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

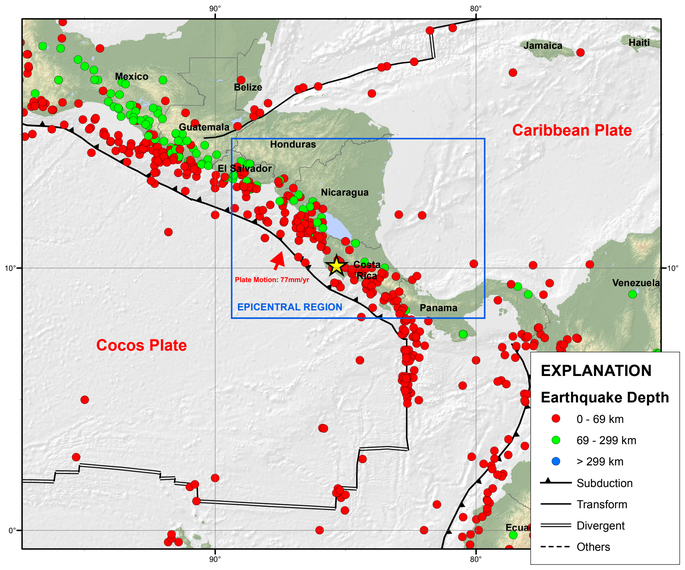
EARTHQUAKE SUMMARY MAP XXX

Prepared in cooperation with the Global Seismographic Network

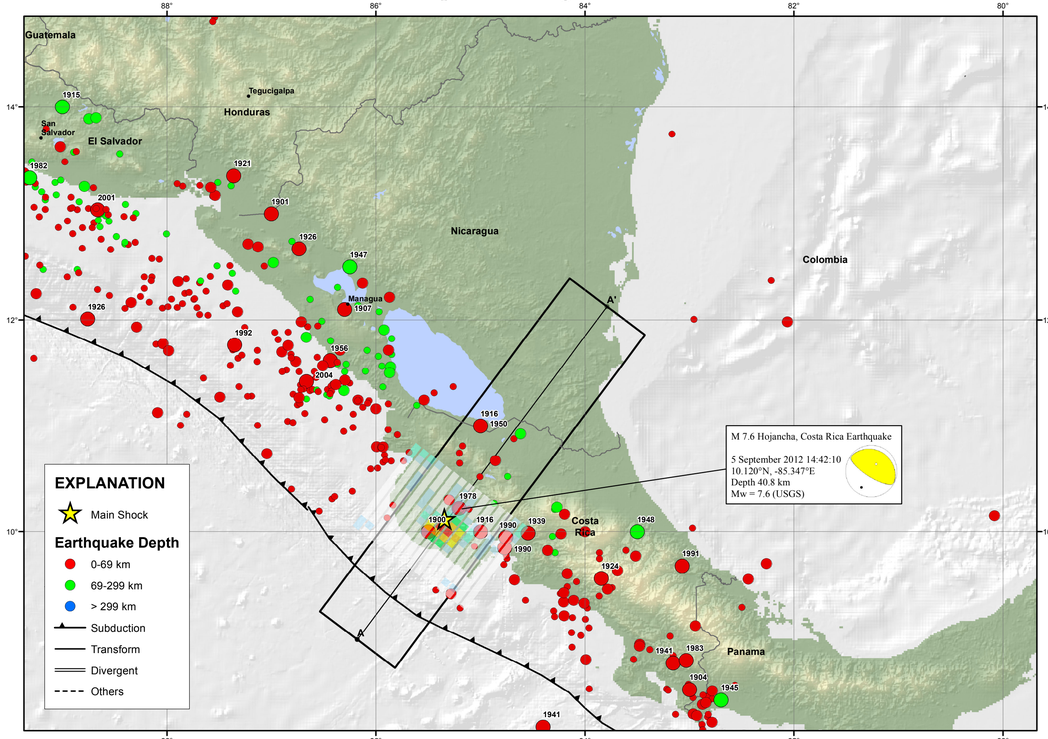
GSN

M 7.6 Hojancha, Costa Rica Earthquake of 5 September 2012

Tectonic Setting



Epicentral Region



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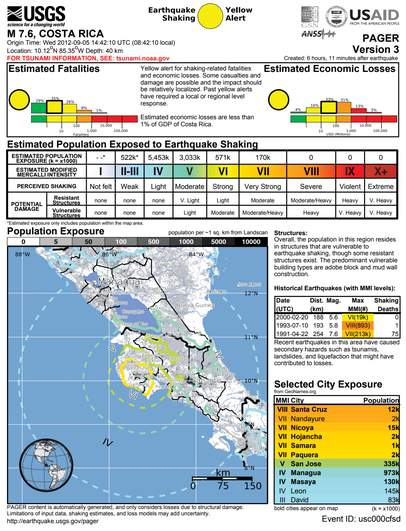
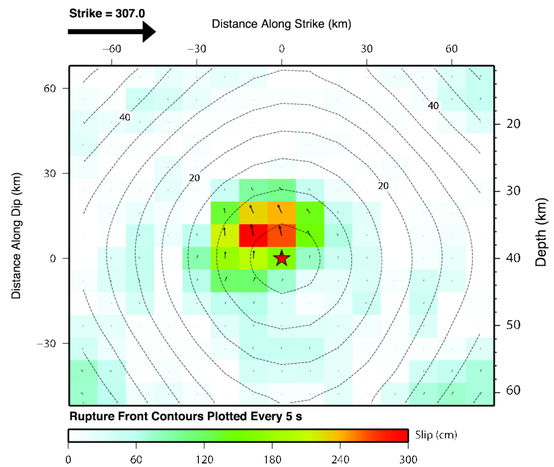
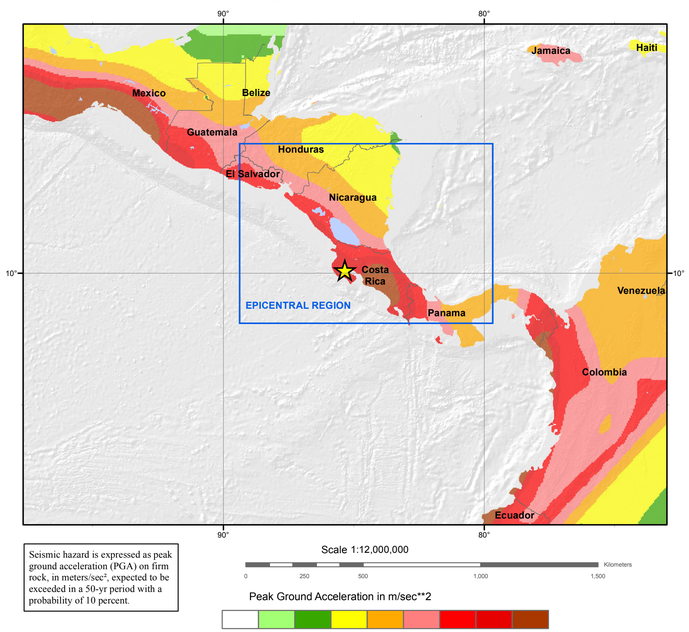


Finite Fault Model

Distribution of the amplitude and direction of slip for subfault elements of the fault rupture model are determined from the inversion of teleseismic body waveforms and long period surface waves. Arrows indicate the amplitude and direction of slip (of the hanging wall with respect to the foot wall); the slip is also colored by magnitude.The view of the rupture plane is from above. The strike of the fault rupture plane is N37W and the dip is 25 NE. The dimensions of the subfault elements are10km in the strike direction and 8 km in the dip direction.The rupture surface is 70 km along strike and 50 km downdip. The seismic moment release based upon this plane is 2.93e+27 dyne.cm.

