USGS
science for a changing world

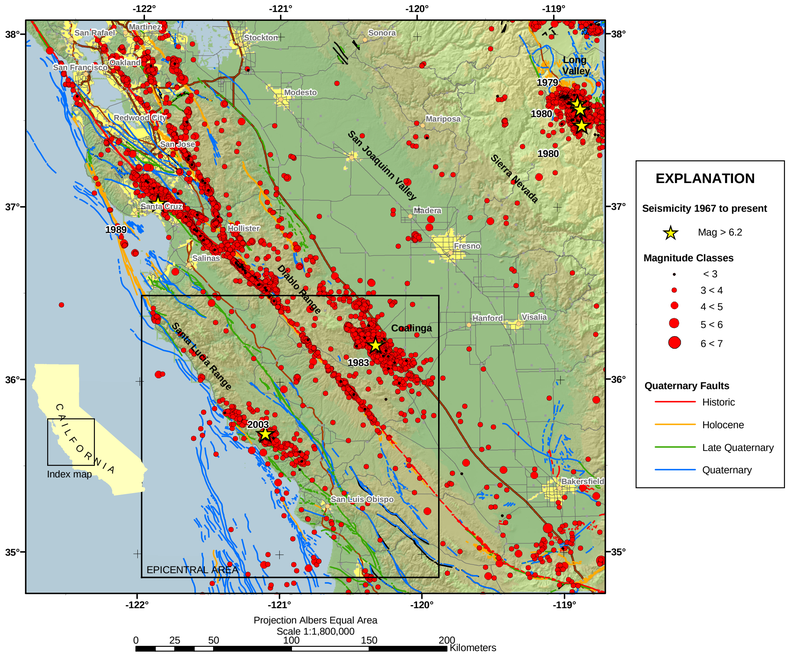
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

M 6.5 San Simeon, California, 22 December 2003

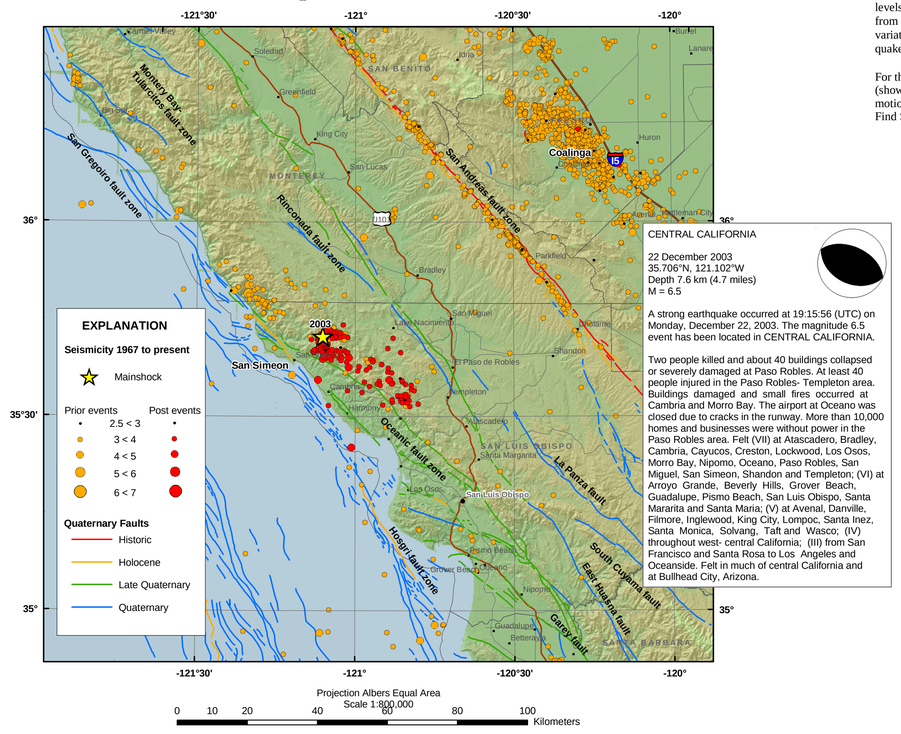
Prepared in cooperation with:

