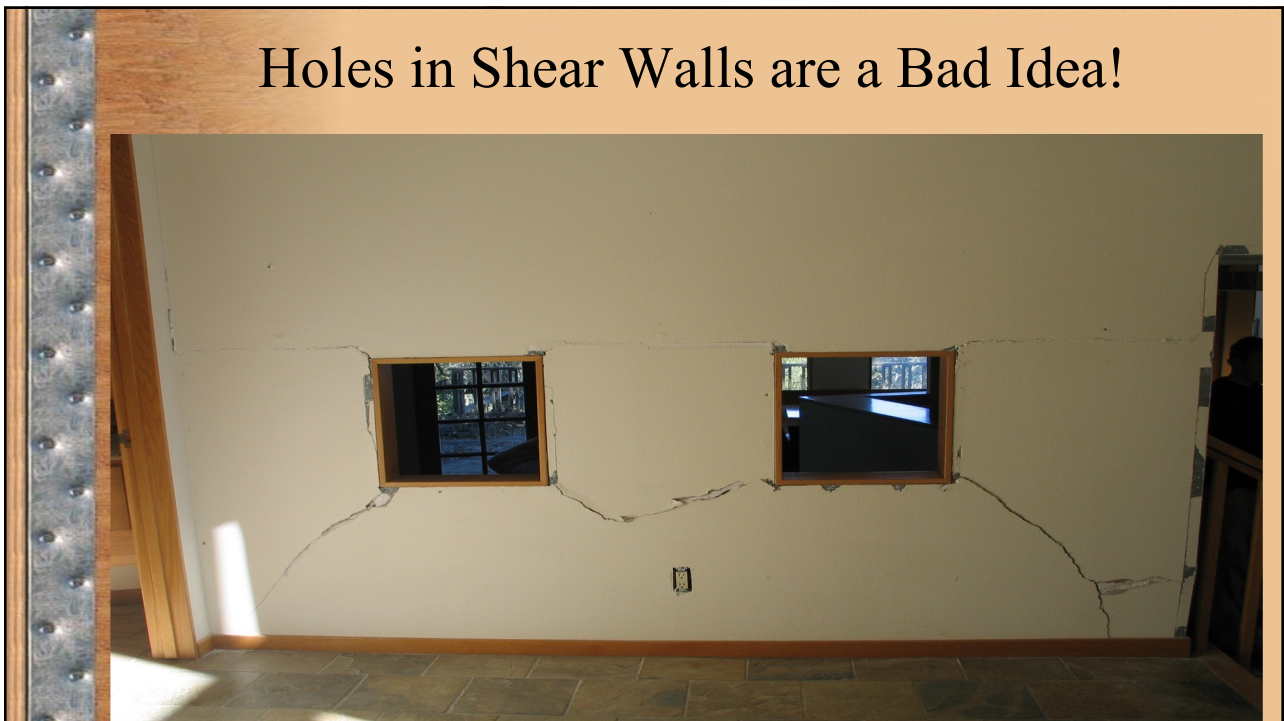
This House was Retrofitted and is
now Occupied Again
Garage was Undamaged and left in
its new Location

70



Right Side
of House Separated
From the Rest of
Structure

71



Holes in Shear Walls are a Bad Idea!

72

Cripple Wall Racked



73

Rim Joist Buckled



74

House was Red-Tagged
and Later Demolished

75

Shadow Canyon, Templeton



76

CMU Spalling- House Slid About Six Inches to the West



77

Connection from Rim Joist to Sill Failed



78

Bent Anchor Bolt



79

Cables and Hydraulic Jacks Pulled House Back Onto Foundation



80

“A Little More”