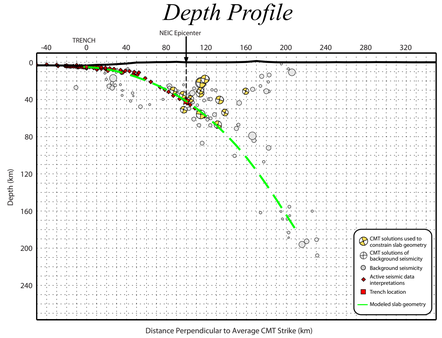


Seismic Hazard



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



TECTONIC SUMMARY

The September 5th 2012 M 7.6 earthquake beneath the Nicoya Peninsula, Costa Rica, occurred as the result of thrust faulting on or near the subduction zone interface between the Cocos and Caribbean plates. At the latitude of this earthquake, the Cocos plate moves north-northeast with respect to the Caribbean plate at a velocity of approximately 77 mm/yr, and subducts beneath Central America at the Middle America Trench.

Over the past 40 years, the region within 250 km of the September 5th earthquake has experienced approximately 30 earthquakes with M 6 or greater; two of these were larger than M 7, and neither caused documented fatalities. The first was a M 7.2 in August of 1978, 9 km to the north-northeast of the September 5th event; the second had a magnitude of M 7.3, and struck a region just over 50 km to the east-southeast in March 1990. The earthquake of October 5, 1950, M 7.8, occurred in the general area of the September 5th 2012 earthquake, although the hypocenter of the earlier earthquake is not known to high precision. The 1950 earthquake caused damage in northwestern Costa Rica and in the Valle Central of Costa Rica, but no reported casualties. The closest earthquake to cause fatalities in recent history was the M 6.5 April 1973 earthquake, which occurred at shallow depth approximately 80 km to the northeast; the 1973 shock resulted in 26 fatalities and over 100 injuries.

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.

Significant Earthquakes >= M 7.0

Year	Mon	Day	Time	Lat	Long	Dep	Mag
1900	06	21	2052	10.000	-85.500	0	7.2
1900	11	09	1610	13.000	-90.000	0	7.0
1901	10	08	0214	13.000	-87.000	0	7.1
1904	12	20	0544	8.500	-83.000	0	7.2
1907	12	30	0526	12.100	-86.300	0	7.2
1916	02	27	2020	12.000	-90.000	0	7.3
1916	04	24	0802	11.000	-85.000	0	7.2
1916	04	26	0221	10.000	-85.000	0	7.1
1924	03	04	1007	9.557	-83.844	35	7.0
1926	02	08	1517	12.011	-88.758	35	7.1
1926	11	05	0755	12.670	-86.736	35	7.1
1934	07	18	0136	8.045	-82.480	25	7.6
1939	12	21	2054	9.986	-84.546	35	7.2
1941	12	05	2047	8.752	-83.158	35	7.3
1941	12	06	2124	8.143	-84.401	35	7.0
1945	06	03	1305	8.400	-82.700	80	7.0
1947	01	26	1006	12.500	-86.250	170	7.0
1948	11	19	0104	10.000	-83.500	80	7.0
1950	10	05	1609	11.000	-85.000	0	7.8
1956	10	24	1442	11.619	-86.436	35	7.2
1962	07	26	0814	7.499	-82.781	23	7.2
1978	08	23	0038	10.222	-85.204	25	7.0
1983	04	03	0250	8.777	-83.032	25	7.5
1990	03	25	1316	9.847	-84.769	32.9	7.1
1990	03	25	1322	9.948	-84.757	22	7.3
1991	04	22	2156	9.675	-83.072	12.3	7.6
1992	09	02	0016	11.766	-87.352	45	7.7
2001	01	13	1733	13.038	-88.661	38	7.7
2012	09	05	1442	10.120	-85.347	40.8	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)
Ji, C., D.J. Wald, and D.V. Helmberger, Source description of the 1999 Hector Mine, California earthquake; Part I: Wavelet domain inversion theory and resolution analysis, Bull. Seism. Soc. Am., Vol 92, No. 4. pp. 1192-1207, 2002.
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.

Map prepared by U.S. Geological Survey
National Earthquake Information Center
5 September 2012
Map not approved for release by Director USGS