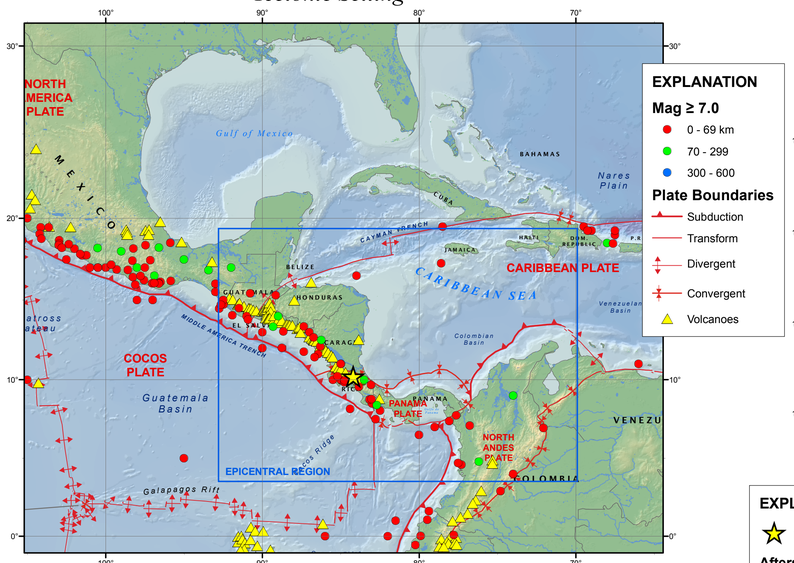
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