81

Support 2nd Floor and Level House



82



Use Hydraulic
Jacks to Raise
Home, Slide Back
Onto Foundation

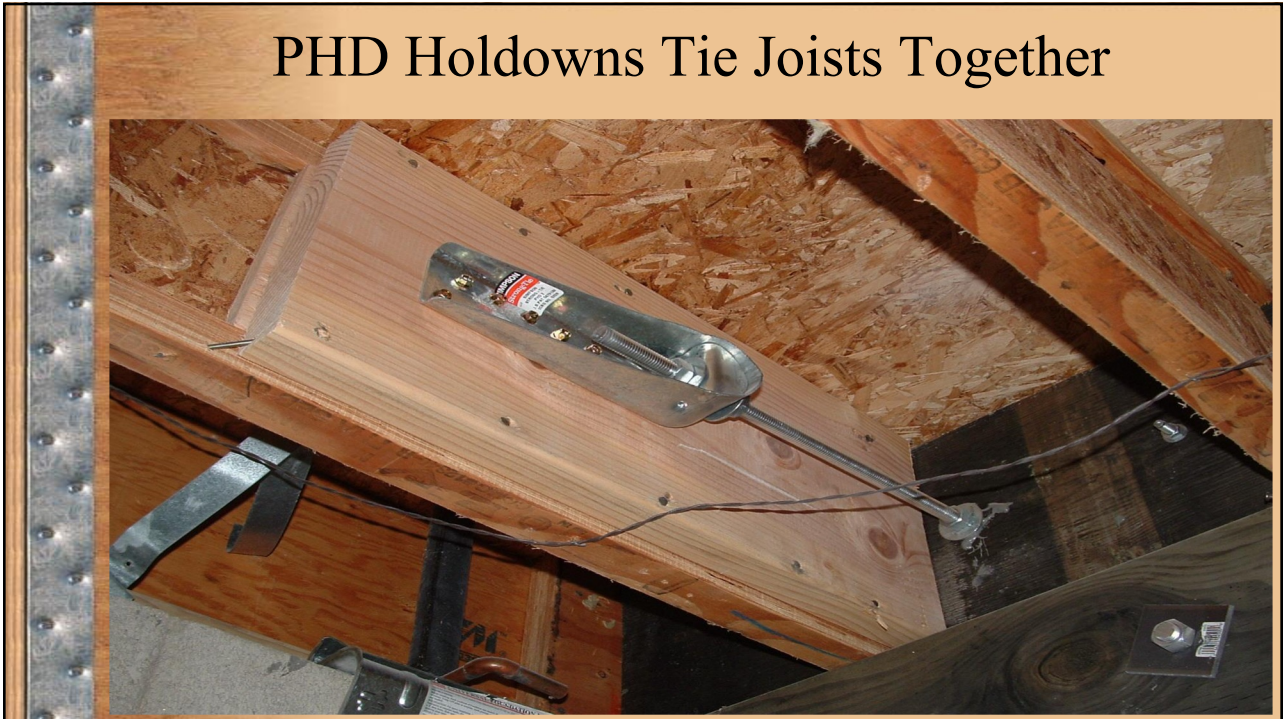
83



New Ledger to Support Floor Joists

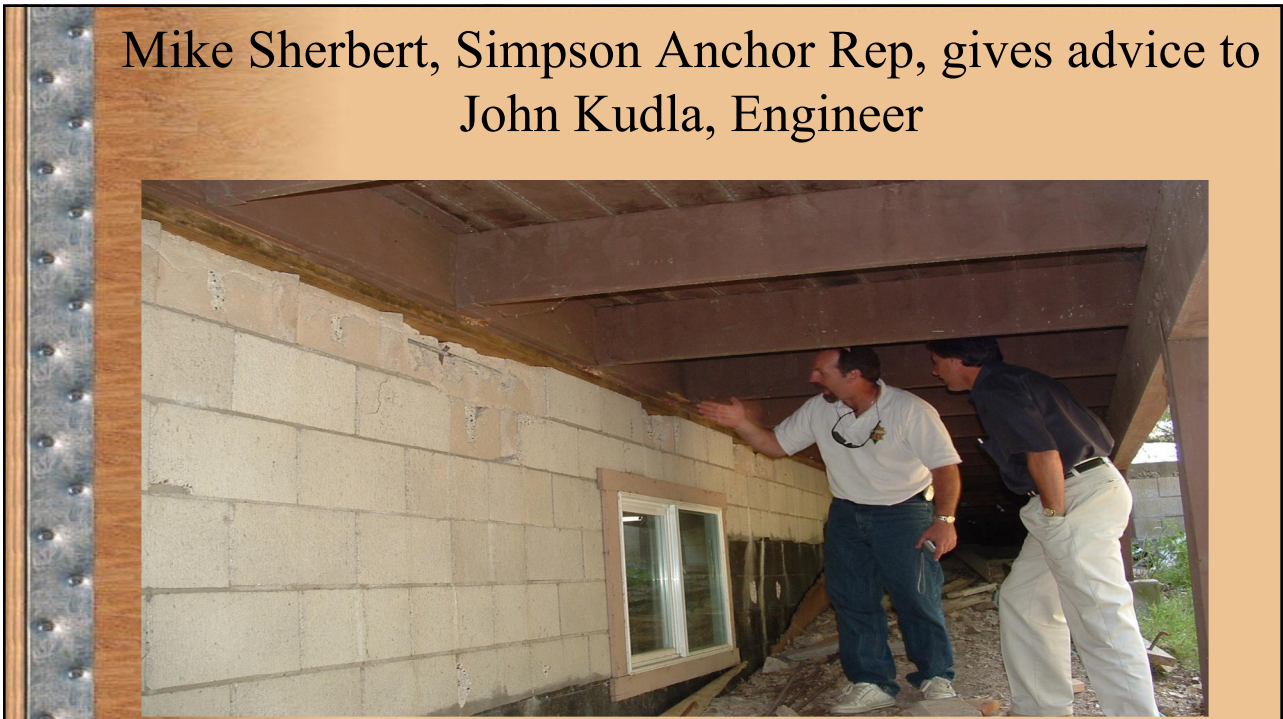
84

PHD Holdowns Tie Joists Together



85

Mike Sherbert, Simpson Anchor Rep, gives advice to John Kudla, Engineer



86

UFP Retrofit Plates on New Sill Plate



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Results of San Simeon Earthquake:

- The **2003 San Simeon earthquake** struck on December 22 on the **Central Coast of California**, about 7 miles northeast of **San Simeon**. Probably centered in the Oceanic fault zone within the **Santa Lucia Mountains**, it was caused by **thrust faulting** and the rupture propagated southeast from the **hypocenter** for 12 miles.
- The most violent ground movement was within 50 miles of the **epicenter**, though the earthquake was felt as far away as Los Angeles. With a **moment magnitude** of 6.5, it was the **most destructive earthquake to hit the United States since the Northridge quake of 1994**.

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Q&A

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Questions?

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San Simeon Earthquake – December 22, 2003, M6.5

Janiele Maffei, S.E.
Chief Mitigation Officer

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California Earthquake Authority


Established
1996



Residential Earthquake Insurance

- 1.1 Million Policyholders
- Publicly Managed/Private Financed/Not for Profit
- \$19 Billion in Claim-Paying Capacity


Established
2013



Residential Earthquake Mitigation Grants

- Pre-1980 Homes/\$3,000 Grant
- Retrofits to Date: 22,868
- Developing New Programs for Low Income and Multi-Family Homes

Established
2019



California Wildfire Fund

- Coverage for Wildfires Caused by Investor-Owned Utilities
- Overseen by California Catastrophe Response Council
- \$21 Billion in Claim-Paying Capacity

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California Seismic Safety Commission 2004 Report on CA Earthquakes

Earthquake	Year	Magnitude	Lives Lost	Injuries	Buildings Damaged or Destroyed	Direct Losses in \$ Millions
San Simeon	2003	6.5	2	47	480	\$250
Napa	2000	5.2	0	72	?	\$65
Hector Mine	1999	7.1	0	0	<10	<\$0.2
Northridge	1994	6.7	57	9,000	14,000	\$40,000
Landers/Big Bear	1992	7.3/6.5	1	402	?	91.1
Loma Prieta	1989	6.9	63	350	27,640	\$10,000
Whittier	1987	5.9	8	200+	10,500	\$358
Coalinga	1983	6.5	0	94	1,000+	\$31
San Fernando	1971	6.7	65	2,000+	2,600+	\$505
Long Beach	1933	6.4	115	100's	?	\$40
Santa Barbara	1925	6.3	13	?	?	\$8

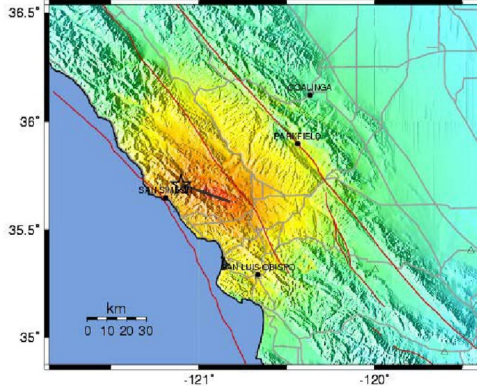
Table 1. Recent, Significant California Earthquakes (www.seismic.ca.gov). Earthquake losses depend not only on the magnitude of an earthquake but also the proximity to structures and the quality of the construction.

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Shake Map Comparison

M6.5 San Simeon earthquake

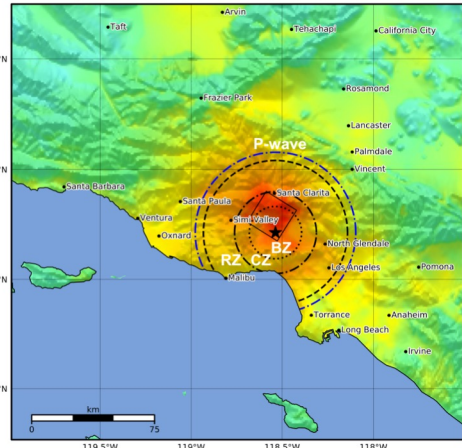
CISN Rapid Instrumental Intensity Map Epicenter: 11 km NE of San Simeon
 Mon Dec 22, 2003 11:15:56 AM PST M 6.5 N35.71 W121.10 Depth: 7.6km ID:4014



Processed: Mon Feb 9, 2004 11:13:57 AM PST.

