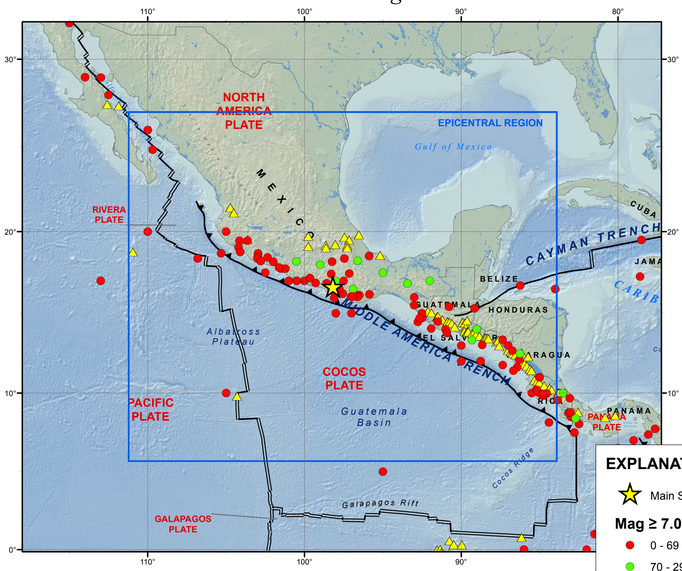
U.S. DEPARTMENT OF THE INTERIOR
U.S. GEOLOGICAL SURVEY

EARTHQUAKE SUMMARY MAP XXX

Prepared in cooperation with the Global Seismographic Network
GSN

M7.4 Oaxaca, Mexico Earthquake of 20 March 2012

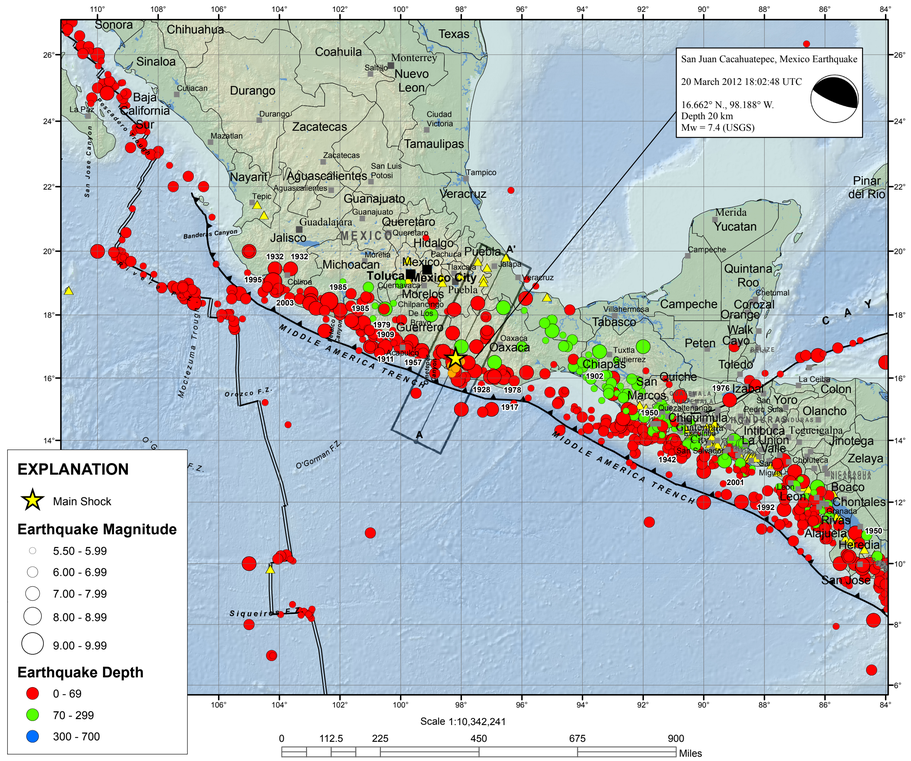
Tectonic Setting



RELATIVE PLATE MOTIONS

In this region, the dominant plate motion is that between the Philippine Sea plate and the Sunda plate. The Philippine Sea plate moves west-northwest with respect to the Sunda plate at 60-110 mm/year. Complex plate motion results from the numerous micro-plates also in the region.