EARTHQUAKE SUMMARY MAP XXX

Prepared in cooperation with the Global Seismographic Network

M6.1 Costa Rica Earthquake of 8 January 2009

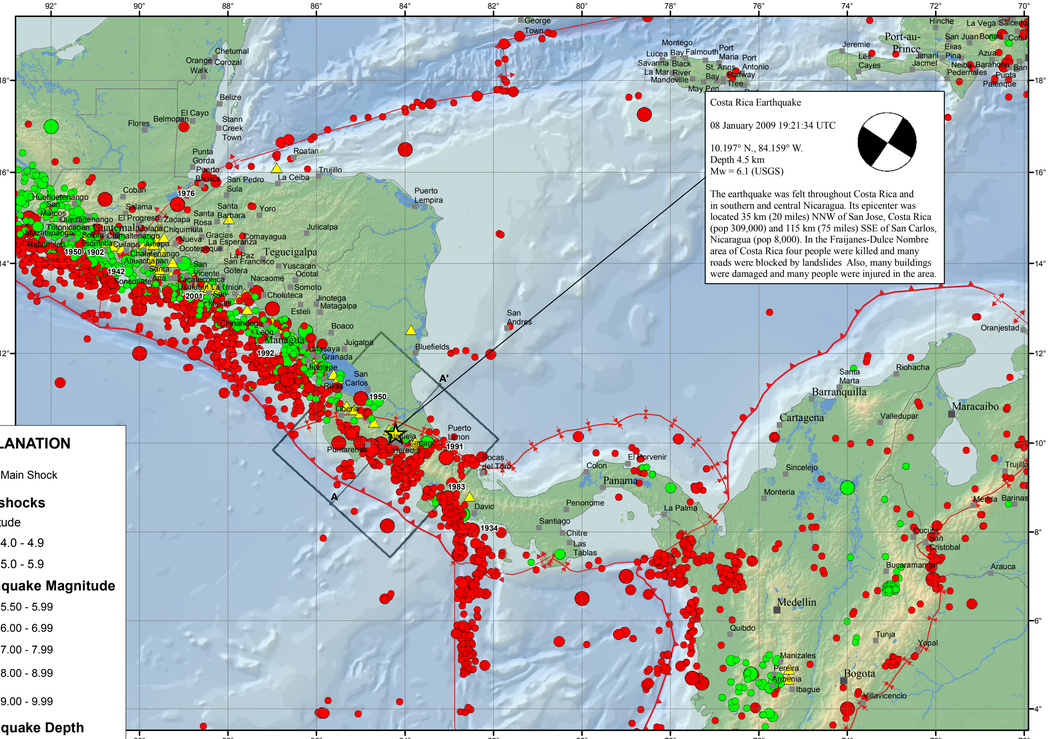
Tectonic Setting



RELATIVE PLATE MOTIONS

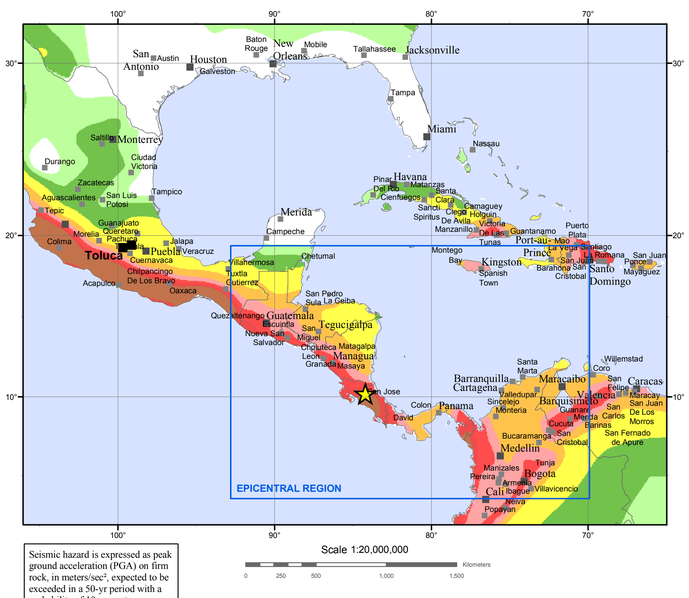
The Cocos Plate and Caribbean Plate converge in the region of this earthquake, with the Cocus plate subducting under the crustal Caribbean Plate. Plate convergence is around 75 mm/yr.

Epicentral Region



Note on earthquakes: From 1900 - 1963, earthquakes shown are from Centennial Catalog, magnitudes greater than 5.5. From 1964 - 2002, earthquakes are from HDF catalog, magnitudes greater than 4.5. From 2003 to present, earthquakes are from NEIC, magnitudes greater than 4.5.

Seismic Hazard



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec², expected to be exceeded in a 50-yr period with a probability of 10 percent.

Peak Ground Acceleration in m/sec**2

.2 .4 .8 1.6 2.4 3.2 4.0 4.8

M 6.1, COSTA RICA
Origin Time: Thu 2009-01-08 19:21:36 UTC
Location: 10.22°N 84.21°W Depth: 14 km

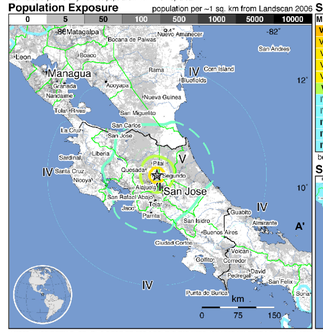
PAGER
Version 4
Created: 1 hrs, 54 mins after earthquake

Estimated Population Exposed to Earthquake Shaking

ESTIMATED POPULATION EXPOSURE (k = x1000)	- -*	120k*	5.195k	2.296k	1,053k	36k	2k	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
POTENTIAL DAMAGE: 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
VII	Rio Segundo	9k
VII	Sabanilla	1k
VII	Santo Domingo	5k
VI	San Juan	7k
VI	Zarcero	3k
V	San Jose	335k
IV	Masaya	130k
IV	Tipitapa	127k
IV	Managua	973k
IV	Leon	144k
IV	Matagalpa	109k

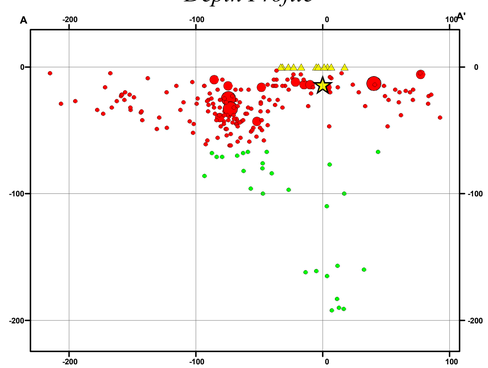
bold cities appear on map (k = x1000)

