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

EARTHQUAKE SUMMARY MAP XXX

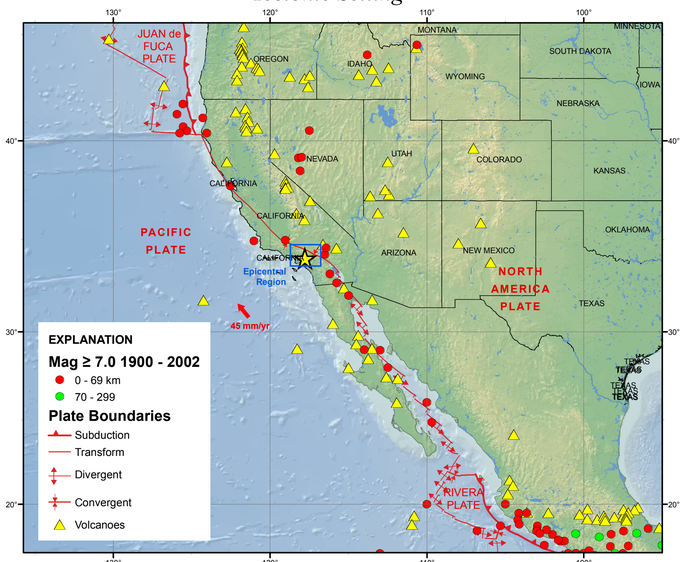
*Prepared in cooperation with:*

ANSS

CISN California Integrated Seismic Network

# M5.5 Chino Hills, Los Angeles Area, CA Earthquake of 29 July 2008

## *Tectonic Setting*

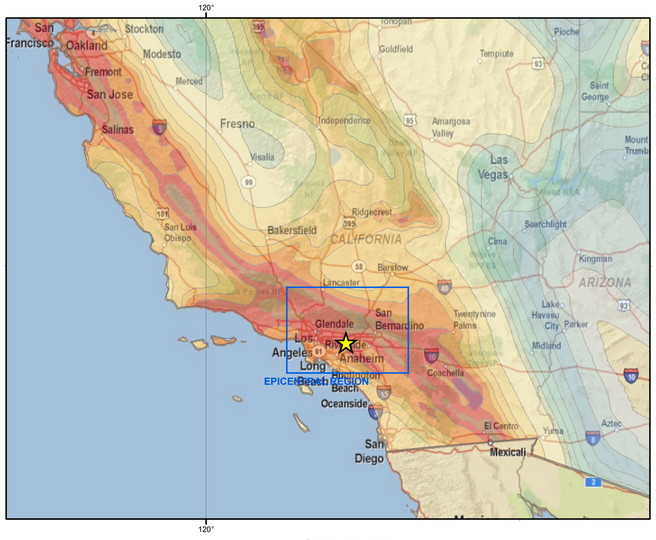



RELATIVE PLATE MOTIONS

The broad red vector represents the motion of the Pacific Plate relative to the North America Plate in the region. The motion of the Pacific Plate is generally 45 mm/yr northwestward with respect to the North America Plate.

Scale 1:20,000,000

## *Seismic Hazard*




Seismic hazard is expressed as percent g on firm rock, expected to be exceeded in a 50-yr period with a probability of 10 percent.

Scale 1:5,000,000

## *Epicentral Region*


Scale 1:600,000

TECTONIC SUMMARY

The Chino Hills (greater Los Angeles area) earthquake of 29 July 2008, 11:42 PDT (18:42 UTC), was centered in the hills south of the communities of Diamond Bar and Chino Hills. The characteristics of elastic-waves radiated from the earthquake source imply that the earthquake was caused by oblique-reverse faulting, in which a block of crust is thrust up and over the crust on the opposite side of the fault and also moves sideways with respect to the crust on the opposite side of the fault. This style of faulting is intermediate between pure reverse (thrust) faulting and pure strike-slip faulting. The causative fault is of a type that would be expected to result from the northerly oriented compressive tectonic stresses that affect the Los Angeles region, but the earthquake has not been associated with a specific geologically mapped fault.