CISN California Integrated Seismic Network — a partner in ...
Advanced National Seismic System ANSS

Seismicity and Physiographic Setting



Epicentral Area



CENTRAL CALIFORNIA

22 December 2003
35.706°N, 121.102°W
Depth 7.6 km (4.7 miles)
M = 6.5

A strong earthquake occurred at 19:15:56 (UTC) on Monday, December 22, 2003. The magnitude 6.5 event has been located in CENTRAL CALIFORNIA.

Two people killed and about 40 buildings collapsed or severely damaged at Paso Robles. At least 40 people injured in the Paso Robles- Templeton area. Buildings damaged and small fires occurred at Cambria and Morro Bay. The airport at Oceano was closed due to cracks in the runway. More than 10,000 homes and businesses were without power in the Paso Robles area. Felt (VII) at Atascadero, Bradley, Cambria, Cayucos, Creston, Lockwood, Los Osos, Morro Bay, Nipomo, Oceano, Paso Robles, San Miguel, San Simeon, Shandon and Templeton; (VI) at Arroyo Grande, Beverly Hills, Grover Beach, Guadalupe, Pismo Beach, San Luis Obispo, Santa Margarita and Santa Maria; (V) at Avenal, Danville, Filmore, Inglewood, King City, Lompoc, Santa Inez, Santa Monica, Solvang, Taft and Wasco; (IV) throughout west- central California; (III) from San Francisco and Santa Rosa to Los Angeles and Oceanside. Felt in much of central California and at Bullhead City, Arizona.

SHAKEMAP

A ShakeMap is a representation of ground shaking produced by an earthquake. While an earthquake has one magnitude and one epicenter, it produces a range of ground shaking levels at sites throughout the region depending on distance from the earthquake, the rock and soil conditions at sites, and variations in the propagation of seismic waves from the earthquake due to complexities in the structure of the Earth's crust.

For the San Simeon earthquake, there are few seismic stations (shown as triangles) in the strongly shaken area so ground motionsin these areas are inferred and are not well determined. Find ShakeMap online at http://earthquake.usgs.gov/shakemap.

PEAK GROUND ACCELERATION

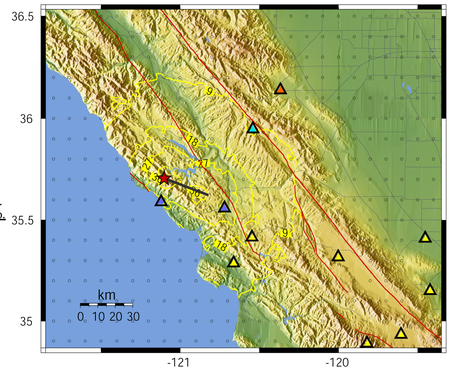
Contours show ground motion ac - celeration in %g (100%g is equal to the acceleration due to gravity). Stations are shown as triangles, and small circles show locations of estimated shaking based on past earthquakes of similar magnitude. The black line represents the ap - proximate extent of rupture to the southeast of the epicenter (red star). Surface faults are shown with red lines and roads are shown as grey lines.

INSTRUMENTAL INTENSITY

Color- coded predicted seismic intensity (see Legend) based on ground motions recorded in past earthquakes. Stations are shown as triangles. The black line represents the approximate extent of rupture to the southeast of the epicenter (red star). Surface faults are shown with red lines and roads are shown as grey lines.