Overall, the population in this region resides in structures that are vulnerable to earthquake shaking, though some resistant structures exist. A magnitude 6.5 earthquake 84 km Northeast of this one struck Costa Rica on April 14, 1973 (UTC), with estimated population exposures of 9,000 at intensity VIII and 152,000 at intensity VII, resulting in an estimated 26 fatalities. On April 22, 1991 (UTC), a magnitude 7.6 earthquake and tsunami 142 km Northeast of this one struck Valle de la Estrella, Costa Rica, with estimated population exposures of 213,000 at intensity VII and 1,809,000 at intensity VI, resulting in an estimated 75 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: us2009bpba

Depth Profile



TECTONIC SUMMARY

The Costa Rican earthquake of January 8th, 2009 occurred within the Caribbean plate just east of its surface boundary with the Cocos plate. The earthquake has a strike-slip mechanism and likely resulted from the release of stresses built up within the crust of the Caribbean plate as the Cocos plate subducts beneath it. The plates converge at a rate of about 75 mm/year and the Cocos subducted slab dips to the northeast at around 45° to a depth of 170 km.

Cocos subduction has been responsible for a tremendous amount of historically damaging earthquakes in Central America. In 1776 an earthquake in Santiago, Guatemala left 20,000 dead, destroyed 3,000 buildings and forced the colonial capital of Central America to be moved. In 1931 a M6.0 earthquake in Managua, Nicaragua killed 2,000 people. In 1972 another earthquake in Managua with M6.2 left approximately 5,000 dead, 20,000 injured and 250,000 homeless. The 1976 M7.5 Motagua earthquake in Guatemala claimed 23,000 lives and injured 76,000 more. This event took place along the Motagua fault zone, which acts as the active transform boundary between the Caribbean and South America plates. In 1986 a M5.5 earthquake killed 1,000 people in El Salvador. The 1991 M7.6 earthquake in Costa Rica killed 47 people and injured 109 more. In 1992 a M7.6 earthquake in Nicaragua killed at least 116 people. Most damage and casualties were a result of a tsunami triggered by the earthquake. In January of 2001, a M7.7 earthquake southwest of San Miguel, El Salvador killed 852 people and damaged 150,000 buildings. Extensive landsliding was responsible for most of the deaths and damage associated with this event. One month later, to the day, a M6.6 earthquake took 315 lives in the San Juan Tepezontes-San Vicente-Cojutepeque area in El Salvador.

Significant Earthquakes Mag >= 7.5

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1907	06	25	1754	1.000	127.000	200	7.5
1910	12	16	1445	4.500	126.500	0	7.6
1913	03	14	0845	4.500	126.500	0	7.9
1914	05	26	1422	-2.000	137.000	0	7.9
1916	01	13	0820	-3.000	135.500	0	7.6
1926	10	26	0344	-3.219	139.097	35	7.5
1932	05	14	1311	0.258	126.169	35	8.1
1936	04	01	0209	4.165	126.521	35	7.7
1950	10	08	0323	-3.750	128.250	0	7.5
1957	09	24	0821	5.230	127.117	35	7.7
1965	01	24	0011	-2.455	125.965	28.4	8.2
1968	08	10	0207	1.422	126.260	19.6	7.6
1971	01	10	0717	-3.232	139.744	54.9	7.7
1979	09	12	0517	-1.688	135.966	18.9	7.5
1986	08	14	1939	1.805	126.485	30.9	7.5
1996	02	17	0559	-0.919	136.973	36.5	8.2
2007	01	21	1127	1.065	126.282	22	7.5
2009	01	03	1943	-0.510	132.783	35	7.6

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
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 Academic 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.

Map prepared by U.S. Geological Survey
National Earthquake Information Center
8 January 2009
Map not approved for release by Director USGS