The 29 July 2008 earthquake was situated about 30 km east-southeast of the Whittier Narrows earthquake of 1 October 1987, which had a magnitude of 5.9, caused 8 fatalities, and produced over $358 million in damages. The 2008 earthquake was also situated about 20 km south of the Upland earthquake of 28 February 1990 (labeled above), which had a magnitude of 5.5 and caused over $12 million in damages. The Whittier Narrows earthquake occurred as the result of thrust-faulting (reverse-faulting on a shallowly dipping plane) on the Puente Hills thrust. The Upland earthquake occurred as the result of left-lateral strike-slip motion on a northeast-striking fault.

**Significant Earthquakes Mag >= 5.9 1769 - 2008**

| Year | Mon | Day | Time | Lat | Long | Dep | Mag |
|---|---|---|---|---|---|---|---|
| 1769 | 07 | 28 | 0000 | 33.9 | -117.8 | | 6 |
| 1812 | 12 | 08 | 1500 | 34.37 | -117.65 | | 6.9 |
| 1855 | 07 | 11 | 0415 | 34.1 | -118.1 | | 6 |
| 1858 | 12 | 16 | 1000 | 34 | -117.5 | | 6 |
| 1894 | 07 | 30 | 0512 | 34.3 | -117.6 | | 5.9 |
| 1899 | 07 | 22 | 2032 | 34.3 | -117.5 | | 6.5 |
| 1899 | 12 | 25 | 1225 | 33.8 | -117 | | 6.7 |
| 1910 | 05 | 15 | 1547 | 33.700 | -117.400 | | 6.0 |
| 1918 | 04 | 21 | 2232 | 33.750 | -117.000 | | 6.8 |
| 1923 | 07 | 23 | 0730 | 34.000 | -117.250 | | 6.2 |
| 1933 | 03 | 11 | 0154 | 33.616 | -117.966 | 16 | 6.3 |
| 1971 | 02 | 09 | 1400 | 34.412 | -118.400 | 8 | 6.6 |
| 1987 | 10 | 01 | 1442 | 34.061 | -118.078 | 10 | 5.9 |
| 1992 | 06 | 28 | 1505 | 34.203 | -116.827 | 5 | 6.9 |
| 1994 | 01 | 17 | 1230 | 34.213 | -118.537 | 18 | 6.8 |

DATA SOURCES

EARTHQUAKES AND SEISMIC HAZARD
USGS, National Earthquake Information Center
NOAA, National Geophysical Data Center
IASPEI, Centennial Catalog (1900 - 1999) and extensions (Engdahl and Villaseñor, 2002)
HDF (unpublished earthquake catalog) (Engdahl, 2003)
Global Seismic Hazard Assessment Program

PLATE TECTONICS AND FAULT MODEL
PB2002 (Bird, 2003)
Finite Fault Model, Chen Ji, UC Santa Barbara (2007)

BASE MAP
NIMA and ESRI, Digital Chart of the World
ESRI Online Services
USGS, EROS Data Center
NOAA GEBCO and GLOBE Elevation Models

REFERENCES


Bird, P., 2003, An updated digital model of plate boundaries: Geochem. Geophys. Geosyst., v. 4, no. 3, pp. 1027- 80.

Engdahl, E.R. and Villaseñor, A., 2002, Global Seismicity: 1900 - 1999, chap. 41 of Lee, W.H.K., and others,eds., International Earthquake and Engineering Seismology, Part A: New York, N.Y., Elsevier Academeic Press, 932 p.

Engdahl, E.R., Van der Hilst, R.D., and Buland, R.P., 1998, Global teleseismic earthquake relocation with improved travel times and procedures for depth determination: Bull. Seism. Soc. Amer., v. 88, p. 722-743.