Peak Ground Acceleration

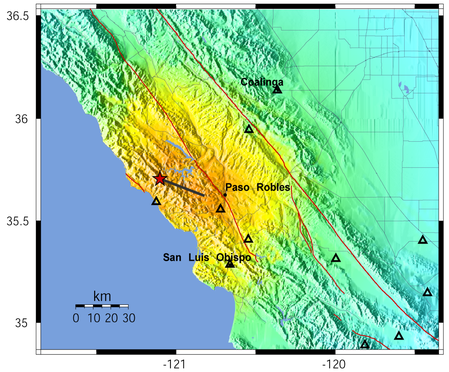
CISN Peak Accel. Map (in %g) Epicenter: 11 km NE of San Simeon, CA
Mon Dec 22, 2003 11:15:56 AM PST M 6.5 N35.71 W121.10 Depth: 7.6km ID:40148755



PROCESSED: Tue Jan 6, 2004 04:59:22 PM PST,

Instrumental Intensity Map

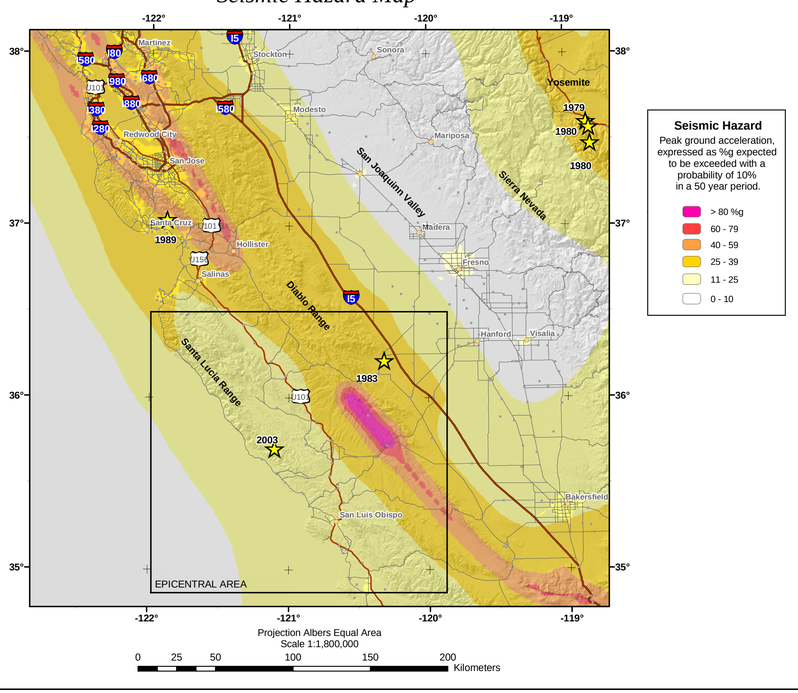
CISN Rapid Instrumental Intensity Map Epicenter: 11 km NE of San Simeon
Mon Dec 22, 2003 11:15:56 AM PST M 6.5 N35.71 W121.10 Depth: 7.6km ID:40148755



PROCESSED: Tue Jan 6, 2004 04:59:22 PM PST,

PERCEIVED SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Severe	Violent	Extreme
POTENTIAL DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy
PEAK ACC.(%g)	<.17	.17-1.4	1.4-3.9	3.9-9.2	9.2-18	18-34	34-65	65-124	>124
PEAK VEL.(cm/s)	<0.1	0.1-1.1	1.1-3.4	3.4-8.1	8.1-16	16-31	31-60	60-116	>116
INSTRUMENTAL INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+

Seismic Hazard Map



TECTONIC SUMMARY

This earthquake likely occurred on a blind thrust fault in the Santa Lucia mountains of coastal Central California, north of the town of Cambria. The location of the earthquake is in a region with a history of frequent small and moderate shocks. A study of the elastic- waves radiated from the source indicates that the San Simeon earthquake was caused by reverse faulting. Rupture propagated to the south-east from the hypocenter over a distance of approximately 20 km. Previous shocks from the region have also been caused by reverse faulting or by oblique- reverse faulting. Although the nearest mapped fault is part of the Oceanic fault zone, a system of vertical strike-slip faults, the dip and the thrust motion ofthe San Simeon event are not consistent with movement on a vertical fault. The largest historical earthquake in the vicinity of the earthquake was the magnitude 6.2 Bryson earthquake of November 1952.