Epicentral Region



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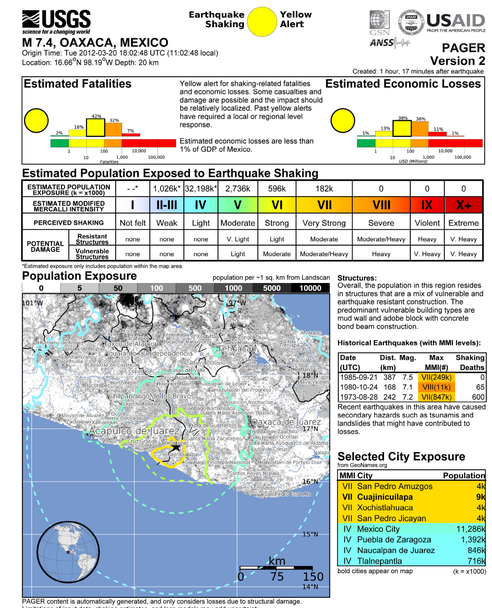
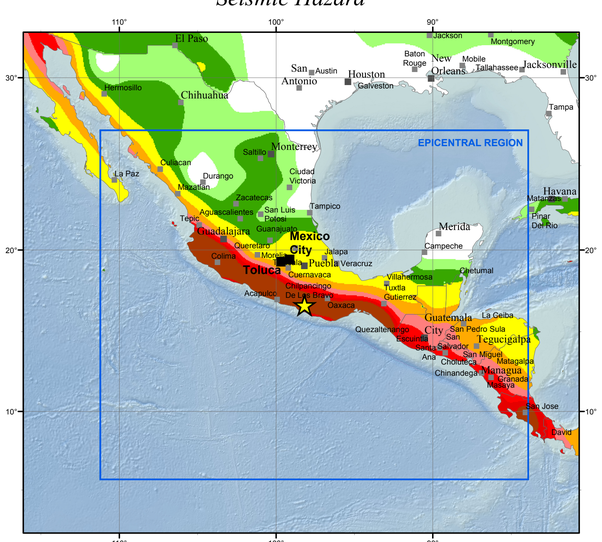
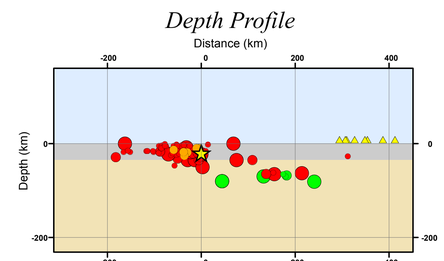


Seismic Hazard



Seismic hazard is expressed as peak ground acceleration (PGA) on firm rock, in meters/sec^2, expected to be exceeded in a 50-yr period with a probability of 10 percent.

Depth Profile



Cross-section defined by profile boundaries shown on the Epicenter Map

Damage associated with the magnitude 7.4 Oaxaca, Mexico earthquake of March 20, 2012.

TECTONIC SUMMARY

The March 20, 2012 earthquake occurred as a result of thrust-faulting on or near the plate boundary interface between the Cocos and North America plates. The focal mechanism and depth of the earthquake are consistent with its occurrence on the subduction zone interface between these plates, approximately 100 km northeast of the Middle America Trench, where the Cocos plate begins its decent into the mantle beneath Mexico. In the region of this earthquake, the Cocos plate moves approximately northeastwards at a rate of 60 mm/yr.

Historically, there have been several significant earthquakes along the southern coast of Mexico. In 1932, a magnitude 7.9 thrust earthquake struck in the region of Jalisco, several hundred kilometers to the northwest of todays event. On October 9, 1995 a magnitude 7.9 earthquake struck in the Colima-Jalisco region, killing at least 49 people and leaving 1,000 homeless. The most deadly nearby earthquake occurred in the Michoacan region 470 km to the northwest of todays event, on September 19, 1985. This magnitude 8.0 earthquake killed at least 9,500 people, injured about 30,000, and left 100,000 people homeless. More recently, a 2003 M7.6 Colima, Mexico earthquake 640 km to the northwest of todays event killed 29 people, destroyed more than 2,000 homes and left more than 10,000 homeless.

Significant Earthquakes Mag >= 7.5

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1902	04	19	0223	14.000	-91.000	0	7.5
1902	09	23	2018	16.000	-93.000	0	7.8
1907	04	15	0608	17.000	-100.000	0	7.9
1908	03	26	2303	18.000	-99.000	80	7.7
1909	07	30	1051	17.000	-100.500	0	7.6
1911	06	07	1102	17.500	-102.500	0	7.6
1911	12	16	1914	17.000	-100.500	50	7.6
1917	12	29	2250	15.000	-97.000	0	7.7
1928	03	22	0417	16.127	-96.505	35	7.5
1928	06	17	0319	16.028	-97.036	35	7.7
1928	10	09	0301	16.229	-97.550	35	7.5
1931	01	15	0150	16.053	-96.614	35	7.8
1932	06	03	1036	19.457	-104.146	25	7.9
1932	06	18	1012	19.452	-103.632	54.3	7.9
1941	04	15	1909	18.677	-102.957	35	7.6
1942	08	06	2337	13.780	-90.913	35	7.7
1950	10	05	1609	11.000	-85.000	0	7.8
1950	10	23	1613	14.500	-91.500	0	7.5
1957	07	28	0840	16.881	-99.297	37.2	7.8
1973	01	30	2101	18.455	-102.960	37.2	7.6
1976	02	04	0901	15.297	-89.145	12.1	7.5
1978	11	29	1952	16.012	-96.602	24.5	7.8
1979	03	14	1107	17.759	-101.222	24.6	7.5
1985	09	19	1317	18.437	-102.358	15	8.0
1985	09	21	0137	17.827	-101.622	18.4	7.6
1992	09	02	0016	11.766	-87.352	45	7.7
1995	10	09	1535	19.052	-104.208	26.2	8.0
1999	09	30	1631	16.046	-96.912	40	7.5
2001	01	13	1733	13.038	-88.661	38	7.7
2003	01	22	0206	18.770	-104.104	24	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)
World Slap (Hayes and Wald, 2010)

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 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.

The GEBCO_08 Grid, version 20090202, http://www.gebco.net

Hayes, Gavin, and Wald, David, 2010, Slab models for subduction zones: USGS, http://earthquakes.usgs.gov/research/data/slab

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
20 March 2012
Map not approved for release by Director USGS