DISCLAIMER

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

USGS science for a changing world

USAID FROM THE AMERICAN PEOPLE

**M 5.4, GREATER LOS ANGELES AREA, CALIFORNIA**
Origin Time: Tue 2008-07-29 18:42:15 UTC
Location: 33.95°N 117.76°W Depth: 14 km

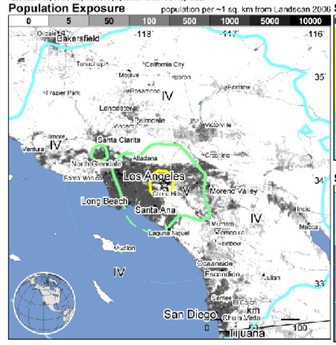
**PAGER**
**Version 4**
Created: 12 days, 23 hrs after earthquake

### Estimated Population Exposed to Earthquake Shaking

| ESTIMATED POPULATION EXPOSURE (k = x1000) | | - | 607k* | 10,660k* | 10,408k* | 1,172k* | 0 | 0 | 0 | 0 |
|---|---|---|---|---|---|---|---|---|---|---|
| ESTIMATED MODIFIED MERCALLI INTENSITY | | I | II-III | IV | V | VI | VII | VIII | IX | X+ |
| PERCEIVED SHAKING | | Not felt | Weak | Light | Moderate | Strong | Very strong | Severe | Violent | Extreme |
| POTENTIAL DAMAGE | Resistant Structures | none | none | none | V. Light | Light | Moderate | Moderate/Heavy | Heavy | V. Heavy |
| | Vulnerable Structures | none | none | none | Light | Moderate | Moderate/Heavy | Heavy | V. Heavy | V. Heavy |

*Estimated exposure only includes population within the map area.

**Population Exposure** population per ~1 sq. km from Landscan 2006




**Selected City Exposure**

| MMI | City | Population |
|---|---|---|
| VI | Chino Hills | 66k |
| VI | Pomona | 165k |
| VI | Diamond Bar | 65k |
| V | Yorba Linda | 64k |
| VI | Walnut | 31k |
| V | Brea | 39k |
| V | Placentia | 49k |
| V | Los Angeles | 3,694k |
| V | Long Beach | 482k |
| IV | San Diego | 1,223k |
| IV | Tijuana | 1,376k |

Bold cities appear on map (k = x1000)

**Shaking Intensity** MMI

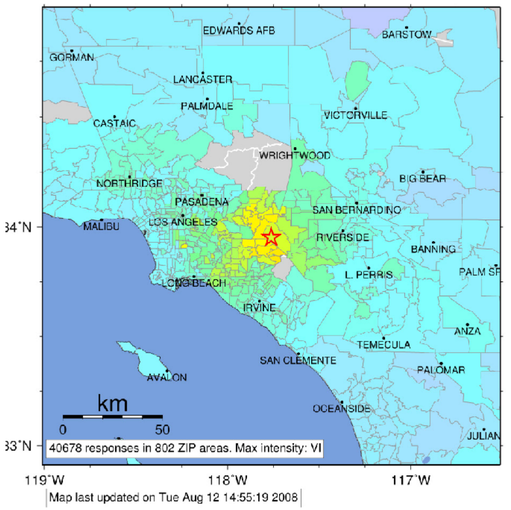
Overall, the population in this region resides in structures that are resistant to earthquake shaking, though some vulnerable structures exist. A magnitude 5.9 earthquake 37 km Northeast of this one struck Whittier Narrows California on October 01, 1987 (UTC), with estimated population exposures of 20,000 at intensity VIII and 1,292,000 at intensity VII, resulting in an estimated 8 fatalities. On January 17, 1994 (UTC), a magnitude 6.7 earthquake 78 km Northeast of this one struck Northridge, California, with estimated population exposures of 211,000 at intensity IX or greater and 1,968,000 at intensity VIII, resulting in an estimated 60 fatalities. Recent earthquakes in this area have caused, landslides and liquefaction that may have contributed to losses.
This information was automatically generated and has not been reviewed by a seismologist.

http://earthquake.usgs.gov/pager

Event ID: ci14383980

### USGS Community Internet Intensity Map (3 miles SW of Chino Hills, CA)

ID:14383980 11:42:15 PDT JUL 29 2008 Mag=5.4 Latitude=N33.95 Longitude=W117.76




| INTENSITY | I | II-III | IV | V | VI | VII | VIII | IX | X+ |
|---|---|---|---|---|---|---|---|---|---|
| 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 |


Map prepared by U.S. Geological Survey
National Earthquake Information Center
26 September 2008
Map not approved for release by Director USGS