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Ext
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very
PEAK ACC.(g)	<.17	.17-1.4	1.4-2.9	2.9-9.2	9.2-18	18-34	34-85	85-124	>
PEAK VEL.(cm/s)	>.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-37	37-80	80-176	>
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X

M6.7 Northridge earthquake



SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
DAMAGE	None	None	None	Very light	Light	Moderate	Moderate/heavy	Heavy	Very heavy
PGA(%g)	<0.05	0.3	2.76	6.2	11.5	21.5	40.1	74.7	>139
PGV(cm/s)	<0.02	0.13	1.41	4.65	9.64	20	41.4	85.0	>178
INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X

Scale based on Worden et al. (2012) Version 1: Processed 2018-11-28T21:10:02Z
 Δ Seismic Instrument ○ Macroseismic Observation ★ Epicenter □ Rupture

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2003 M6.5 San Simeon earthquake

94



2003 M6.5 San Simeon earthquake

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- House must be in an EBB ZIP Code
- Successful applicants receive a \$3,000 grant
- Supplementary grants available for income qualifying households

EarthquakeBraceBolt.com

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Tale of Two Houses: Mitigation Works



97

Earthquake Brace & Bolt

2024

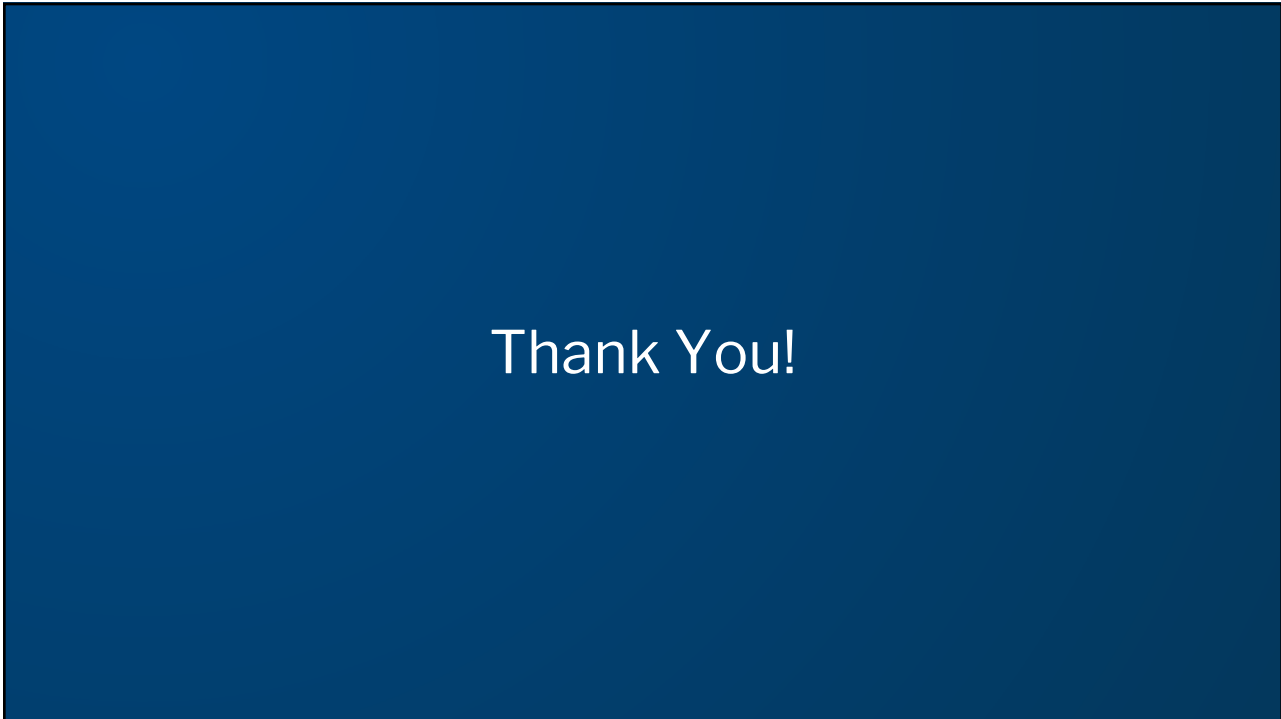
814 ZIP codes

Registration Open:
January 10, 2024 – February 21, 2024

EarthquakeBraceBolt.com



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Q&A

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Questions?
info@earthquakecountry.org

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- [Twitter.com/eca](https://twitter.com/eca)
- info@earthquakecountry.org



Please take our brief survey about today's workshop:
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