The broad scale tectonics of coastal central California are dominated by the northwestward motion of the Pacific plate with respect to the North American plate. Most of the relative plate motion is accommodated by slip on major strike- slip faults, such as the San Andreas fault, situated about 60 km northeast of the epicenter of this earthquake, and the San Simeon- Hosgri fault system, about 10 km southwest of the epicenter. The reverse faulting that generated the recent earthquake was caused by the release of compressive stress that was generated by the motion of crustal blocks within the overall strike- slip plate- boundary zone.

DATA SOURCES

USGS, National Earthquake Information Center
California Integrated Seismic Network
US Quaternary Faults and Fold Database
California Geological Survey
Earthquake Engineering Research Institute
USGS EROS Data Center
ESRI Data and Maps

ONLINE SOURCES
http://earthquake.usgs.gov/
http://www.cisn.org/
http://qfaults.cr.usgs.gov/
http://www.consrv.ca.gov/cgs/

DISCLAIMER

Base map data, such as place names, highways and other cultural features,are the best available but may not be current or may contain inaccuracies, and therefore should not be regarded as having official significance.

The House of Bread was located in the Mastagni/Acorn Building which collapsed. By the time these pictures were taken, emergency personnel had removed the front wall of the building and a great deal of debris.

Photo by Junichi Sakai

The earthquake caused a sulfur hot spring to erupt behind Paso Robles City Hall. This appears to be a new spring source. Hot spring water, large clouds of steam, and a strong sulfur smell were released.

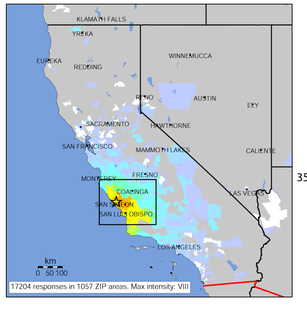
Photo by Patxi Uriz

This unreinforced masonry building was built in 1892 and its clock tower became a symbol for the town of Paso Robles. The second story collapsed during the earthquake, killing two employees of Ann's Dress Shop as they tried to flee onto Park Street.

Photo by Patxi Uriz

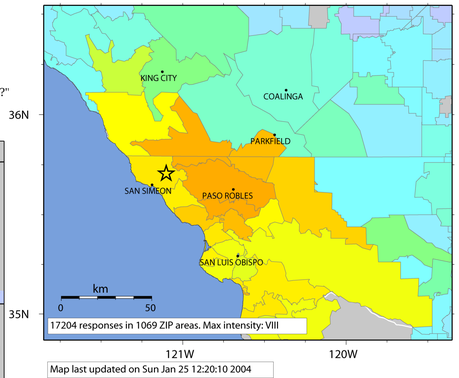
COMMUNITY INTERNET INTENSITY MAP

The CIIM, commonly referred to as "Did you feel it?", summarizes the online questionnaire responses provided by Internet users. An intensity number is asigned to each community from which a completed CIIM form was received; each intensity value reflects the effects of earthquake shaking on the people and structures in the community. The color- coded ZIP code on the map represents the average of the individual intensity values in that ZIP code zone. For more information about CIIM go to: http://earthquake.usgs.gov/, select "Did you feel it?"



Reported Intensity Map

Community Internet Intensity Map (11 miles N of Cambria, CA)
ID:40148755 11:15:56 PST DEC 22 2003 Mag=6.5 Latitude=N35.71 Longitude=W121.10



Map last updated on Sun Jan 25 12:20:10 2004

INTENSITY	I	II-III	IV	V	VI	VII	VIII	IX	X+
SHAKING	Not felt	Weak	Light	Moderate	Strong	Very strong	Sever e	Violent	Extreme
DAMAGE	none	none	none	Very light	Light	Moderate	Moderate/Heavy	Heavy	Very Heavy

Map prepared by U.S. Geological Survey
National Earthquake Information Center
26 January 2003
Map not approved for release by Director USGS